Chapter 5 - Road and Path Design

9.5.1 Purpose

(1) The purpose of this chapter of the policy is to support the provisions of the Reconfiguration Code and the Infrastructure Works Code for the design of roads and paths under the planning scheme.

(2) In supporting these codes this chapter augments the provisions of the following -

(a) *Queensland Streets;*

(b) *Queensland Urban Drainage Manual* (QUDM);

(c) *AUSTROADS Parts 13 and 14*;

(d) Department of Main Roads design manuals.

9.5.2 Applicability

This chapter applies to all applications under the planning scheme for construction of new roads and paths, or alterations to the design of existing roads or paths within the planning scheme area.

9.5.3 Road Function, Width and Movement Network Design

9.5.3.1 General

(1) The local government's approved specifications for road construction works conforms to *AUS-SPEC # 1 - Construction*, except as amended in this policy.

(2) The use of the word road in this chapter may also include streets but not vice versa.

9.5.3.2 Streets

(1) Streets are designed in accordance with the requirements of *Queensland Streets* except as specifically described in relation to conditions of reconfiguration approval for developments, or as specified in this chapter of the policy.

(2) *Queensland Streets* is the principal document for the design of reconfiguration layouts. This chapter of the policy is intended to augment this document and takes precedence.

9.5.3.3 Roads

(1) Where conflict exists, this chapter of the policy takes precedence.

(2) Roads are designed in accordance with the requirements of -

(a) *Queensland Streets*;

(b) *Queensland Transport Design Manuals*;

(c) *AUSTROADS*;

(d) this chapter of the policy.

(3) Industrial uses, commercial uses and park residential roads are designed based on -

(a) *Queensland Streets*;

(b) this chapter of the policy;

(c) *AUSTROADS*;

(d) Department of Main Roads design criteria.

(4) Park residential streets are those streets serving areas zoned Park Residential in the planning scheme. Commercial streets are those streets servicing commercial activity in the planning scheme.

9.5.4 Street And Road Types

(1) For logical and economical street design, it is a pre-requisite that the purpose of each road and street is determined and the future traffic is predicted.

(2) *Queensland Streets* describes the characteristics of street types and is the basis for classification of streets and roads.

(3) Residential streets and other roads are classified under the requirements of the *Local Government Act*. The street and road types referred to are those contained in *Queensland Streets* and as detailed in the local government's approved standard drawing R-RSC-15.

(4) Table 1 identifies the road classifications adopted for residential streets.

Table 1 - Road Classifications

Type A	Type B	Type C
Access Street Access Place	Collector Street	Trunk Collector Street

9.5.5 Road Naming Guideline

9.5.5.1 Receipt of Development Application for Reconfiguring a Lot

(1) An application for street name/s may be lodged as part of a reconfiguration application.

(2) In this case, the Land Development Team will commence processing the street name/s application in conjunction with the reconfiguration application.

9.5.5.2 Research of Street Names

(1) The applicant is required to submit one (1) preferred and two (2) alternative street names for each street in the development.

(2) The following issues will be considered when researching proposed street names -

(a) How the proposed street designation comprising street, close, drive and similar names complies with the road's proposed function as part of the greater road network such as arterial, sub-arterial and trunk collector roads and streets;

(b) Ease of access in finding and navigating streets;

(c) Possible future impacts from the development on the house numbering sequence;

(d) Promotion of local identity through naming streets based on significant historical or geographical features;

(e) Views held by the Divisional Councilor on behalf of local residents.

(3) The naming of new roads within or adjoining a lot reconfiguration should –

(a) Have short names where possible;

(b) Have a common theme for major or medium reconfigurations;

(c) Have a relationship to the historical context of the area;

(d) Have a relationship to existing themes of adjacent areas;

(e) Promote local heritage through the use of names of local people of significance;

(f) Not be a combination of names. One word names are preferred;

(g) Not be difficult to spell or pronounce;

(h) Not be names of infamous characters or words that are profane or socially unacceptable;

(i) Not duplicate or be similar to other road names in the city;

(j) Not be names which advertise commercial entities unless they are of local significance;

(k) Not be a contrived name. They should be an actual name.

(4) The naming of new roads should be in accordance with Table 2.

Table 2 - Road Naming Options

Road Classification	Naming Options for Road Types
Access Place (cul de sac)	Court; Close or Place.
Access Road	Street; Terrace; Vista; Circuit or Crescent.
Collector Road	Street; Avenue; Way; Drive; or Boulevard.
Trunk Collector Road	Street; Road; Avenue; Way; Drive; Boulevard or Parade.

(5) Roads should conform to Table 3.

Table 3 - Road Type Description

Road Classification	Naming Options for Road Types
Crescent or Circuit	Loop road that connects to the same road at separate locations
Esplanade	Located along a permanent waterway, lake or foreshore
Avenue, Drive, Parade, Boulevard or Way	A road that is extensively tree lined and in an appropriate location
Trunk Collector Road	Highway, Freeway, Motorway, Bypass

9.5.6 Street Layout Requirements

(1) Streets are positioned in relation to drainage requirements, particularly overland stormwater flow paths, and control of traffic movements are investigated before submission of the road and lot layout to the local government. The preliminary investigation results are submitted in conjunction with the road and lot layout.

(2) Downhill culs-de-sac are not acceptable unless a park or drainage reserve of sufficient width is provided. If approval is granted, provision is made to minimise the quantity of overland flow by provision of additional entry structures.

(3) The lot layout may require amendment at the engineering design stage if the width of the overland flow path is insufficient. The minimum width is 15 metres.

(4) Traffic volumes maintain the limits specified by *Queensland Streets*.

9.5.6.1 Engineering Requirements

(1) The ideal locations resulting from consideration of traffic and development layout requirements are designed to satisfy engineering requirements.

(2) The engineering factors affecting road location and layout include -

(a) Grading;

(b) Sight distance;

(c) Alignment;

(d) Intersection location;

(e) Access.

(3) Although the engineering design of roads is the responsibility of the Consultant Engineer, it is essential that the Surveyor or Planner preparing the development proposal is fully aware of the engineering requirements for the various types of roads to ensure that the road locations and layout proposed are satisfactory in this respect. Major alterations to the development layout may be necessary to enable engineering requirements to be fulfilled. Engineering requirements include drainage overland flow paths, vertical alignment and horizontal alignment. The Consultant Engineer is responsible for a layout to suit the above requirements.

(4) Before preparing the reconfiguration layout plan, the applicant is to consult the local government to ascertain if a Structure Plan already exists for the area in question.

(5) Approval of the developmental layout is subject to stormwater design calculations being submitted to satisfy the local government that the overland flow from a storm of 1 percent AEP (100 year ARI) can be conveyed through the development clear of all proposed lots.

(6) Full and accurate topographical information is provided at this stage, to enable an accurate assessment of the suitability of the proposed road locations.

9.5.6.2 Road Capacity

(1) Traffic requirements are based on the total traffic which will use a road, and not only on the requirements of the development under consideration.

(2) The applicant provides the full road reserve width, for the class of road required for the ultimate traffic, in accordance with the local government's road planning layout.

9.5.6.3 Traffic Impact Report

(1) Where applicable, a detailed Traffic Impact Report is required to assess the impact that traffic associated with the proposed development will have on the adjoining road network.

(2) Issues addressed and presented in the Traffic Import Report include -

(a) Traffic impact on surrounding development and the adjacent transport network;

(b) Access to the proposed development;

(c) Maintenance of traffic flow efficiency and safety standards;

(d) Protection of the environment, in particular noise level alleviation;

(e) Maintenance of pedestrian and bicycle flow efficiency;

(f) Site consolidation to minimise fragmented roadside development;

(g) Parking impact of the proposed development.

(3) Details analysed and presented in the report include -

(a) Design year covering a 10 year planning horizon from the date of completion of the development;

(b) Clearly presented statistical details of the proposed development;

(c) Traffic generations by the proposed development, both daily and peak hours;

(d) Directional distribution of generated traffic, travel pattern and vehicle classification;

(e) Current traffic volume/full turning movement volumes on affected existing roads and intersections. Vehicular volumes are classified into cars and commercial vehicles and are projected forward at appropriate growth rates;

(f) Impact of the development on pedestrian and bicycle movements, including access to existing linkages. Volumes are ascertained by the local government on a project by project basis;

(g) Analysis of intersections using the computer software program *SIDRA* or similar. Details to include -
(i) intersection treatment;
(ii) method of control;
(iii) delay;
(iv) capacity;
(v) traffic volume;
(vi) saturation levels;
(vii) queue lengths;
(viii) copies of input, output and graphical intersection layout from *SIDRA* or equivalent;

(h) Conceptual plan of intersection configurations showing -
(i) lane layouts;
(ii) turning radii;
(iii) storage lengths;
(iv) auxiliary lanes;
(v) medians;
(vi) shoulders;
(vii) footpaths/bikeways and other relevant information;
(viii) for signalised intersections, the same analyses and conceptual plans as per item (f); together with signals phasing diagrams from *SIDRA* or similar output;
(ix) any adverse effects on safety issues, capacities and levels of service of intersections and the road network and appropriate ameliorative measures suggested;
(x) all assumptions and references made in the traffic analyses;
(xi) all proposals for external road works are compatible with the Department of Main Roads future upgrading requirements.

(4) The Traffic Impact Report is prepared by a professionally qualified traffic engineer or transportation engineer.

(5) The Traffic Impact Report is submitted to the local government and the Department of Main Roads when applicable for assessment prior to consideration of engineering design and drawings.

9.5.7 Standard Road Widths

9.5.7.1 Residential Streets Type A, B, and C

(1) Notwithstanding the provisions of *Queensland Streets,* the minimum street reserve width for Type A, B and C streets conforms to Schedule 6 - Movement Network and Road Design. This is illustrated on approved standard drawing R-RSC-15.

(2) Appropriate intersection treatment and traffic calming devices are incorporated into the road design to ensure that speeds are kept down to an acceptable level in a residential street environment without restricting service vehicle access. Preferred solution s are illustrated in section 9.5.8 - Road Design Safety of this chapter.

(3) Notwithstanding the provisions of *Queensland Streets*, Type A, B and C streets and sub-arterial roads conform to approved standard drawing R-RSC-15.

(4) The performance criteria applicable for the design of the road reserve width are the relevant safety requirements and the provision of sufficient landscaping and green areas within road reserves. In achieving such performance requirements, irrespective of the approval lot/road layout, road reserves may have to be widened in places to compensate for such lost lot areas, while other sections may be narrowed down thereby keeping a minimum road reserve width of fifteen (15) metres not taking intersections into account.

9.5.7.2 Other Road Reserve Widths, Cross-Sections

(1) Roads other than residential streets are designed and constructed generally in accordance with *Queensland Streets* recommendations and approved standard drawings R-RSC-15.

(2) For the case of industrial roads, *Queensland Streets* provides deem-to-comply cross-sections.

(3) The local government approved standard drawings numbered R-RSC-2, R-RSC-3, and R-RSC-4 provide the basis for driveway crossover profile policy, the criterion being that a loaded vehicle is able to cross the verge and enter the property without bottoming on the surface of the driveway.

(4) The needs of bicycles are considered in the design of all road types and this may necessitate amendments to the standard cross section elements at the discretion of the local government.

(5) Design of bicycle facilities complies with -

(a) the local government's approved standard drawings P-RSC-2, P-RSC-4 and P-RSC-5;

(b) *Queensland Streets*;

(c) *AUSTROAD - Guide to Traffic Engineering Practice - Part 14 Bicycles*;

(d) the *Manual of Uniform Traffic Control Devices (MUTCD)*.

Note -

Refer Section 9.5.14 - Pedestrian and Bicycle Paths.

(6) The road reserve width at culs-de-sac is to provide for a minimum distance of 4 metres from the lip of the channel to the property boundary. The minimum radius at the head of a cul-de-sac in Urban Residential Zones is 8.5 metres to the lip of the channel.

9.5.7.3 Arterial Roads

(1) In general, when approval is given to a development proposal, the local government will nominate those roads which are designed as arterial, sub-arterial and trunk collector roads.

(2) Arterial roads are designed in accordance with the requirements of *Queensland Streets*, Department of Main Roads Design Manuals, *AUSTROADS* and this chapter of the Policy.

(3) Notwithstanding the recommendations of *Queensland Streets*, the local government requirements for sub-arterial roads conform to approved standard drawing R-RSC-15.

9.5.8 Road Design Safety

9.5.8.1 General

(1) The following is a list of <u>some</u> of the references required when designing for road safety -

(a) *AUSTROADS Part 5: Intersections at Grade*;

(b) *AUSTROADS Part 6: Roundabouts*;

(c) *AUSTROADS Part 12: Roadway Lighting*;

(d) *AUSTROADS Part 13: Pedestrians*;

(e) *AUSTROADS Part 14: Bicycles*;

(f) *AUSTROADS Part 15: Motor Cycle Safety*.

(2) Not withstanding the recommendations in *AMCORD* and *Queensland Streets*, the local government requires desirable standards for road design. This is particularly relevant to sight distance at round-a-bouts and intersections.

9.5.8.2 Signs and Road Markings

(1) All necessary warning signs, regulatory signs, direction signs and road markings, as directed by the local government are provided by the Developer.

(2) Signing, road marking and construction signing are in accordance with the *Manual of Uniform Traffic Control Devices (MUTCD*) and Department of Main Road's requirements, as amended from time to time. Additional relevant information may be obtained from AUSTROADS publications.

(3) The following signage and marking are provided -

(a) Street name signs at each intersection, in accordance with the local government's approved standard drawing R-RSC-11;

(b) Lane lines on all divided roads;

(c) Where the sight distance available is less than the desirable minimum, double unbroken centre lines are provided;

(d) At a temporary termination of road construction, such as a development or stage boundary, the following is erected -
   (i) on an arterial, sub-arterial, industrial or trunk collector road; a striped barrier board to local government requirements;
   (ii) on access streets, access places or collector roads; guide posts at 1.5 metre spacing as a minimum; barrier boards may be required by the local government to improve safety.

(4) The relevant sign reference number from the Department of Main Road's *MUTCD* is included on the plan for each sign.

(5) All signs and pavement markings are adequately dimensioned to ensure accurate setting out.

(6) Unless otherwise specified, a minimum of Class 1 reflective sheeting is used for all road signs. Class 2 reflective sheeting may be used for kerb side parking control signs.

9.5.8.3 Road Edge Guide Posts

(1) Road edge guide posts are provided at all locations where concrete kerb and channel is not constructed, such as at half road construction, tapers and ends of roads.

(2) Guide posts conform to the local government's approved standard drawings MR 1356.

9.5.8.4 Guardrails

(1) Guardrails are installed in accordance with the local government's approved standard drawings R-0180 and R-0181. Refer also to the Department of Main Roads drawings as approved by the Institute of Public Works Engineering Australia Queensland (IPWEAQ).

(2) For the warrants and locations of guardrails, refer to the Department of Main Roads *Urban Road Design Manual - Volume 1* (*URDM*).

(3) There may be circumstances where the local government may require guardrail in additional locations.

9.5.8.5 Pedestrian Fences

(1) Pedestrian fences are constructed in accordance with the local government's approved standard drawings G-0044 and G-0045;

(2) Fences are installed for pedestrians in accordance with the requirements of the Department of Main Roads *URDM - Volume 1* and the *Manual of Uniform Traffic Control Devices.* Care is taken to ensure that the fences do not constitute a hazard for vehicles and their occupants.

9.5.8.6 Tree Planting

(1) Street tree planting in medians and adjacent to carriageways conforms to the *Road Landscaping Manual* published by the Department of Main Roads, Queensland. Figure C5-4 in the manual indicates clearance zones between vehicular traffic and trees.

9.5.9 Geometric Design Standards for Roads

9.5.9.1 General

(1) Geometric design for residential streets complies with the requirements of *Queensland Streets* and *AUSTROADS*, except as specified herein.

(2) Other roads comply with *Queensland Streets*, Department of Main Roads (Qld) standards and as specified herein.

(3) Refer also to the *AUSTROADS* publications.

9.5.9.2 Maximum Radii of Vertical Curves

(1) Where kerb and channel is required, the following maximum radii are adopted to reduce the possibility of storm water ponding in the channel -

(a) Crest Curves maximum radius: 3000 metres;

(b) Sag Curves maximum radius: 1250 metres.

9.5.9.3 Vertical Curves at Intersections

(1) Where a side road joins at a "T" intersection, a reduced length of vertical curve in the side road is acceptable because of the lower traffic speed in the side road at the intersection. The minimum length of such a vertical curve is 7 metres.

(2) The nearest VC tangent point to the through road is located at, or outside of, the kerb line of the through road.

(3) The situation where a crest vertical curve masks the commencement of a horizontal curve is avoided, as such a combination is potentially dangerous.

9.5.9.4 Recommended Crossfall

(1) The normal crossfall of pavement and shoulders are -

(a) Asphaltic Concrete Surfaced Pavements: 2.5 percent;

(b) Bituminous Sealed Pavements and Shoulders: 3.0 percent;

(c) Graveled Shoulders: 5.0 percent.

9.5.9.5 Maximum and Minimum Crossfall

(1) Where steeper or flatter than normal crossfalls are required, for example at intersections, turning circles of culs-de-sac, or joining to existing construction the -

(a) maximum permissible pavement crossfall is 5 percent;

(b) minimum permissible pavement crossfall is 2 percent.

9.5.9.6 Median Crossfalls

(1) The maximum crossfall on grassed medians on divided roads is desirably 1 in 6 with an absolute maximum of 1 in 4. Refer also to Department of Main Roads design manuals.

(2) At median openings, the pavement crossfall does not exceed 5 percent.

(3) The longitudinal grade is also considered in relation to high vehicles turning through an intersection.

9.5.9.7 Split Level Roads

In general, development layouts are designed to avoid split level roads. Where this is not possible, prior approval to use split level roads is required from the local government.

9.5.9.8 Horizontal Alignment

(1) A truncation of the real property boundary for road and streets is provided at each intersection/deflection, such that sight distance is maintained for the design speed of the street.

(2) The minimum property boundary truncation at a 90° bend is 6 metre 3 chord.

(3) Pavement tapers to existing construction is designed in accordance with the current *NAASRA* or *AUSTROADS* publications based on the design speed.

(4) Tapers are constructed to the same standard as the proposed full road pavements.

(5) Kerb and channel radii for tapers where small deflections occur are as long as possible in order to improve appearance.

9.5.9.9 Vertical Alignment

(1) Notwithstanding the recommendations in *Queensland Streets,* vertical grades conform to the standards in Table 4 -

Table 4 - Maximum Road Grades

Road Classification	Desirable Maximum Grade	Absolute Maximum Grade
Sub-Arterial road		8 percent
Type C roads	8 percent	12 percent
Type A and B roads	16 percent	20 percent provided the length of that grade is less than 20 metres, and is no closer then 40 metres from an intersection, and the grade to that intersection is no greater than 12 percent.

(2) The maximum grade on type A and B roads may be varied provided it can be demonstrated by alternative methods that the safety of children on bicycles is not compromised.

(3) The maximum allowable grade from the end of the construction centre line at lip level to the centre of the head of a cul-de-sac is 5 percent.

(4) The minimum pavement centreline grade is 0.4 percent.

(5) The grading of kerb and channel normally conforms to the road centreline grading. However, at locations where the kerb and channel grading diverts from the centreline grade, such as at intersections or on super elevated curves -

(a) The minimum channel grade is 0.4 percent;

(b) Every endeavour is made to eliminate sudden changes of grade, by providing vertical curves of reasonable length.

(6) The desirable minimum level of a road at the lip of channel or edge of pavement is RL 2.4 AHD. Roads proposed below this level have a rigid pavement or alternatively, the Engineer is to demonstrate how the sub-soil drains can discharge freely without tidal infiltration.

(7) In situations where construction cannot be avoided below RL 2.4 AHD, the absolute minimum level of a rigid pavement is RL 2.0 AHD.

9.5.9.10 Boundary Roads

(1) An existing unsealed boundary road to a development is constructed to a standard no less than the greater of one half of a full width road or 6 metres from the channel lip line to the bitumen edge. A greater width may be specified in conditions of development approval depending on the traffic using the road.

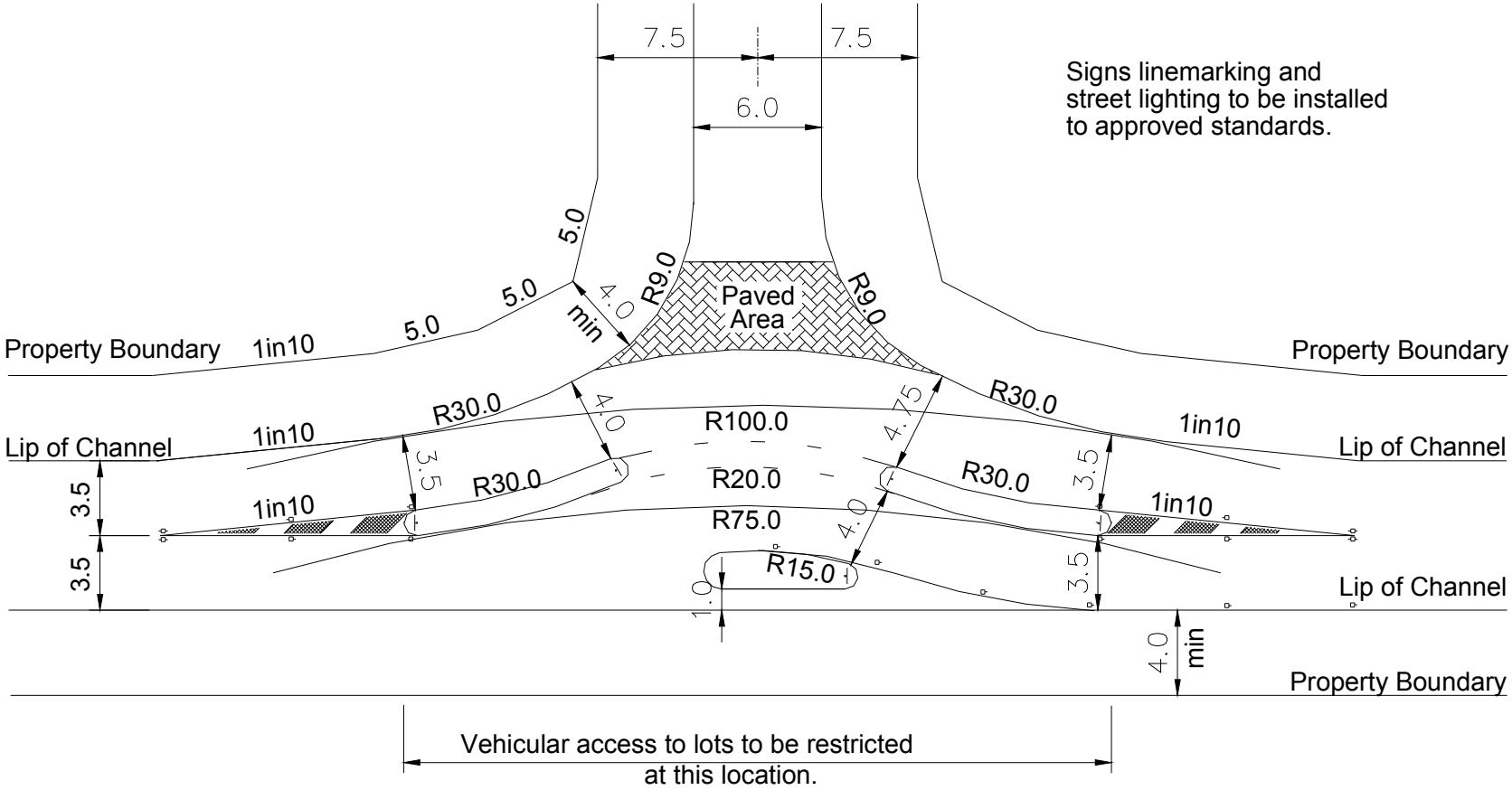
(2) An existing sealed boundary road to a development is widened with kerb and channel constructed on an alignment determined by the local government. Pavement widening extends from the existing full depth road pavement edge and not from an existing sealed shoulder edge. It is the responsibility of the developer to determine if there is an existing sealed shoulder within the scope of the works for which the conditions of development apply.

(3) The Developer provides a minimum of the greater of 10 metres or two-thirds of the road reserve width for boundary roads.

9.5.9.11 Service Vehicle Road Manoeuvring

The following diagrams indicate the minimum dimensions for a 10.2 metre long standard service vehicle to manoeuvre at intersections, acute bends, no through roads and speed control devices -

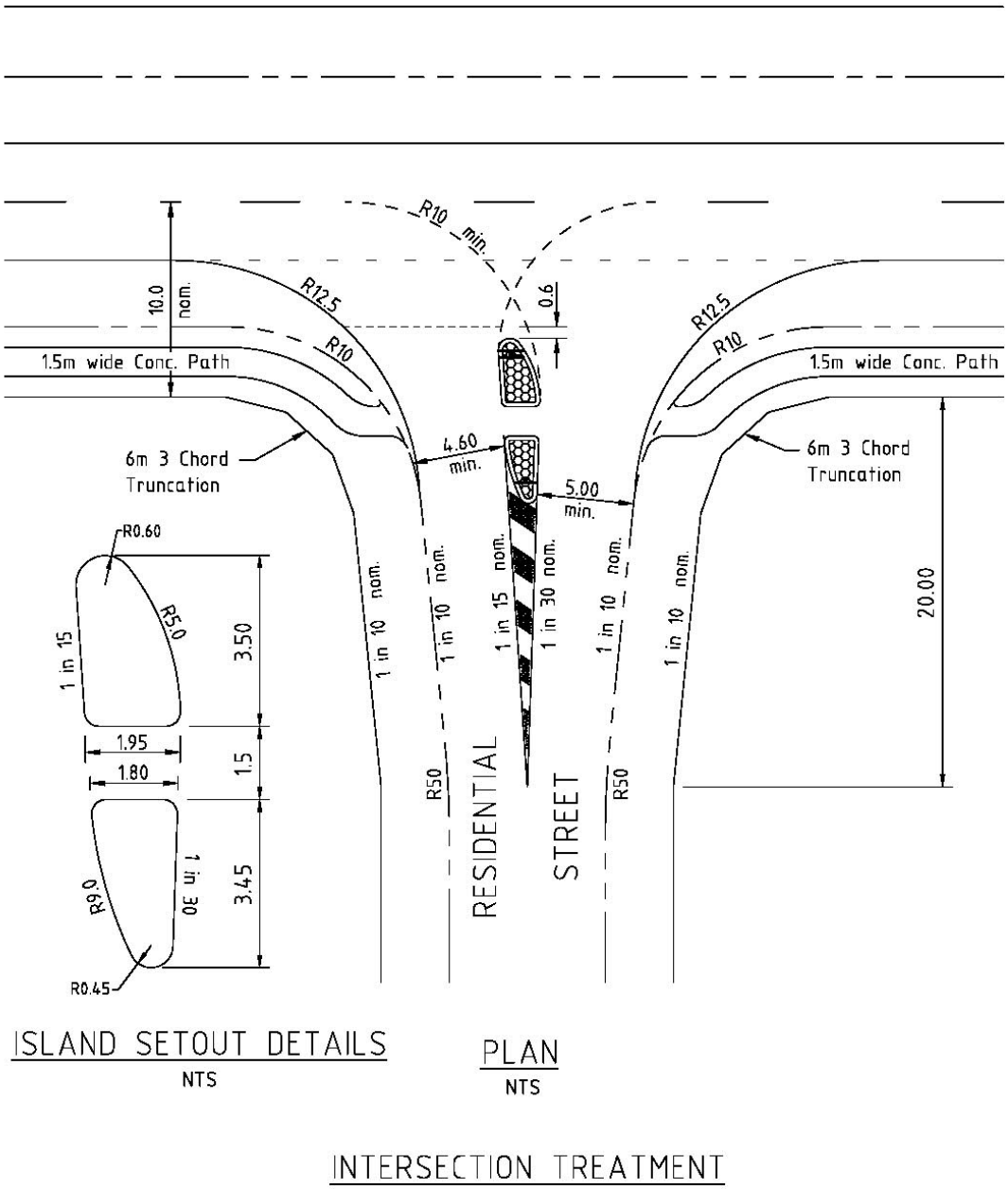
Diagram 1 - Typical T Intersection Slow Point at Junction of Type A to B Streets



TYPICAL T INTERSECTION SLOW POINT AT JUNCTION OF TYPE A TO B STREETS

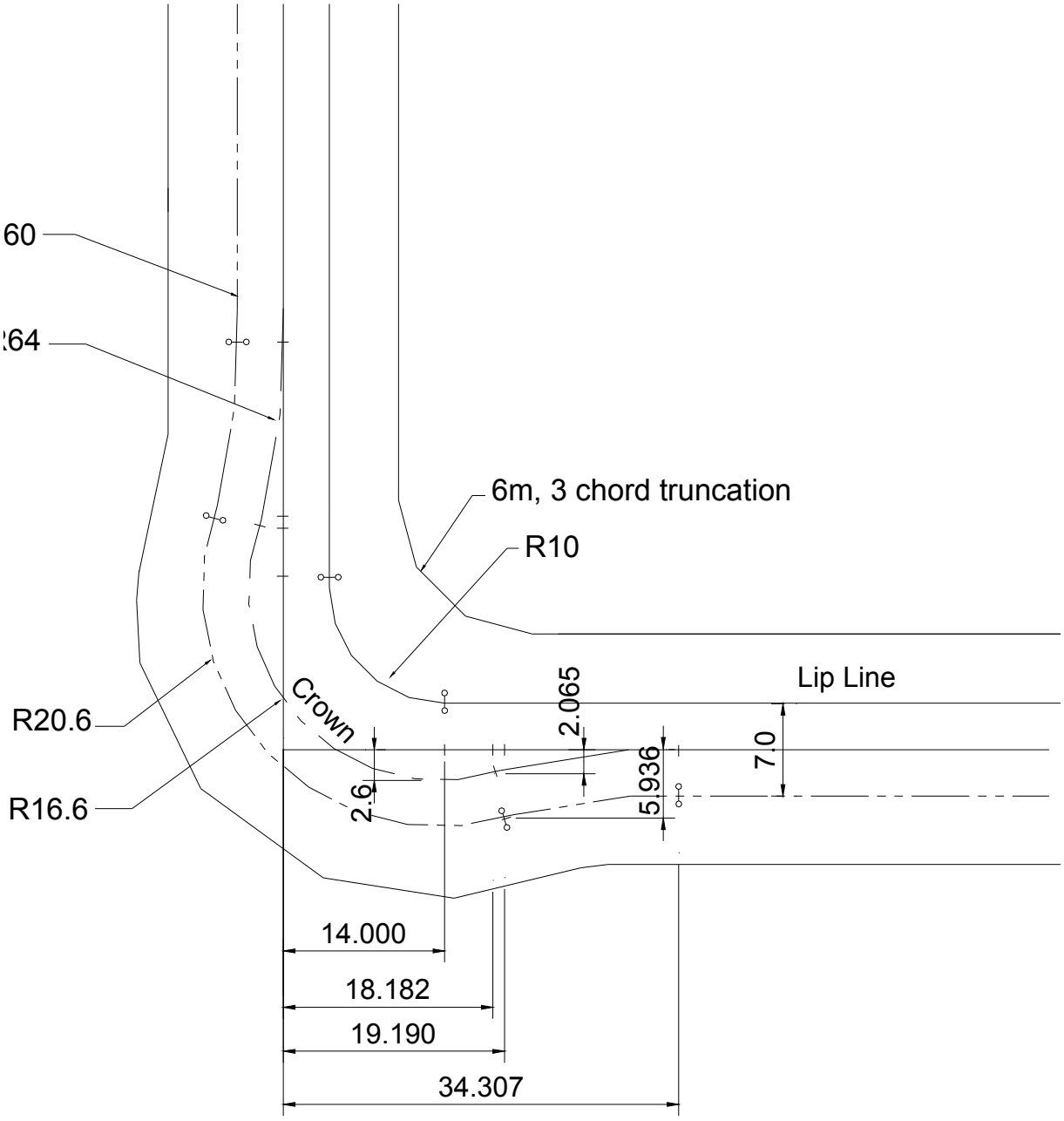
GUIDE ONLY

Diagram 2 - Typical "T" Intersection Splitter Island



INTERSECTION TREATMENT

Diagram 3 - Typical Widening at Right Angle Bend

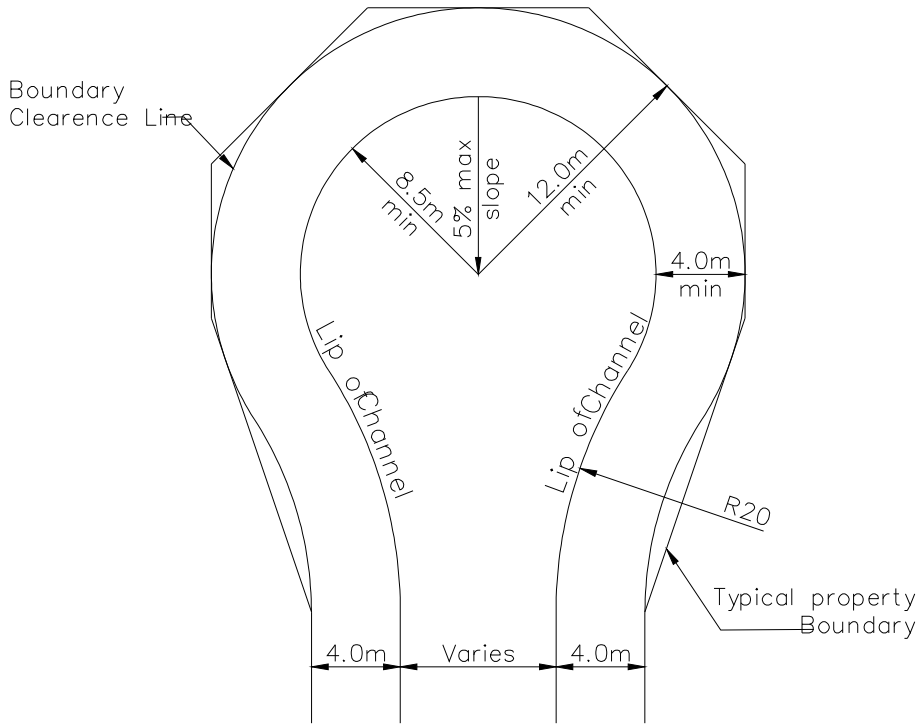


NOTES: 1. Property side boundaries to coincide with chords angles where practical.

ELBOW TREATMENT
ACCEPTABLE SOLUTION

NTS

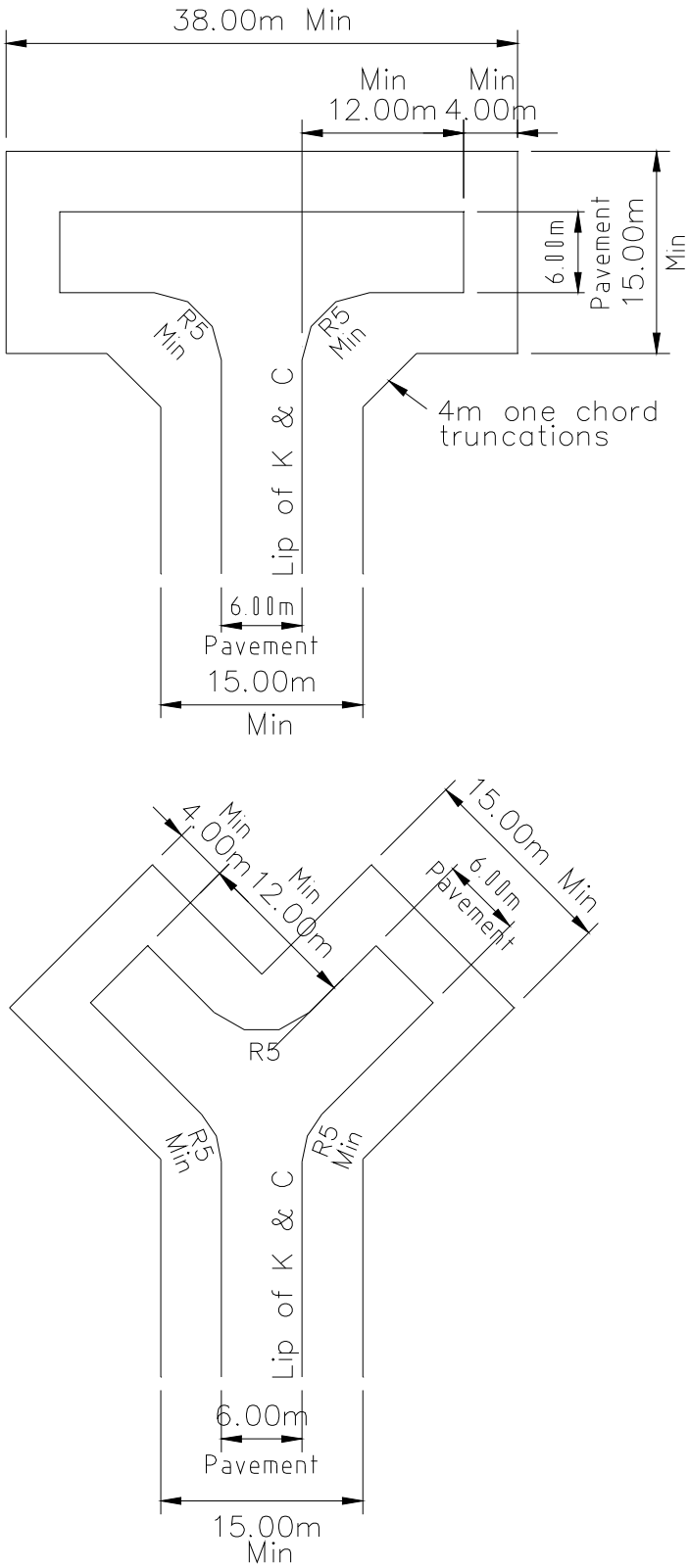
Diagram 4 - Typical Residential Cul-De Sac Treatment



RESIDENTIAL CUL-DE-SAC TREATMENT

Refer also to examples shown in Figures 2.12B; 2.12J and 2.12H(b) on pages 60, 60D and 60E of "Queensland Streets"

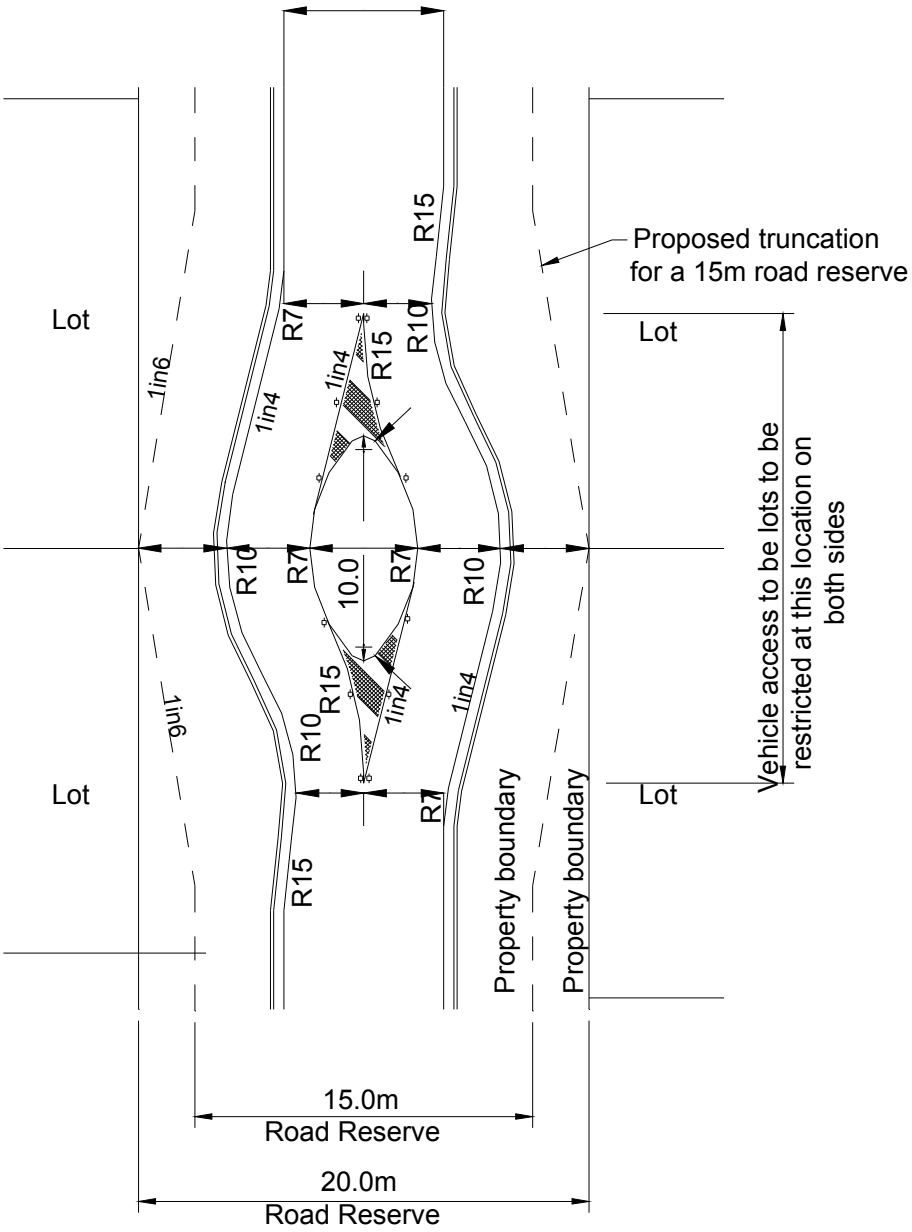
Diagram 5 - Typical Dead End Manoeuvring Area



TYPICAL MANOEVERING AREAS
ACCEPTABLE SOLUTION

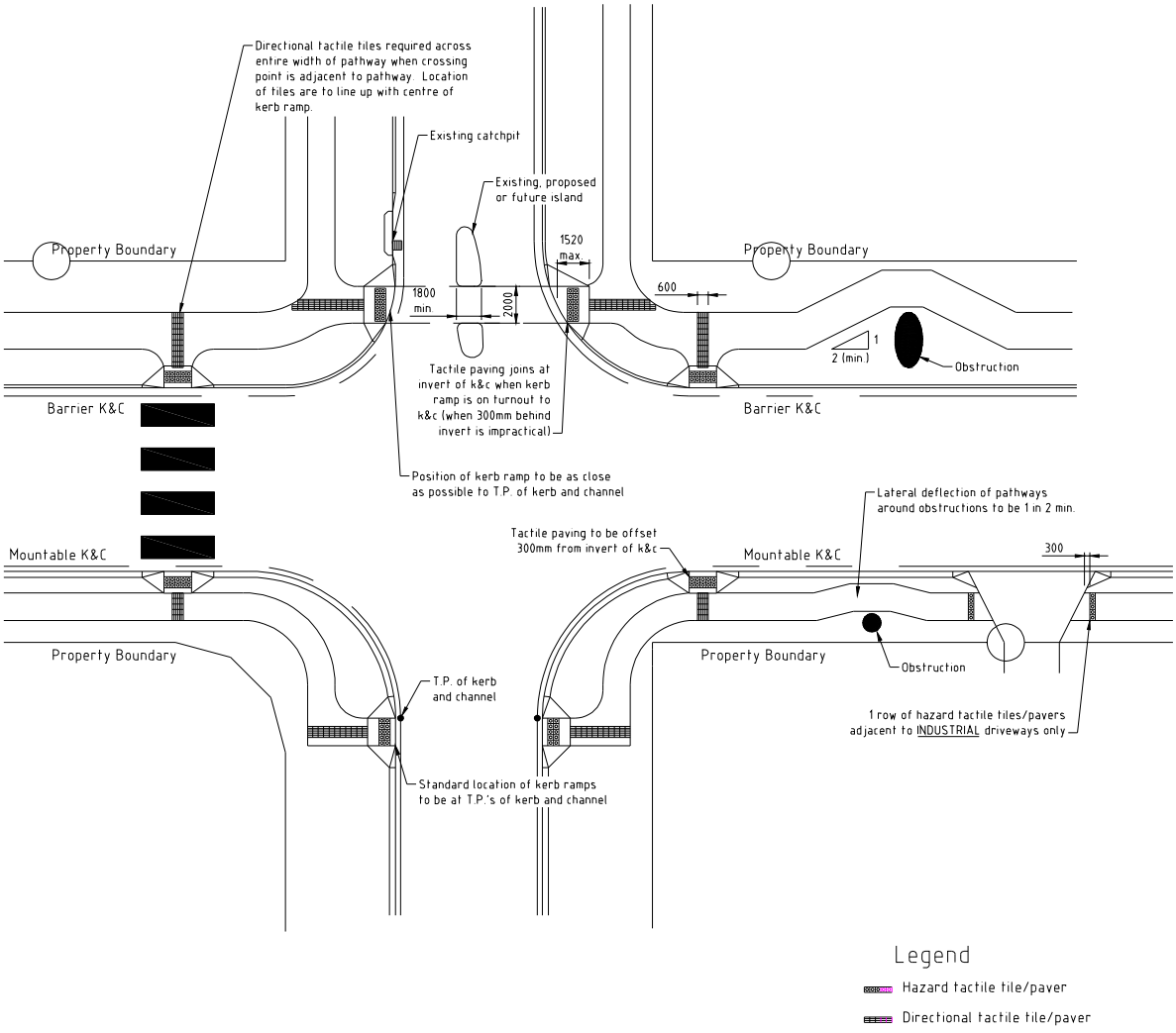
Diagram 6 - Typical Speed Control Treatment for Type A and B Streets

Signs linemarking and street lighting
to be installed to approved standards.



TYPICAL SPEED CONTROL DEVICE FOR TYPE A & B STREETS
GUIDE ONLY

Diagram 7 - Typical Treatment at Intersection for Pedestrian Safety



9.5.10 Road Infrastructure

9.5.10.1 Kerb and Channel Location

Concrete kerb and channel is provided on both sides of all roads except where otherwise stated in the relevant development approval.

9.5.10.2 Kerb and Channel Types

(1) The types of kerbs and channels used in the local government area are in accordance with approved standard drawing R-RSC-6.

(2) The type of kerb and channel for Type A and B streets is Mountable Type M1.

(3) Barrier kerb and channel Type B1 with 450mm channel is used in the following cases -

(a) Trunk collector roads (Type C road);

(b) Industrial roads: heavy-duty barrier type is used with additional 50mm base thickness;

(c) Sub-arterial and arterial roads;

(d) Locations where high pedestrian volumes are likely, such as shopping centres, on the frontage of schools and major sporting facilities and parks: barrier type B1 kerb and channel is used for greater pedestrian safety. Heavy duty barrier type is used where required by the local government;

(e) Bridges and culverts.

9.5.10.3 Semi-Mountable Type Kerb

(1) Medians and traffic islands: semi mountable type kerb type SM4 and SM5 is used with a concrete median and landscaped median respectively.

(2) Roundabouts (centre island): a semi-mountable kerb type SM5 is used, except that 75mm high kerb may be adopted where the roundabout lies on a minor road which is unlikely to be a bus route.

9.5.10.4 Existing Kerb and Channel

Where proposed construction adjoins existing barrier kerb and channel, the local government will decide whether the existing profile is extended or tapered smoothly to the local government's standard mountable type kerb and channel.

9.5.10.5 Edge Restraints

Edge restraints, type RSC-1, are not permitted unless used in conjunction with a drainage swale or specifically approved by the local government.

9.5.10.6 Pram (Kerb) Ramps

(1) Pram (kerb) ramps are provided adjacent to all kerb returns, at park entrances and at any other location required by the local government. Refer approved standard drawings R-RSC-14 and R-0084.

(2) The Access Advisory Group assisting disabled persons has resolved that the requirement for pram ramps is considered in accordance with the following -

(a) Pram crossings in rollover kerb and channel at regular intervals at the design stage;

(b) Additional pram crossings at Tee intersections, in the direction across the through road, where the through road is a collector or of a higher standard;

(c) Pedestrian/wheelchair/pram refuge space in the middle of the road at some of the larger intersections.

9.5.10.7 Service Conduits

(1) Service conduits are provided under the pavement of all developmental roads and streets at locations shown on the approved standard drawings R-RSC-9, R-RSC-10 and R-RSC-13 unless directed otherwise by the local government.

(2) The type, class and laying of the service conduits is in accordance with the approved drawings from the relevant authorities and the local government's approved standard drawings.

(3) Relevant conduit markers, in the form of metal discs, are fixed into the kerb on each side of the road at the point the conduit passes under the kerb and channel. Refer to approved standard drawing R-RSC-13.

(4) The engineering design is to demonstrate there is sufficient width to locate services to rear lots. The local government requires the installation of service conduits along the access by the Developer. The conduits are constructed in accordance with the current relevant Australian Standards for the services provided.

9.5.10.8 Public Utility Services

(1) The standard allocation of the verge and roadway cross-section for the various services and utilities is in accordance with the local government’s approved standard drawings R-RSC-9 and R-RSC-10 unless otherwise approved by the local government.

(2) Where ENERGEX and Communications share a joint use trench, conduits are located in accordance with the current policies of those service authorities.

9.5.10.9 Bridges and Culverts

(1) All bridges and culverts extend the full width of the carriageway plus the width of the verges as determined by the local government.

(2) Concrete footpaths are provided on both sides of bridges and culverts on all roads in developments.

(3) Bridges and culverts on a divided industrial, sub-arterial road or arterial road have a concrete footpath on the outer side of each bridge and culvert.

(4) Bridges and culverts on arterial roads have concrete footpaths as specified by the local government and/or the Department of Main Roads.

(5) Pedestrian concrete paths over bridges and culverts have a clear width of not less than 2 metres from the inside face of the handrail to the face of the kerb. A wider width may be required, if determined by the local government, to provide for service locations.

(6) Bridges and culverts with the deck at road level are surfaced with asphaltic concrete of minimum thickness 40mm.

(7) A bridge or culvert with the deck level below road level is paved and surfaced to the standards applying to the particular road type. The minimum requirement is 300mm of gravel pavement surfaced with asphaltic concrete.

(8) The design loading for each bridge is determined by the local government. All traffic loadings are based on Equivalent Standard Axles (ESAs, ie. equivalent 80kN axle load passes).

9.5.10.10 Pavement Surfacing

(1) Type A, B & C roads are surfaced with a minimum of 25mm Asphalt Concrete (AC). A chip seal, 7mm single coat bitumen seal, is provided under A.C. where a flexible pavement is used. The

nominal spray rate for the cut back bitumen is 0.9 litres* residual Class 170 bitumen per square metre and the 7mm aggregate spread rate is 1 cubic metre per 130 square metres.

(2) Industrial, commercial, sub arterial and arterial roads are surfaced with a minimum of 40 mm of Asphalt Concrete. A chip seal, 7mm single coat bitumen seal, is provided under AC where a flexible pavement is used.

(3) Flexible pavements at roundabouts and all cul-de-sac heads are surfaced with 40mm Asphalt Concrete (AC). A chip seal, 7mm single coat bitumen seal, is provided under AC where a flexible pavement is used.

(4) Asphalt Concrete conforms to Brisbane City Council's Specification (Type II asphalt).

(5) The local government may approve the use of pavers in certain conditions.

(6) Rural roads are generally surfaced with a two coat hot bitumen seal to current local government requirements. The present requirements are as follows but may vary from time to time -

(a) Primer Seal Coat - cut back bitumen, 1.3 litres* residual Class 170 bitumen per square metre. Cover aggregate, 16mm, spreading rate, one cubic metre per 75 square metres;

(b) Seal Coat - cut back bitumen, 1.0 litres* residual Class 170 bitumen per square metre. Cover aggregate, 10mm, spreading rate, one cubic metre per 110 square metres.

Note -

- The actual rate chosen will depend on the following -
  - the A.L.D. of the stone;
  - the degree of penetration of the primer seal coat;
  - the accuracy achieved in the spreading of the aggregate.

(7) Reference should be made to the local government's approved specification for further details.

Note -

Except where varied otherwise in the planning scheme, road works conform to *AUS-SPEC, #1, Development Construction specifications*, Queensland.

(8) The local government may be contacted for approval of aggregate spreading rates and all bitumen spray rates.

9.5.11 Pavement Design

9.5.11.1 General

(1) Both flexible and bound pavements may be used. The total required pavement thickness is as follows -

(a) If Unbound Flexible Pavements where cumulative ESAs do not exceed 10^6 refer to *Australian Road Research Board Special Report No. 41; Into a New Age of Pavement Design;*

(b) *A Structural Design Guide for Flexible Residential Street Pavements* by P.T.Mullholland;

(c) If Unbound Flexible Pavements where cumulative ESAs exceed 10^6 refer to -
(i) Department of Main Roads *Pavement Design Manual*;
(ii) *AUSTROADS - Pavement Design; A Guide to the Structural Design of Road Pavement*;

(d) If Bound Pavements (All Traffic Loadings) refer to the Department of Main Roads *Pavement Design Manual*;

(e) If A.C. Surfacing, material design and construction is to Brisbane City Council standards; or

(f) If Rigid Pavements -
  (i) On Type A or Type B street, design is to the requirements of the Cement and Concrete Association Australia publications -
    a. *Concrete Street and Parking Area Pavement Design*;
    b. *Guide Specification for Construction of Concrete Street and Parking Area Pavements*;
    c. Such as cement concrete pavements for other than Type A and B streets, design is to the requirements of the AUSTROADS publication, *Pavement Design*: *A Guide to the Structural Design of Road Pavements.*

9.5.11.2 Subsurface Drainage

The design of subsurface drainage is based on *Australian Road Research Board Special Report No. 35; Subsurface Drainage of Road Structures*, by R.J. Gerke.

9.5.11.3 Material Testing

Testing of material is performed by a National Association of Testing Authorities (N.A.T.A) registered materials tester, using methods described by the Standards Association of Australia and/or Queensland Transport.

9.5.11.4 Design Procedures

(1) Procedures as outlined in the following publications are used for subgrade evaluation -

  (a) For design traffic up to 1 x 10 ^{6} ESAs, *Australian Road Research Board Special Report No. 41 Into a New Age of Pavement Design - A Structural Design Guide for Flexible Residential Street Pavements,* by P.T. Mullholland);

  (b) For design traffic more than 1 x 10 ^{6} ESAs, the Department of Main Roads *Pavement Design Manual;*

  (c) Alternatively, *AUSTROADS Pavement Design, Guide to the Structural Design of Road Pavements* may be used.

(2) Total pavement thickness is based on the values obtained from Soaked California Bearing Ratio tests, determined in accordance with the method in *Australian Standard AS1289 - Methods of testing soils for engineering purposes.*

(3) In cases where the 4 day soaked CBR value is less than 3 percent, 50mm of material having a 4 day soaked CBR of 15 percent is added to the design depth of pavement for each 0.5 percent or part thereof the CBR is below 3 percent. For example, if the CBR is 2.5 percent, add 50mm; if it is 2 percent, add 100mm. As an alternative, approved subgrade stabilisation or subgrade replacement procedures may be carried out when subgrade CBR is less than 3 percent.

9.5.11.5 Determination of Design Traffic

Design Traffic for the various road classifications is defined as indicated in Table 5.

Table 5 - Design Traffic

Road Description	Road Type	ESAs *
Access Places and Access Streets	A	5×10^{4}
Collector	B	1×10^{5}
Trunk Collector	C	1×10^{6}
Sub-Arterial		2×10^{6}
Industrial		$2 \times 10^{6\Delta}$
Arterial		DMR DESIGN STANDARDS

Notes -

Δ Refer *Queensland Streets* Traffic Generation Details

* Figures indicated are to be used as a guide only. The local government will determine the requirements for each individual situation.

9.5.11.6 Design Thicknesses

(1) Subgrade test results including a drawing showing the locations of tests and proposed pavement thicknesses are submitted to the local government for approval after basic site earthworks have been completed.

(2) Pavement depths are increased by an additional 100mm for 10 metres on either side of slow points, traffic calming devices, traffic islands adjacent to intersections, cul-de-sac heads and all intersections.

(3) The pavement thickness is subject to confirmation by the local government following a site inspection. Further testing of the subgrade may be required by the local government prior to placement of pavement material.

(4) The local government may require either local or general variation of the pavement thickness, dependent upon the actual subgrade conditions encountered.

(5) The minimum total thickness of pavement required is -

Table 6 - Minimum Total Pavement Thickness

Road Classification	Minimum Compacted Thickness in Millimetres					
	A.C.	Chip Seal	Base	Sub base	CBR15	Total
Type A,B and C	25mm	5mm*	125mm	125mm	N/A	280mm
Sub-Arterial	40mm	5mm*	125mm	125mm	N/A	295mm
Arterial	40mm	5mm*	125mm	125mm	N/A	295mm
Industrial	40mm	5mm*	125mm	125mm	N/A	295mm

Note -

* Assumed ALD for 7mm chip seal of 5mm.

- Roundabouts are to have a minimum 40mm AC surfacing with a Chip seal, 7mm single coat bitumen seal, under A.C where a flexible pavement is used.
- The total pavement thickness required is not to include the thickness of AC surfacing which is deemed to be a wearing surface only unless the AC thickness is greater than 75mm.
- Asphaltic concrete will be considered as a structural course when designed in accordance with Department of Main Roads standards.

9.5.11.7 Testing and Construction of Roads

(1) Site investigation is performed to determine soil types based on a series of test holes sampled along the job site. Testing should be at a sufficient interval so as to determine soil boundaries.

(2) The minimum testing distances are -

(a) for streets of less than 120 metres length: 2 test locations;

(b) for streets of over 120 metres length: Test location every 60 - 100 metres depending on soil types.

(3) Samples are taken in order of running chainages and extend 500mm below the proposed subgrade level. Where the depth of fill will exceed 500mm, testing of the subgrade is not required. However, testing of the fill is required.

(4) At each test location the testing is to include both field and laboratory testing -

(a) Field testing -
(i) Visual description of sample including the material type and colour. The Unified Soil Classification system can be used to satisfy this;
(ii) Dynamic Cone Penetrometer test to a depth of 1 metre;
(iii) Field moisture content;

(b) Laboratory testing -
(i) Gradings of the subgrade;
(ii) Linear shrinkage (LS);
(iii) Soaked CBR testing.

(5) Soaked CBR testing is undertaken once grading and plasticity test results have been obtained so that soil boundaries can be identified. In this way a sample representing a material type need only be tested.

(6) The design CBR is determined as follows -

(a) Where there are fewer than 5 CBR test results on the same material - Design CBR = the lowest 4-day soaked CBR value;

(b) Where there are more than 4 results on the same material -
(i) Design CBR = the 10th percentile of all 4 day results on the same material;
(ii) Design CBR = C - (1.3 x S).

Note -

- where C= the mean of all 4 day soaked CBR values;
- where S= standard deviation of all 4 day soaked CBR values.

(7) The above method is the same as that outlined in ARRB SR41 for F = 1.0. The method outlined in clause 2.2.3(b) of ARRB SR41 may also be used.

(8) The location of the boundaries of soil types may be identified by using dynamic cone penetrometer, soil grading, and linear shrinkage tests and correlating these to 4 day soaked CBR test results. That is, such boundaries need not be established with CBR tests.

(9) Dynamic Cone Penetrometer tests are carried out to a depth of 1metre.

(10) The location of the boundaries of soil types may be assisted by, but not be solely determined by -

(a) visual classification of the soil including its type and colour using the USC system;

(b) field moisture content.

(11) Pavement design is based on 4 day soaked CBR values of the subgrade material.

(12) Design traffic figures for various categories of roads are defined in this chapter of the policy. Refer to Table 5 - Design Traffic.

(13) Some roads do not meet these criteria, and design traffic figures may be obtained from the local government.

(14) For the purpose of this design, two design charts have been adopted -

(a) for design traffic up to 1×10^6 ESAs, refer to *Figure 7 ARRB Special report number 41*;

(b) for design traffic greater than 1×10^6 ESAs, refer to Department of Main Roads - *Pavement Design Manual*.

(15) Thickness design of asphalt pavements is based on Department of Main Roads design charts.

(16) Asphalt complying with Brisbane City Council's specification for Type II mix is recommended with a depth as specified in this policy.

(17) Interlocking 80mm thick clay pavers may be used provided they are laid on a 175mm thick layer of mass concrete.

(18) Skid resistance of paved surfaces is not to exceed the values recommended by the Department of Main Roads.

(19) Pavement materials are in accordance with applicable design manuals for unbound materials.

(20) Approval is sought from the local government where bound material is proposed to be used.

(21) The paving material is to meet grading and plasticity requirements as set out in the Department of Main Roads specification. The strength of the material is assessed by the Soaked California Bearing Ratio Test. Sufficient testing of supplied pavement material is undertaken to ensure that the material meets grading, plasticity and strength requirements.

(22) A quality assurance program for testing is adopted and the pavement tested on a lot to lot basis.

(23) A pavement layer is not covered with the next layer or wearing course until the moisture level is less than the Optimum Moisture Content.

(24) A general construction specification is required to accompany all engineering documents. The local government's approved construction specifications are AUS-SPEC # 1 except for the following specifications which conform to the Queensland Department of Main Roads -

(a) flexible pavements;

(b) sprayed bituminous surfacing;

(c) asphaltic concrete;

(d) bituminous microsurfacing;

(e) signposting.

(25) Regardless of the above specifications, the local government's requirements as modified in this Policy take precedence.

(26) The job specification is to contain requirements for construction tolerances, an example of which is indicated in Table 7 - Tolerance Requirements, as being indicative of a standard acceptable to the local government.

Table 7 - Tolerance Requirements

Course	Design Level Tolerance	Thickness Tolerance	Sharp Tolerance	Crossfall Tolerance
General Earthworks	+ 0 mm - 100 mm	N/A	N/A	As directed
Subgrade	+10 mm - 15 mm	N/A	N/A	As directed
Sub-base	+ 10 mm - 10 mm	+ 40 mm - 20 mm	25 mm in 3 metre maximum	± 1.0 percent
Base	+ 15 mm - 10 mm	+ 15 mm - 15 mm	15 mm in 3 metre maximum	± 1.0 percent
Surfacing	+ 10 mm - 5 mm	+ 15 mm - 0 mm	7 mm in 3 metre maximum	± 0.5 percent
CBR 15 Material	+ 10 mm - 15 mm	+ 40 mm - 20 mm	25 mm in 3 metre maximum	± 1.0 percent

(27) The job specification is to include testing requirements for developments which include lot fill, roads and trenches. An example is given in Table 8 - Testing Requirements, as being indicative of a standard acceptable to the local government.

Table 8 - Testing Requirements

Parameter	Description	Standard of compaction	Testing Interval
Compaction	Lot fill	95 percent Std	1 Test per lot per layer
	Trenches	90 percent Mod or, 95 percent Std	80 metres length/ 300 mm thick
	Subgrade	Top 300mm 100 percent Std Below 300mm 95 percent Std	2 test per road 1 test per 100m
	Select fill	95 percent Mod	2 test per road 1 test per 100m
	Sub base	95 percent Mod	2 test per road 1 test per 100m
	Base	98 percent Mod	2 test per road 1 test per 100m
Investigation	Subgrade CBR (Compulsory)		One per soil type
	Grading Linear, Shrinkage and Dynamic Cone Penetration (Additional optional testing to support CBR's)		Enough to identify soil boundaries.
Quality	Gravel	Grading, Shrinkage and P.I.	1 test per 400 metres min 2 per development
	CBR	CBR to be tested at minimum requirement for compaction (See above)	1 test per 400 metres or 1 test per 2000 metres with test results from source

(28) The job specification may include proposed layer thicknesses. An example is given in Table 9 which is indicative of a standard acceptable to the local government.

Table 9 - Layer Thicknesses

Course	Minimum Thickness (mm)	Maximum Thickness (mm)
Subgrade (CBR 15 material)	100	150
Sub-base	100	150
Base	100	150
Surfacing (AC)	25	N/A
Surfacing (concrete)	150	N/A

Note -

Maximum particle size of base, sub-base and grade courses for the minimum thickness is 40mm. Materials used comply with the Queensland Department of Main Roads standard specifications which may over-ride the above minimum thickness requirements.

(29) All lot fill testing is carried out in accordance with the requirements of *AS 3798: 1996 - Guidelines on Earthworks for Commercial and Residential Developments*. The level of control is to the approval of the local government's representative. Tolerances on level are to ensure that the finished grade is within 0.5 percent of the design grade and that the resultant profile achieves its design functions.

(30) Prior to acceptance of the works On-Maintenance, a comprehensive report of all testing carried out during construction is submitted for the local government's records.

9.5.11.8 Sub-Soil Drainage

(1) Sub-soil drainage is installed at all locations, in all subgrade materials other than sand. The invert level is above tidal influence which is RL 1.6 AHD.

(2) The design of subsurface drainage complies with the criteria in *ARRB Special Report No. 35 Subsurface Drainage of Road Structures* by R.J. Gerke.

(3) Details and locations of subsoil drainage is in accordance with the local government's approved standard drawing R-RSC-12 unless otherwise directed by the local government.

9.5.12 Un-Signalised and Signalised Intersections

Note -

Road reserve widths, truncations and carriageway configuration are subject to the local government road planning layout requirements.

9.5.12.1 Truncations

(1) The minimum truncation of the real property boundary, at an intersection, is outlined in Table 10.

Table 10 - Intersection Truncations

Road Classification	Truncation Required
Type A, B, C and D roads to any road. Distance criterion to achieve giveway conditions specified in the *MUTCD*	Based on sight. Minimum 6 metres by 3 chord
Industrial	8 metres by 3 chord Refer to *Queensland Streets*
Sub Arterial to any road	10 metres by 3 chord
Arterial Road to Arterial Road	25 metres by 5 chord

(2) Where the intersection angle is other than 90°, the truncation is by chords to a circle of radius equal to the above truncation lengths.

(3) In all cases, the minimum truncation depends upon maintaining the minimum width of verge for each type of road as shown on approved standard drawing R-RSC-15. Sight distance is to the satisfaction of the local government and the Department of Main Roads where appropriate.

9.5.12.2 Channelisation

(1) Warrants for the provision of channelisation at intersections is traffic volumes and intersection layout, and the local government will determine at which intersections channelisation is required.

(2) It is not possible to set out standards which are applicable to all situations. Therefore, when channelisation is required, refer to the current Department of Main Roads Design Manuals and *AUSTROADS* publications.

(3) All channelisation, except for slow points and minor roundabouts on residential type A and B streets, are designed to accommodate a Design Semi-trailer, providing a clearance of not less than the requirements as specified in AUSTROADS.

(4) Intersections, slow points and minor roundabouts on residential type A and B streets are designed to accommodate a standard 10.2 metre long garbage truck with a minimum of 0.3 metre clearance from the overhang of the vehicle to the kerb and channel lip or kerb lip as applicable.

(5) The minimum radius for the standard garbage truck is 11 metres to the outside front wheel path.

(6) Traffic islands are preferably delineated by raised kerbs. Other physical barriers or pavement marking may be appropriate in certain circumstances.

(7) Traffic islands may be classified as -

(a) Channelising or directional islands;

(b) Roundabouts;

(c) Median islands;

(d) Medians;

(e) Separators; or
(f) Pedestrian refuge islands.

(8) For details on islands and their classification, refer to the *Manual of Uniform Traffic Control Devices* (Qld) and relevant *AUSTROADS* publications.

(9) All traffic islands are constructed with concrete semi-mountable type kerb.

(10) All islands less than 12 m^2 or of a width less than 2 metres between kerb faces are constructed of full depth concrete with F62 mesh reinforcement placed centrally. The surface treatment is as specified by the local government; either coloured, patterned or stamped concrete. Approved plastic sheeting is placed under all concrete surfacing.

(11) The surface treatment of all other islands is full depth topsoil with turf or low planting. The local government may approve of landscaping in large islands.

(12) A water service is installed every 80 metres approximately, with a minimum of 1 service per median.

(13) Tree planting in median islands conforms to the *Road Landscaping Manual* published by the Qld. Department of Main Roads. Refer to figure C5-4 of the manual for clearance zone widths.

(14) Where the fall across an island is greater than 1 in 4, the island is surfaced with concrete or other treatment approved by the local government.

(15) Subsoil drainage to the local government's standards may be required in traffic islands where surface treatment other than concrete has been provided. The drainage is connected to an underground drainage system to the local government's requirements.

(16) All traffic islands are designed in accordance with the current Department of Main Roads Design Manuals and *AUSTROADS* publications. Particular attention is paid to commencing islands at horizontal curves and vertical curves with respect to sight distance.

9.5.12.3 Roundabouts

(1) Roundabouts may be proposed as a design solution but are subject to approval by the local government.

(2) The design is in accordance with current Department of Main Roads Design Manuals: *AUSTROAD*, *Part 6*, *Guide to Traffic Engineering Practice - Roundabouts* and the local government's standards.

(3) The maximum design speed through a roundabout is 50 km/h.

(4) The local government will determine the design criteria for the roundabout. This criteria includes the number of traffic lanes and radius of the centre island. Preliminary layouts are submitted to the local government for examination prior to final design.

(5) Notwithstanding the requirements of *Queensland Streets*, raised splitter islands are provided on all approaches to all roundabouts, unless otherwise approved by the local government.

(6) The minimum radii for centre islands are -

(a) Type A and B streets: 6 metres;

(b) Type C roads: 10 metres.

(7) Multi-lane roundabouts are in accordance with *AUSTROADS - Part 6, Roundabouts*.

(8) Centre islands of roundabouts are constructed to a similar standard as traffic islands except that concrete edging of 1.5 metres minimum width from the outer edge for the full circumference is provided.

(9) The centre section has a raised kerb and landscaping to the local government approved design. A certificate is submitted stating that the soil type provided is suitable for landscaping. A watering point is installed to roundabouts where directed by the local government.

(10) Roundabouts are designed and constructed to ensure that a forgiving environment is provided. Where appropriate, frangible poles and posts are used.

(11) An irrigation system may be required if specified by the local government.

(12) Subsoil drainage is provided for the full circumference of the roundabout and wherever else determined by the local government’s representative during construction and connected directly to an underground stormwater drainage system.

(13) Roundabout carriageways are surfaced with 40mm minimum depth of asphaltic concrete surfacing; or with concrete designed as specified in this policy; or with other approval materials. Bituminous surfacing chip seals are not permitted on roundabout carriageways under any circumstances.

(14) AC or concrete surfacing as specified herein is extended on the pavement to the greater of -

(a) 15 metres from the outside curve of the roundabout carriageway; or

(b) the point of the splitter island furthest away from the roundabout.

9.5.13 Clearing and Earthworks

9.5.13.1 General

(1) Road reserve clearing and earthworks construction is carried out in accordance with the specifications in *AUS-SPEC # 1, Development Construction,* except as amended in this policy.

(2) Clearing and earthworks on roads controlled by the Department of Main Roads conforms to that department's specifications.

(3) Refer to Chapter 12 - Excavation and Fill of this policy, for the standard required for lot clearing and earthworks. Refer also *AS3798: 1990 - Guidelines on Earthworks for Commercial and Residential Developments*.

(4) The use of heavy vibrating compaction equipment is restricted to locations where the possibility of structural damage to adjacent buildings is negligible. Approval for their use is applied for from the local government.

(5) No trees are destroyed or removed within the areas that are dedicated to the local government or within approximately 10 metres of the rear boundaries of all proposed lots except where approved for the location of services.

(6) Trees on existing roads are not damaged nor removed without the approval of the local government. All trees on existing roads affected by the works are shown on the plan and details of methods for protection and/or relocation of the trees are submitted for local government approval.

(7) All felled timber on the site is removed from fill areas before the earthworks are commenced. The local government is notified when this work has been completed.

(8) Excess material excavated from existing road reserves remains the property of the local government. When requested, it may be possible to re-assign ownership for a consideration when the material is required for filling of the subject land to design levels. Spoil is deposited on local government land if required, within 5km of the job site. The actual land will be nominated by the local government.

9.5.13.2 Disturbed Areas

(1) All disturbed areas within a development are topsoiled with 75mm minimum approved topsoil and grassed. Areas subject to erosion may require special treatment as directed by the local government or as specified in this policy.

(2) Works will not be taken Off-Maintenance unless 80 percent grass coverage is achieved in each 10 square metres of areas requiring grassing.

9.5.13.3 Treatment of Dams

All dams are dewatered, all silt removed and the dam wall leveled to existing ground level before approved filling commences. Certificates are provided to confirm that compaction at positions and levels requested by the local government have been satisfactorily completed.

9.5.14 Pedestrian and Bicycle Paths

9.5.14.1 General

(1) Pedestrian paths are designed in accordance with *AUSTROADS Part 13* except as amended herein.

(2) Bicycle paths are designed in accordance with *AUSTROADS Part 14*, *Queensland Streets - section 4.0* and the Department of Main Roads standards except as amended herein.

(3) All proposed development works are designed to cater for bicycle and pedestrian movements.

(4) The needs of cyclists and pedestrians are considered at the initial stage of the design of transport infrastructure.

(5) Pedestrian and bicycle paths are generally constructed in concrete and are in accordance with the local government's approved standard drawings R-RSC-5, R-RSC-8, P-RSC-2, P-RSC-4 and P-RSC-5 unless otherwise approved.

(6) Cross sections and a longitudinal section are submitted and conform to local government standards for each path.

(7) Pedestrian paths and bicycle paths are joined to the kerb and channel via a pram ramp when located on a road verge.

(8) The minimum width of land dedicated to the local government for the location of a path is 15 metres.

(9) Pedestrian and bicycle paths are constructed above the flow of a 50 percent AEP storm.

(10) The absolute minimum level of a concrete or sealed pedestrian or bicycle path is RL 2.0 AHD.

9.5.14.2 Key Design References

Refer to the following design references in Table 11 for local government design standards.

Table 11 - Reference to AUSTROADS Part 14 Design Standards

Design Consideration	AUSTROADS Part 14 Reference
Horizontal Curvature	Section 6.3.2
Clearances	Section 6.3.5
Gradients	Section 6.3.6
Sight Distances	Section 6.3.7
Superelevation, crossfall and drainage	Section 6.3.8
Surface tolerances	Section 8.5.1
Pavements materials and construction	Section 8.5.2

9.5.14.3 Path Requirements

(1) The cross-section of the verge conforms to the details in approved standard drawing R-RSC-8 except where otherwise approved by the local government.

(2) Unless otherwise required by the conditions of approval, path paving is provided on both sides of all collector streets and trunk collector streets except those in Park Residential developments. Refer standard drawing R-RSC-15 for more details.

(3) Depending on the location and function, path paving widths are provided to local government requirements. Pedestrian paths are designed to provide sufficient space for pedestrians with prams or strollers. Pedestrian paths are not less than 1.5 metres in width and should exceed that minimum where pedestrian demand is high in locations such as at commercial sites. At such locations the local government may require the paving to extend the full width of the verge, from the property alignment to the kerb. Refer to standard drawings R-RSC-5 and R-RSC-8.

(4) A shared bicycle/pedestrian path to commuter path standards as defined in *AUSTROADS Part 14, section 6.6.1* with links to local roads and or cycle routes is required along arterial, sub arterial and trunk collector roads. Refer standard drawing R-RSC-15.

(5) Consideration is given to anticipated future demand. The width of shared paths is in accordance with standard drawing R-RSC-5.

(6) The possible need to separate path users over part or all of the route will be determined where there is anticipated significant conflict between cyclists and pedestrians. Path separation is carried out in accordance with *AUSTROADS Part 14, Section 6.6.2*.

(7) Exclusive bicycle paths are installed where there is significant cycling demand and conflict with pedestrians is deemed to be high. Refer *AUSTROADS Part 14, section 6.7 and 6.*8.

9.5.14.4 Pathway Infrastructure

(1) Lighting is provided along paths to local government requirements to ensure visibility, safety and security. Lighting conforms to the Infrastructure Works Code, Chapter 9 - Electrical Reticulation and Street Lighting of this policy and *AUSTROADS Part 14, Section 6.9*.

(2) Devices such as fencing and bollards may be used to discourage motor vehicles on shared paths. The placement of fences, poles and bollards within the path width should minimise disruption to cyclists and pedestrians and not pose a safety hazard. Warning of the location of such devices in paths is in accordance with *AUSTROADS Part 14, Section 6.7.3*. Raised pavement markings are not used. Removable bollards are designed and installed to leave the path safe with nothing protruding above path level when the bollard is removed or lowered.

(3) Grab rails or holding rails are installed on shared paths near road crossings as per local government requirements and in accordance with *AUSTROADS Part 14, Section 6.7.3*. Galvanised rails are painted either white or yellow in conjunction with 3 bands of retroreflective tape as per *Australian Standard 1906.1: 1993 - Retroreflective materials and devices for road traffic control purposes-Retroreflective materials.*

(4) Bollards, fencing and grab rails positioned near path entrances are fitted with retroreflective devices or tape to increase visibility.

(5) Offset Chicane, standard drawing P-RSC-5 and Reverse Curve, standard drawing P-RSC-4 design treatments are used for bike paths and shared paths rather than centre bollards.

(6) Z Chicane rails are not used as a slowdown control devices in new developments.

(7) Kerb ramps and ramps for driveway crossovers are flush with the road pavement and do not have a lip at the invert in accordance with standard drawings R-RSC-14, R-RSC-2, R-RSC-3 and R-RSC-4. They are designed and installed in accordance with *Australian Standard 1428: 2003 - Design for Access and Mobility.*

(8) Kerb ramps used for transitions between off-road paths and on-road facilities at higher transition speeds should be in accordance with *AUSTROADS Part 14, Section 4.5.3*.

(9) Bicycle detection systems are provided in road pavement bicycle lane approaches to all new signalised intersections.

(10) Traffic control signs and pavement markings, including bicycle pavement symbols, are in accordance with *AUSTROADS Part 14, Section 9 and MUTCD Part 9*.

(11) Guide signs are provided at locations where guidance for the continuity of the cycle route is considered necessary in accordance with local government and the Department of Main Roads requirements. Refer *AUSTROADS Part 14, Section 9.4*.

(12) No Through Road signs on dead end streets which lead to bicycle paths include warning signs and line marking treatments that are not included in the *MUTCD* are specified in accordance with local government requirements.

(13) Reflectorised raised pavement markers are not placed inside a bicycle lane. They are installed on the motorist's side of the line marking with a bevelled front edge.

(14) Coloured bicycle lanes are installed at sections of bicycle lanes which are frequently crossed by motor vehicles and where safety is a concern particularly at left turn slip lanes. This is done in order to -

(a) reduce the chance of conflict between motor vehicles and cyclists;

(b) enhance the visibility and recognition of bicycle lanes;

(c) improve cyclists safety in high conflict areas;

(d) increase the skid resistance of the pavement in a critical area for cyclists.

(15) Green is the colour recognised for use in bicycle lanes and matches standard green colours in accordance with *Australian Standard 2700: 1996 - Colour standards for general purposes*, G13 Emerald, G27 Homebush Green, or approximate match of colour determined in accordance with *AS/NZ1580.601.1: 1995 - Paints and related materials-Methods of test-Colour-Visual comparison.*

(16) The surface treatment will be assessed for skid resistant requirements typically applied to all classes of roads at roundabouts, signalised intersections and approaches to hazardous locations.

9.5.14.5 Road Pavement Cycling Requirements

(1) Bicycle paths on new roads are designed and constructed in accordance with the desirable standards within *AUSTROADS Part 14*, *MUTCD Part 9* and *Queensland Streets*.

(2) Sealed shoulders intended for bicycle lanes are continuous through intersections.

(3) A combination of on-road cycling treatment is utilised to provide safe and continuous movement of cyclists along a roadway such as -

(a) sealed shoulders;

(b) wide kerbside lane;
(c) exclusive or peak period bicycle lane;

(d) advisory treatments such as Bicycle Awareness Zone;

(e) shared parking / bicycle lane;

(f) contra flow bicycle lane;

(g) bus/bicycle lane

(4) The provision of bicycle lanes at intersections is in accordance with *AUSTROADS Part 14, section 5* and *MUTCD Part 9*. Consideration is given to the various movement patterns of cyclists and addresses the following movement stages -

(a) midblock;

(b) transition;

(c) approach;

(d) storage;

(e) through;

(f) departure.

(5) The requirement to provide on-road cycling facilities may require -

(a) reduction in width of traffic lanes;

(b) sealing of road shoulders;

(c) indent of car parking;

(d) prohibition of car parking;

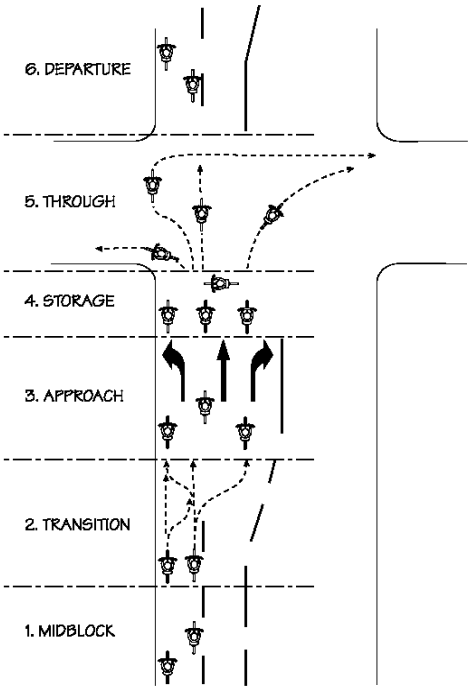
(e) widening of road at median;

(f) widening of road at verge;

(g) removal of traffic lane;

(h) provision of a high standard off-road path.

Diagram 8 - Cyclist Movement Elements through an Intersection



(Source: Cumming, 1999)

9.5.14.6 Roadworks Affecting Cycling Facilities

(1) Roadworks signs are not installed across shared paths, bicycle lanes or sealed shoulders which may be used by cyclists unless absolutely necessary and/or no other suitable location is available.

(2) All warning signs placed on bicycle and pedestrian facilities are clearly visible under all conditions. Adequate advance warning to oncoming cyclists and pedestrians are given when temporary signs block part or all of a path or other bicycle facility.

(3) Traffic management plans for roadworks clearly show the provisions for cyclists and pedestrians. Preference is given to minimising the length of detours to cyclists and pedestrians

9.5.14.7 Path Design Safety

(1) Initial planning and design provides access for wheelchair users, elderly people and pedestrians with prams or strollers.

(2) The grade on pedestrian paths, shared paths and exclusive bicycle paths are kept to a minimum but are not less than 0.4 percent. Grades greater than 8 percent are undesirable over an extended path length.

(3) A general guide on maximum grade lengths once they exceed 5 percent is detailed in Table 12.

Table 12 - Recommended Maximum Grade Lengths for Paths

Grade	Maximum Distance
5-6 percent	240 metres
7 percent	122 metres
8 percent	90 metres
9 percent	60 metres
10 percent	30 metres
11+ percent	15 metres

(Source: Adapted from VDOT 1990)

(4) Paths do not contain steps, stairways or other hazards or impediments which would prevent safe access by people with disabilities.

(5) The maximum longitudinal slope for disabled people is 1 in 20 with a cross slope not greater than 1 in 40. If a path has a greater longitudinal slope, it is considered a ramp and is to conform to requirements in *Australian Standard 1428.1: 2001- Design for access and mobility.*

(6) Bicycle and pedestrian paths in parks are designed to avoid close proximity to thick vegetation or large trees to minimise root damage and conform to clearances from vegetation and maintain adequate sight distance for cyclists. Refer *AUSTROADS Part 14, Sections 3, and 6.3.7*.

(7) The design and construction of Local Area Traffic Management (LATM) infrastructure such as speed humps, raised platforms, round-a-bouts and traffic islands in order to control access and speed is to cater for the safe movement of pedestrians and cyclists.

9.5.14.8 Bicycle Facilities at Roundabouts

(1) The provision of cycling facilities at roundabouts are generally in accordance with *AUSTROADS Part 14 Section 5.5.2*.

(2) The following design features are considered for each roundabout design. One or more of the following features are provided where appropriate -

(a) standard bicycle lane markings on approach and exit at roundabout;

(b) provision for cyclists to queue at approaches to roundabout;

(c) off ramps on entry and exit on each leg to allow for off-road movement for cyclists;

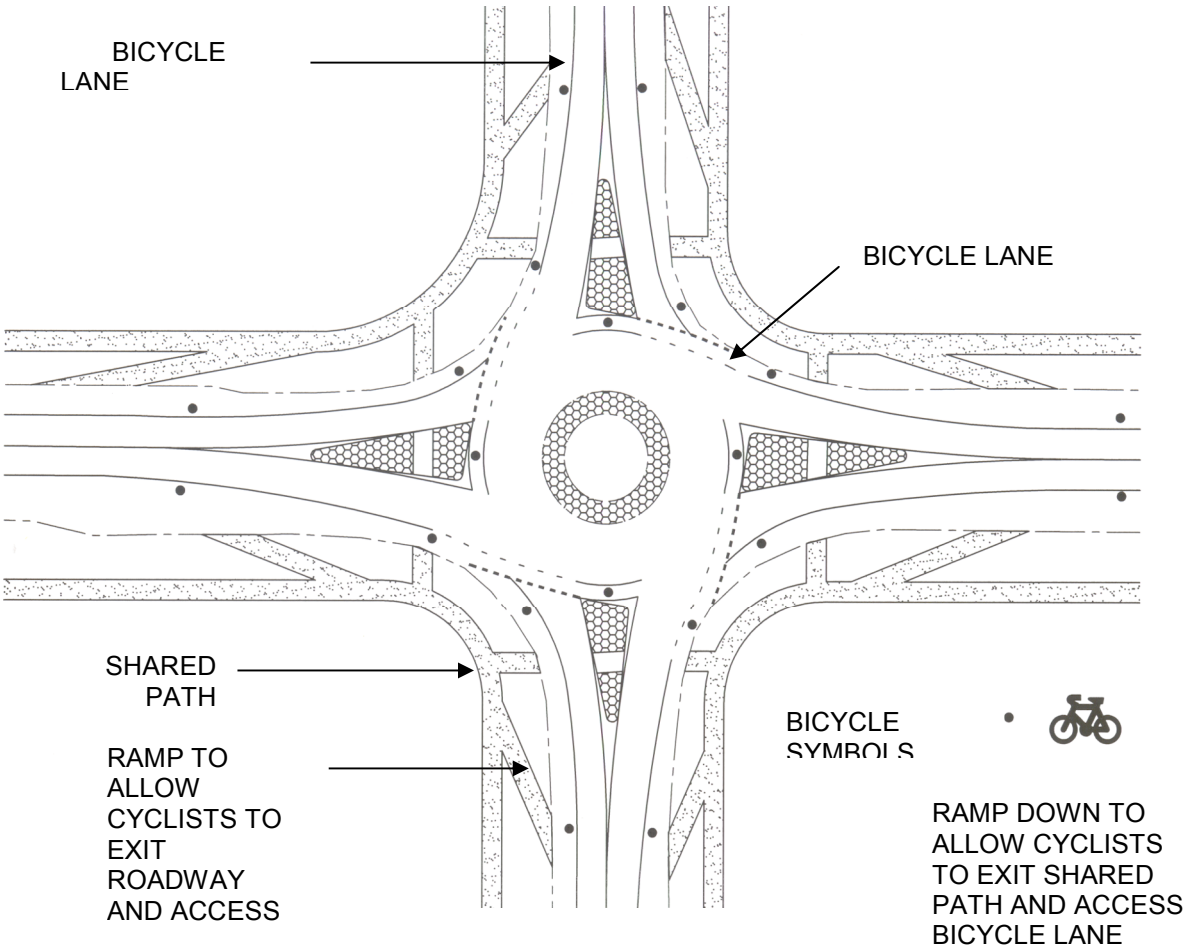
(d) a marked and coloured (green) carriageway bicycle lane extending across the approach and along the exiting bicycle lane;

(e) a marked bicycle lane continuing through the roundabout.

Note -

A sketch, similar to Diagram 9, is required to support the required treatment.

Diagram 9 - Bicycle Friendly Roundabout Treatment



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