PINE RIVERS SHIRE COUNCIL

DESIGN MANUAL

CIVIL INFRASTRUCTURE DESIGN

PINE RIVERS

DESIGN STANDARDS

PINE RIVERS SHIRE COUNCIL

DESIGN STANDARDS

PART 1
DESIGN STANDARDS FOR ROADWORKS

PINE RIVERS SHIRE COUNCIL

PART 1 - DESIGN STANDARDS FOR ROADWORKS

SECTION 4
THE MAJOR URBAN ROAD SYSTEM

4.1.0 MAJOR URBAN ROADS - DEFINITION

"Major urban roads" are **traffic routes** whose primary function is to convey traffic between centres of population, or within the urban area.

In this, they are functionally quite distinct from **streets** or **access places** whose primary purpose is to provide **access** to frontage properties - residential, commercial, industrial or rural.

4.2.0 DESIGN PHILOSOPHY

4.2.1 MIXED FUNCTIONS

The two functions of **traffic route and access** are essentially incompatible.

- The high traffic volume and relatively high speed necessary for efficient and convenient traffic function are incompatible with the safety and amenity of abutting property, particularly for residential development.

- The deceleration and acceleration of vehicles accessing properties, and the inevitable frontage parking, prejudice safe and convenient traffic flow.

Therefore, only in certain special cases is direct access from frontage property to major roads permissible (see Section 4.2.3 of the Design Standards for Roadworks).

In the case of residential allotments, the maximum acceptable traffic volume on a frontage street, from safety and amenity considerations, is 3000 to 3500 vehicles per day (see Section 2.2 of the Design Standards for Roadworks). Above that volume, the thoroughfare becomes, by definition, a **traffic route** and direct frontage access should be denied.

There are, of course, many existing thoroughfares which do **not** comply with these concepts, i.e. “major roads” whose primary function is a traffic route but which nevertheless provide direct frontage to allotments used for residential or other purposes.

4.2.2 OBJECTIVES

The **primary objectives** identified in relation to residential streets are applicable equally to major roads. These objectives are:-

- safety
- amenity
- convenience
- economy

It is important to remember that these objectives apply not only to the major road itself but to adjacent land uses e.g.:-

- the **safety and convenience** of local traffic (vehicular, pedestrian and cycle) crossing a major road is equally important to that of traffic on the major road

- the **amenity** of abutting residences is of equal (or greater) importance than that of road users

4.2.3 FRONTAGE ACCESS

Permitted access

While direct access from properties to major roads is generally unacceptable, there are circumstances in which access may be permissible, i.e.:-

- **major developments** e.g. commercial development, large industrial or medium density residential complexes, or institutions, subject to appropriate design

- **minor infill** development on roads with existing frontage access, where there is no reasonable alternative available

Major Developments

Approval for the direct access of a major development to a major road will be subject to:-

- the access being, wherever possible, designed and constructed to the same standards as for an intersection to the subject road, and the spacing between accesses and intersections being as specified for intersections

- in instances where this is not appropriate, the access is to be designed to the satisfaction of a Pine Rivers Shire Council engineer

- the internal design of the development being such that parking on the road will be discouraged

- appropriate internal buffering being provided to preserve the amenity of the proposed development

- provision being made for internal turning of vehicles to ensure ingress and egress being in a forward direction only

Infill Development

Approval for infill development to have direct access to a major road is at the discretion of the Pine Rivers Shire Council.

Wherever possible, the number of access points should be minimised. Provision of a service street or common driveway(s) will be preferred.

Where infill development is permitted with allotments accessing individually to the major road, construction of roadworks is to be undertaken in accordance with the Pine Rivers Shire Council Town Planning Scheme and Policies.

Existing Frontage Development

Where there is existing development with direct frontage access to a road which is proposed to be constructed to major road standards, protection of the safety and amenity of the existing properties will, in most instances, require provision of a service street on the frontage of those properties.

The design standards for such a service street will be determined by the Pine Rivers Shire Council but for a minor residential access, a typical cross-section would be 3.5m verge width, 6.0m carriageway and 3.0m outer separator.

The requirements for provision of service streets are discussed in detail in Section 4.15.0 of the Design Standards for Roadworks, with supporting design information being included in Section 3.7.7 of the Design Standards for Roadworks.

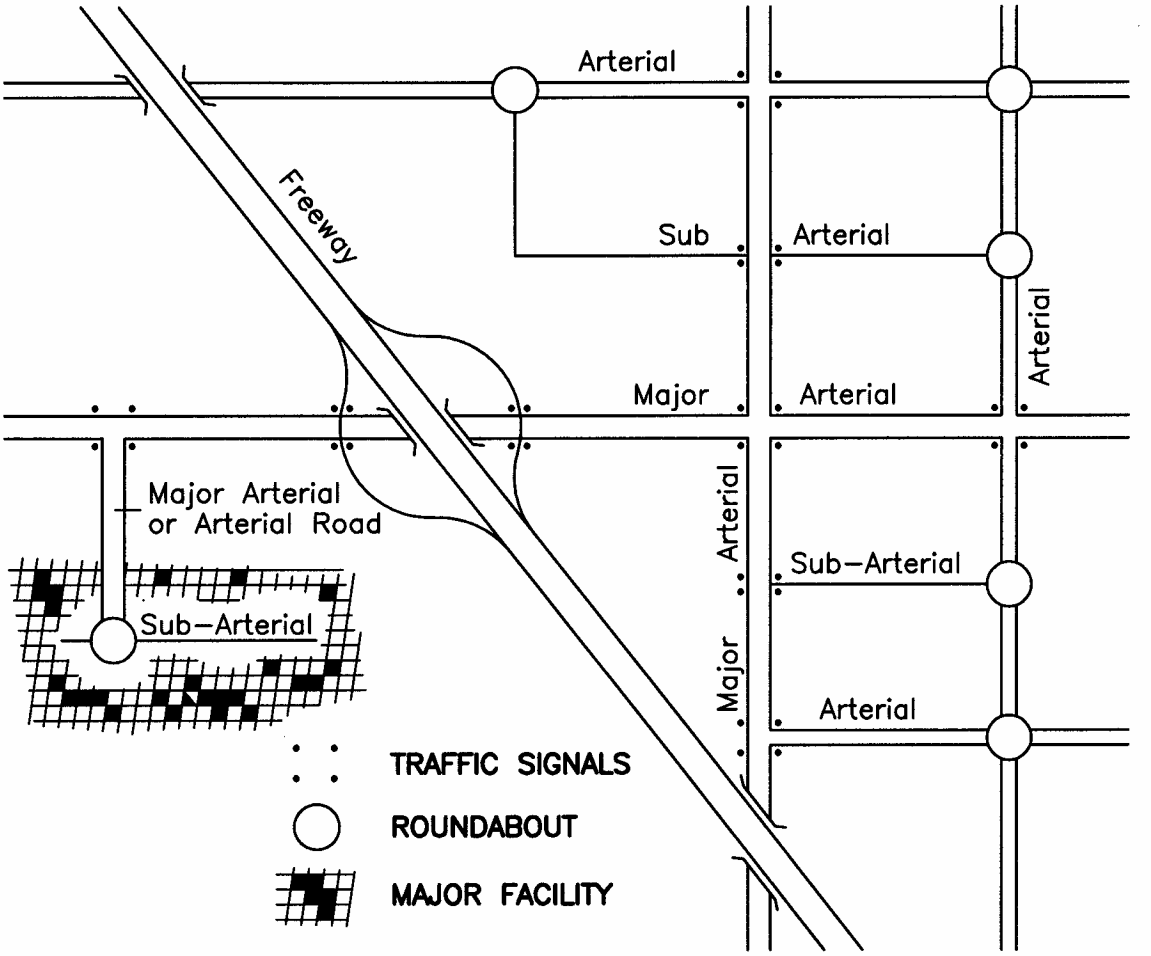
4.3.0 CLASSIFICATION OF MAJOR URBAN ROADS

It is convenient to classify major urban roads into a "hierarchy" based on traffic volume and operating characteristics.

The Design Standards for Roadworks identifies three classes of major road:-

- Freeway
- Arterial road
- Sub-Arterial road

Figure 4.3.A shows a typical relationship between these road classes.



The Major Road System
Figure 4.3.A

Typically, the following characteristics of major roads show an increase in the range from Sub-Arterial to Freeway:-

- design traffic volume
- design traffic speed
- average journey distance
- intersection spacing
- intersection standard

4.4.0 FREEWAYS

Roads of this category may also be described as expressways or motorways.

They are designed as high-speed, high volume traffic routes. Design speed is typically 100 km/h and a cross-section with divided carriageways, each of 2 or more lanes, provides capacity for 40,000 plus vehicles per day.

Access is available only to roads of similar status, or to major arterial roads, by grade separated interchanges at infrequent intervals, usually 2km or more apart.

Freeways are generally purpose-built to relieve the traffic pressure on arterial roads when the practical capacity of these roads is reached.

The need for and location of freeways will be determined by the Pine Rivers Shire Council and/or the Queensland Department of Main Roads from a consideration of regional traffic planning requirements. Design and construction of these roads is not normally a relevant requirement for an individual development approval.

As freeways provide no direct connection to the street system, their main significance to the planning of an individual development is as a major planning constraint if such a road should traverse or bound the land under consideration.

4.5.0 ARTERIAL ROADS

4.5.1 DEFINITION

Generally, arterial roads have the primary purpose of conveying through traffic with its origin and destination relatively remote from the area under consideration.

Arterial roads may also, however, be roads which perform particular major functions, typically involving carrying a higher volume of traffic for specific purposes, or particular classes of traffic. Without limiting this definition, examples would include roads which are the principal carrier of traffic to and from major facilities (e.g. airports, ports, major shopping centres, town centres, major business and / or industrial areas, large educational establishments etc.) or provide the primary access to these major facilities. These roads may also perform other functions.

Within this broad classification there is a wide range of traffic characteristics e.g.:-

- traffic served (from inter-regional to intra-urban)
- traffic volume carried
- traffic speed

A rather arbitrary subdivision can be made into:-

- **Major Arterials** - higher traffic volume generally with no direct connection to the street system

- **Arterials** - lower traffic volume with appropriate connections to the street system and major uses

The term “Arterial Road” in the Design Standards refers to both Major Arterials and Arterials.

4.5.2 TYPICAL STANDARDS

Design and construction standards for an arterial road will be determined by the Pine Rivers Shire Council as the result of strategic traffic planning and will have due regard for other relevant factors such as the nature and use of the area traversed by the road, the nature and purpose of its traffic, the amenity of the area, the environmental impacts of the road and the needs of pedestrian and other traffic, etc.

If the road is of regional or state significance, or likely to become a declared road, Queensland State Departments such as the Department of Main Roads and Queensland Transport may also have input into the design and construction requirements.

General design criteria, applicable where specific design requirements have not been advised, are set out in following sections.

Subject to the above, arterial roads typically may have the following design characteristics:-

- four lane divided roads
  (i.e. two lanes each way with central median)
- generally limited, or no access to frontage property
  (may provide access to major facilities)
- intersections, either signals or roundabouts, at infrequent internals
  (refer to Section 4.7.2 of the Design Standards for Roadworks)

Where access to a major facility is provided directly to the arterial road, such access shall take the form of an appropriate intersection treatment, including provision of traffic signals etc.

Less commonly, a high volume major arterial may require six lanes (three in each carriageway) or a low volume arterial road may require only two lanes (one each way).

The design must incorporate noise attenuation measures for the protection of the amenity of adjacent development (see Section 4.10.12 of the Design Standards for Roadworks) and pedestrian and cyclist facilities (see Section 4.13.0 of the Design Standards for Roadworks).

A typical arterial road cross-section is shown on Pine Rivers Shire Council adopted standard drawing.

4.5.3 STAGING

Often, construction of an arterial road will be staged, the road either existing or being constructed initially as a two-lane road and later being widened to four or more lanes by construction of a second carriageway, as the traffic volume increases.

It is essential, however, that the land requirements for the ultimate road reserve be recognised and provided for in the initial development planning.

A common scenario is for a developer to be required to construct the initial two-lane carriageway for a combination of reasons such as traffic generated by the development, safety issues and amenity reasons. In some instances it may be more appropriate to obtain a contribution towards future construction, with the amount of the contribution being established at the time the application is considered by the Pine Rivers Shire Council. The Pine Rivers Shire Council would use the funds contributed to carry out works along the road as the need for upgrading various sections arises. The Pine Rivers Shire Council (or Queensland Department of Main Roads) could undertake the future construction of the additional carriageway in recognition of the regional traffic component using the road.

In the case of a major development however, the traffic generated by that development alone may require the provision of a four-lane road. In this case the developer will be liable for full construction.

Major intersections may also be constructed in stages, for example the initial construction being a roundabout or signalised intersection at grade, with future construction providing for grade separation of the major route.

The extent of any proposed staged construction by a developer should be fully discussed with and approved by the Pine Rivers Shire Council.

ARTERIAL ROAD
TYPICAL CROSS-SECTIONS

(REFER STANDARD DRAWING 8-10007)

4.6.0 SUB-ARTERIAL ROADS

4.6.1 DEFINITION

Unlike Freeways and Arterial roads, Sub-Arterial roads carry less of the through traffic component and act as **feeder roads** between development areas and the arterial roads.

Sub-Arterial roads may also serve the function of a principal carrier of traffic to, through or around major facilities (e.g. airports, ports, major shopping centres, town centres, major business and/or industrial areas, large educational establishments etc.) or may provide the primary access to these major facilities.

4.6.2 CHARACTERISTICS

Sub-Arterial roads are generally planned and constructed specifically to serve the urban development requirements and hence tend to be located at more or less regular intervals.

They are needed to further subdivide larger areas between arterial roads or to reduce the number of intersections on to arterial roads (see Sections 3.2.2 and 3.2.3 of the Design Standards for Roadworks).

Commonly, sub-arterial roads terminate at a T-junction with an arterial road at either end. Excessive continuous length across arterials will tend to encourage their use by through traffic as a “parallel arterial” and should be avoided.

4.6.3 LOCATION

In new developments, major roads should be located in an approximately square grid pattern with the primary purpose of the road controlling the location.

The impact of spacing of major roads is as follows:-

Larger Spacing

- greater total distances and times
  (greater distance and times on minor streets can lead to driver frustration and speeding, and tendency for “rat-running” through residential areas)
- increased traffic volume on minor streets
  (resulting in loss of amenity and reduced safety)

Lesser Spacing

- Increased capital road cost
- undue fragmentation of residential areas

Traffic engineers often consider a spacing of about **1500m** to be the optimum for road capacity, but residential planning considerations indicate a slightly lesser spacing of about **1200m to 1300m**. This order of spacing results in the creation of a series of viable neighbourhood areas, each of approximately 150 to 180 hectares (see Section 3.2.2 of the Design Standards for Roadworks).

The optimum spacing of major roads in existing developed areas can however be virtually impossible to achieve, due to previous subdivision patterns and location of existing road reserves and topography. In these instances, the location of Sub-Arterial roads shall be to the satisfaction of a Pine Rivers Shire Council engineer.

4.6.4 TRAFFIC VOLUME

If designed to discourage through traffic, and if serving only a normal residential neighbourhood, the catchment of a typical sub-arterial road is unlikely to exceed about 1800 allotments, producing a total traffic volume of about 12,000 vehicles per day, perhaps 8,000 v.p.d. maximum with a directional split (see Figure 4.6.A and Section 4.2.2 of the Design Standards for Roadworks).

This is well **within the capacity of a two-lane road** (maximum approximately 15,000 v.p.d.) and hence only in unusual circumstances would a greater number of traffic lanes be required on a sub-arterial road.

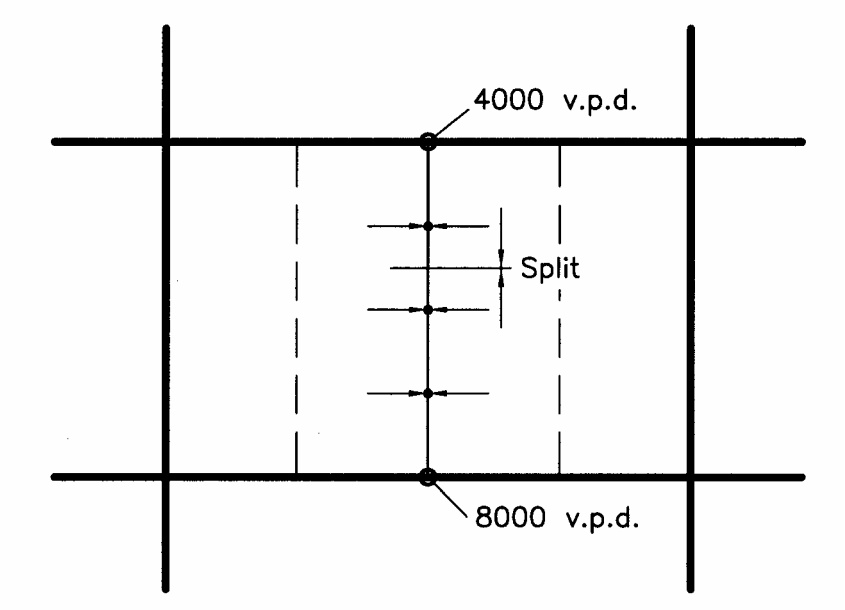


Figure 4.6.A

4.6.5 TYPICAL STANDARDS

Typically, therefore, sub-arterial roads will have the following design characteristics:-

- two-lane undivided cross-section
- generally limited or no direct access to frontage allotments, but may provide access to major facilities
- intersections (T-junctions, roundabouts or signals) at relatively frequent intervals (see Section 4.7.2 of the Design Standards for Roadworks)
- road widening to accommodate channelling of intersections
- the provision of passing/climbing lanes on gradients steeper than 6% where required by the Pine Rivers Shire Council
- the design must have regard to the nature of the area through which it passes and, in residential areas, incorporate noise attenuation measures and limit its impact on the amenity of adjacent development (see Section 4.10.11 of the Design Standards for Roadworks) and pedestrian and cyclist facilities (see Section 4.13.0 of the Design Standards for Roadworks)

A typical Sub-Arterial road cross-section is shown in the Pine Rivers Shire Council adopted standard drawing, and general design criteria are set out in following sections.

SUB-ARTERIAL ROAD
TYPICAL CROSS-SECTIONS

(REFER STANDARD DRAWINGS 8-10006 AND 8-10009)

4.7.0 INTERSECTIONS

4.7.1 NETWORK REQUIREMENTS

Intersections are a potential source of both traffic accidents and traffic congestion, and are costly to construct.

All these factors increase in significance with traffic speed and traffic volume.

Also, intersections between roads of widely different status are undesirable due to the potential traffic hazard resulting from the difference in design speed between the roads.

Hence, the following principles must be recognised:-

- total number of intersections should be reduced to a reasonable minimum
- the higher the road category, the greater the desirable distance between intersections
- roads should desirably intersect only with roads of equal status, or of the category immediately above or below

4.7.2 SPACING OF INTERSECTIONS

Generally the minimum distance between intersections (including any accesses to major developments) should be:-

- Major Arterial road - 1000m
- Arterial road - 500m
- Sub-Arterial road - 300m

Where intersections are signalised, spacing of intersections to facilitate coordination of signals should be considered.

In the case of Sub-Arterial roads, existing landholdings may require intersections at lesser spacing. In such cases, the absolute minimum spacing shall be:-

- intersections on the same side - 100m
- intersections on opposite sides
  - left/right stagger - 100m
  - right/left stagger - **30m**

Note: - Special channelling measures may be needed to prevent the creation of an offset four-way intersection.

4.7.3 TYPE OF INTERSECTION

The types of intersection appropriate on major roads are:-

- **Grade Separation**
  - Virtually essential on freeways but rarely used on other major roads due to very high cost. However, the design of arterial roads may need to provide for future full or partial grade separation, and road reserves planned accordingly.

- **Signalised**
  - Probably the most appropriate treatment for most intersections of arterial roads, particularly where co-ordination of signals can be provided. Provision for pedestrians and cyclists should be incorporated into the design.

- **Roundabout**
  - Particularly appropriate between roads of comparable status and traffic volume, and where heavy right-turning traffic volume occur.

- **Uncontrolled**
  - Permissible for intersections of lower status roads and streets, of T-configuration only.

Table 4.7.A summarises requirements for provision of intersections and appropriate intersection type.

	Major Arterial	**Arterial**	**Sub-Arterial**
Freeway	Grade separation	-	-
Major Arterial	Signals (Grade separation or roundabout)	Signals (Roundabout)	{ Signals (Roundabout) }
Arterial	Signals (Roundabout)	Signals or Roundabout	Signals or Roundabout
Sub-Arterial	{ Signals (Roundabout) }	Signals or Roundabout	Signals, Roundabout, Uncontrolled T-junction
Trunk Collector or Collector	-	Signals (Roundabout or uncontrolled T-junction)*	Uncontrolled T-junction or Roundabout

Note:-

-	indicates intersection generally not permissible
{ }	indicates intersection generally undesirable
( )	indicates less likely alternative
*	on Collector streets servicing small allotment catchments, full turning facilities may not be acceptable

Table 4.7.A

4.7.4 INTERSECTION DESIGN

STANDARDS

The detailed design of intersections should conform to the following relevant standards (or as revised):-

Grade Separated

AUSTROADS / NAASRA	-	Grade Separated Interchanges (1984)	- Ref. 1
QLD. DEPARTMENT OF MAIN ROADS	-	Road Planning and Design Manual	- Ref. 2

Signalised

AUSTROADS / NAASRA	-	Guide to Traffic Engineering Practice Part 5 – Intersections at Grade (1988)	- Ref. 3
AUSTROADS / NAASRA	-	Guide to Traffic Engineering Practice Part 7 – Traffic Signals (1993)	- Ref. 4
QLD. DEPARTMENT OF MAIN ROADS	-	Road Planning and Design Manual	- Ref. 2

Roundabouts

AUSTROADS / NAASRA	-	Guide to Traffic Engineering Practice Part 6 - Roundabouts (1993)	- Ref. 5
QLD. DEPARTMENT OF MAIN ROADS	-	Road Planning and Design Manual	- Ref. 2
As modified by Pine Rivers Shire Council	-	Design Guideline DG 01 – “Roundabouts”	- Ref. 6

Uncontrolled T-Intersections

AUSTROADS / NAASRA	-	Guide to Traffic Engineering Practice Part 5 – Intersections at Grade (1988)	- Ref. 3
QLD. DEPARTMENT OF MAIN ROADS	-	Road Planning and Design Manual	- Ref. 2

CHANNELLING AND AUXILIARY LANES

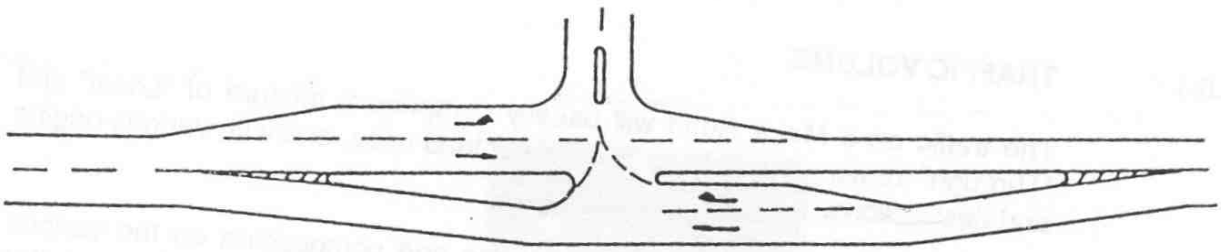
All **signalised** intersections shall have full channelling and auxiliary lanes (deceleration – left turn, right turn, acceleration lane or taper) designed in accordance with Reference 2 above.

Uncontrolled T-Intersections shall have full channelling and auxiliary lanes as above.

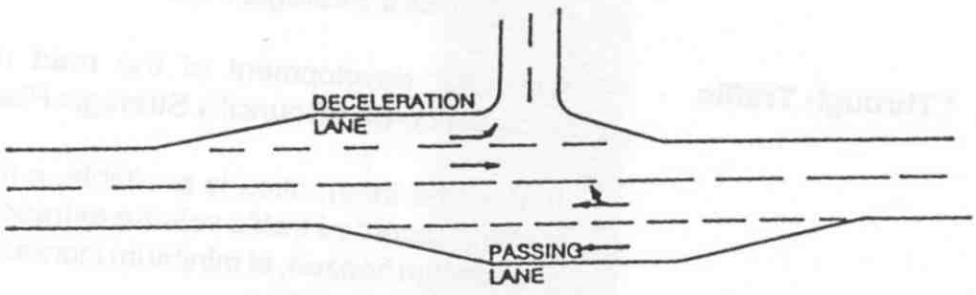
Pine Rivers Shire Council may approve minor connections to Sub-Arterial roads without channelling as follows:-

- Minor intersections - Type AUR right-turn or left-turn lanes in accordance with Reference 2 above.
- Minor accesses - Type AUR right-turn or left-turn lanes in accordance with Reference 2 above.

Assessment for acceptance of the lesser standard alternate treatment shall be subject to the site requirements and traffic projections satisfying the requirements for the alternate treatment, and not requiring a higher order general treatment as published in the accordance with Reference 2 above.



GENERAL TREATMENT - CHR



POSSIBLE ALTERNATIVE FOR MINOR INTERSECTIONS AND ACCESSES - AUR

SUB-ARTERIAL ROADS
TYPICAL T-INTERSECTION DETAILS

Figure 4.7.B

4.8.0 TRAFFIC VOLUME AND CAPACITY

4.8.1 TRAFFIC VOLUME

The traffic on a major road will usually comprise a mixture of "local" and "through" traffic, generated by a variety of land uses, and with various origins and destinations.

Assessment of the resulting traffic volume and composition on the various sections of roadway will almost always require the services of a **specialist traffic engineer**.

In each case the adopted design traffic volume must be to the Pine Rivers Shire Council approval, but in general will be not less than:-

- **local traffic** - traffic catchment fully developed in accordance with the Pine Rivers Shire Council Strategic Plan

- **through traffic** - "ultimate" development of the road network in accordance with the Pine Rivers Shire Council Strategic Plan

  If no better information is available, a minimum of existing recorded traffic volume extrapolated to a 15 year design horizon, at minimum increase of 5% per annum, compounding.

4.8.2 LEVEL OF SERVICE

"Level of service" is a traffic engineering concept, assessing the operating conditions which may occur on a particular roadway when it accommodates various levels of traffic volume.

Six "levels of service" are defined by AUSTROADS (NAASRA) , varying from **"A"** which provides free flow with high speed capability, to **"F"** which is forced flow operation at low speed, with stop-start conditions, long queues and delays.

All major roads are to be designed to provide **level of service "C"**, at the design hour traffic volume, as assessed from the adopted design traffic volume.

In default of site specific information, the design hour traffic volume is to be assumed as 10% of the adopted design traffic volume (A.A.D.T.).

4.8.3 ROAD CAPACITY

The traffic capacity of the various standard cross-sections for major roads will vary with a number of factors including:-

- **Traffic characteristics**
  - proportion of heavy vehicles
  - ratio of peak hour volume to A.A.D.T.
  - directional split in peak hour

- **Site characteristics**
  - road gradient
  - intersection type and design detail

In the case of roads with at-grade intersections, the intersection capacity is likely to be the limiting factor, particularly where intersection spacing is relatively close, e.g. Sub-Arterial roads.

In many cases detailed design will have to provide for localised measures to maintain capacity comparable to that available for the general road cross-section e.g. slow vehicle lanes on hills, extra lanes at signalised intersections.

To justify the adoption of a particular road design to adequately carry the required design traffic volume therefore requires assessment of the traffic capacity of the proposed road by a **specialist traffic engineer**.

Assessment of capacity must, in all cases, be to the satisfaction of the Pine Rivers Shire Council, but generally should be based on AUSTROADS (NAASRA) “Guide to Traffic Engineering Practice”.

As a general guide for preliminary planning purposes only, standard major road cross-sections may be assumed to have the following capacities:-

- Sub-Arterial road - 12,000 v.p.d.
- Arterial road - 30,000 v.p.d.

4.9.0 DESIGN SPEED

4.9.1 DEFINITION

A selected **design speed** provides the basis for consistent design of all the geometric elements which comprise the road geometry e.g. horizontal alignment, vertical alignment, sight distance, superelevation, etc.

4.9.2 APPROPRIATE DESIGN SPEED

An appropriate design speed is dependent on a number of factors including:-

- **Traffic importance of the road**
  - a road of greater importance should have a higher design speed
- **Topography**
  - more rugged topography greatly increases the cost of achieving higher speed design
- **Intersection type and spacing**
  - reduced traffic conflict (e.g. grade separations at infrequent intervals) enables higher speeds to be safely provided
- **Driver expectation**
  - design speed should reflect reasonable driver expectation based on the above factors

4.9.3 MINIMUM DESIGN SPEEDS

The minimum design speed which should generally be provided for at any location along the road is:-

- Sub-Arterial road - 80 km/h
- Arterial road - 100 km/h

In rugged topography, or constrained urban environments, a lower design speed may be adopted, subject to the Pine Rivers Shire Council approval, with the **absolute minimum** design speeds being 20 km/h less than the above speeds.

4.9.4 VARIATION IN DESIGN SPEED

Uniformity of vehicle operating speed over long lengths enhances both safety of operation and roadway capacity. However, variations in the “speed environment” may occur due to varying topography or intersection conditions.

In such cases, the design speed may need to be varied throughout the road length. For example, while an arterial road may have a general design speed of 100 km/h, the design speed may be varied between 80 km/h and 120 km/h in some sections, to reflect variations in terrain or other circumstances.

Reductions in design speed should be gradual e.g. horizontal alignment reduced from 100 km/h to 90 km/h to 80 km/h, rather than a sudden reduction from 100 to 80 km/h.

Increases in design speed should be provided where the alignment and grading are such that speeds well in excess of the general design speed will be attained e.g. a long level straight on a generally 80 km/h road may result in operating speeds of 100 to 120 km/h. The potential higher operational speed of this section should be assessed and a gradual reduction in design speed employed such that the operational speed is reduced to the general design speed at the end of this section.

4.10.0 CROSS-SECTION ELEMENTS

4.10.1 DEFINITION

Cross-section elements are the individual components which together make up the complete road cross-section.

Recommended dimensions and other criteria in respect of each of these elements follow.

4.10.2 DRAINAGE METHOD

The method of drainage of stormwater from the road carriageway has a significant effect on the road cross-section.

Drainage may be by:-

- **Concrete kerb and channel** and underground pipe system or
- **Grassed swale drains** (with or without pipe system)

In general, the swale drain system is preferred for major roads as:-

- **Removal of water is quicker and more positive.**
  With kerb and channel, sections of the carriageway may be flooded in heavy storms, creating a hazard to traffic. This may be accentuated by blockage of gully pits.

- **Pavement edge protection is not required** due to there being no frontage access to properties.

  In the event of a breakdown a vehicle will need to leave the carriageway, in which case the absence of a kerb assists clearing the moving lanes.

Stormwater drainage design is to conform to the Pine Rivers Shire Council Design Standards for Stormwater Drainage.

Where the general drainage system is by swale drains, kerb and channel will still be required at certain locations:-

- **Intersections** - generally extending over the length of all acceleration, deceleration and passing lanes, to delineate the edges of auxiliary lanes.

- **Bus stops** - extending over the length of the stopping bay (see Section 4.12.1 of the Design Standards for Roadworks).

- **Pedestrian crossing points** - see Section 4.13.3 of the Design Standards for Roadworks.

- **In Cuttings** - to ensure positive drainage from the pavement.

Where intersections are in close proximity, it may be appropriate to continue kerb and channel over the full length of road, or a section of the road, rather than to have relatively short gaps between. This is particularly likely to occur on Sub-Arterial roads.

To minimise maintenance requirements, a concrete invert is to be provided to all swale drains, unless otherwise approved by a Pine Rivers Shire Council engineer.

4.10.3 LANE WIDTHS

❖	Through lanes	-	3.5m		
❖	Auxiliary lanes (acceleration, deceleration, right & left turn)	-	3.5m desirable 3.0m minimum		
❖	Curve widening on above widths	-	radius	- 60 to 100m - 101 to 150m - over 150m	- 0.6m - 0.3m - nil
❖	Single lane carriageway	-	shoulder both sides shoulder one side, kerb on the other kerb both sides		- 3.5m - 4.5m - 5.0m
❖	Slip lanes	-	radius over 120m lesser radius – width in accordance with Table 5.14 AUSTROADS / NAASRA "Intersections at Grade"		- 4.5m min
❖	Parking lane (where parking permissible)	-	3.0m on Arterials 2.5m on Sub-Arterials		
❖	Measurement of lane width	-	centre to centre of lane lines face of median or island kerb channel invert of kerb and channel		

4.10.4 SHOULDER WIDTHS

THROUGH LANES

(a) **Outer shoulder**

(i) without kerb & channel

- minimum shoulder width (to provide for breakdown parking) - 2.5m

Note: - surfaced pavement to extend 1.0m beyond outer lane (to minimise pavement edge wear) and balance of shoulder to be bitumen sealed, gravelled or grassed.

(ii) with kerb & channel

- minimum pavement width from outer lane line to channel invert - 1.5m

Note: - additional width may be required to satisfy stormwater flow width criteria.

- minimum total width from outer lane line to top or bottom of batter at a maximum slope of 1:6 (to provide breakdown parking) - 3.0 m

Note: - Where concrete footpaths are to be provided, a minimum of 4.5m will be available from the kerb and channel to the back of the footpath for emergency breakdown parking.

(b) **Inner Shoulder**

In general, medians on arterials will be kerbed due to the relatively close spacing of intersections. However, where the carriageways are widely separated, or on major arterials where intersections are at a considerable distance apart, it may be preferred to use a depressed median with centre drainage.

In such a case, the inner (median) shoulder widths should be:-

- minimum - 1.5m
- desirable on three-lane carriageway (to provide breakdown parking) - 3.0m

Note: - in both cases, the surfaced pavement should extend 1.0m minimum beyond the lane line.

AUXILIARY LANES

(i) without kerb & channel

- minimum shoulder width - 1.5m

(including 0.5m minimum extension of surfaced pavement beyond lane line)

- minimum width beyond lane edge, at maximum crossfall of 1:4 (breakdown parking) - 2.5m

(ii) with kerb & channel

- shoulder width (lane width measured to channel invert - nil

(iii) both cases

- relevant verge cross-section applies

4.10.5 MEDIAN AND ISLAND WIDTHS

- Providing for sheltered turn lane (3.5m lane + 2.5m median) - 6.0m minimum
- Providing pedestrian refuge - 2.5m minimum
- Providing for traffic signals or lighting poles - 2.0m minimum
- Providing for small signs - 1.5m minimum

4.10.6 CROSSFALLS

- Pavement (straight) - 1:40 (2.5%)
- Pavement (curves) - superelevation in accordance with Sections 4.11.2 and 4.11.3
- Shoulders
  - straights - 1:25 (4%)
  - curves - superelevation as for pavement
- Medians
  - desirable maximum - 1:10
  - maximum for vehicle safety - 1:6
  - minimum for drainage - 1:25
  - maximum for crossovers - 1:20

4.10.7 BATTER SLOPES

- Desirable maximum for mowing maintenance, and general maximum for cuts and fills up to 1m height (including swale drains) - 1:4
- Cuts over 1m
  - other than rock - 1:1.5
  - rock - as required for stability
- Fills over 1m - 1:2
- Special stabilisation measures shall be applied to all fill batters steeper than - 1:4

4.10.8 CLEARANCE FROM EARTHWORKS

- Top or bottom of cut or fill batter to road reserve boundary - **3.0m minimum**

Note: - Refer to relevant standard road cross-section, verge and service allocation details.

4.10.9 PEDESTRIAN AND CYCLIST FACILITIES

Pathways for pedestrians and/or cyclists may be required with arterial and sub-arterial roads on either one or both sides (see Section 4.13.0 of the Design Standards for Roadworks).

Where such pathways are required, the cross-section must provide sufficient width for their location (refer to verge cross-sections).

4.10.10 UTILITIES

Arterial and Sub-Arterial road reserves will often provide a location for major utility service mains.

Such services may generally be located adjacent to the road reserve boundary without the need for additional reserve width, but such additional width may be required in some circumstances.

4.10.11 LANDSCAPING

Provision should be made within the road reserve for sufficient width for effective landscaping, for the amenity of both road users and adjacent property.

Flatter batter slopes (e.g. 1:4 or flatter) may be utilised for planting.

4.10.12 NOISE ATTENUATION

Where major roads adjoin existing residential development, or land with a potential for residential development, noise attenuation measures must be provided in accordance with the Pine Rivers Shire Council requirements for Noise Attenuation.

Such measures may include mounding, fencing and heavy planting, used either separately or in combination.

4.10.13 RESERVE WIDTH

The total reserve width required for an Arterial or Sub-Arterial road will be the sum of the width requirements for the various elements previously detailed.

The reserve width may need to vary throughout the road length to provide additional width for batters where earthworks are heavy, pathways, services or auxiliary lanes adjacent to intersections.

Minimum reserve widths are:-

Arterials	-	swale drains	44m
	-	kerb & channel	40m
Sub-Arterials	-	swale drains	30m
	-	kerb & channel	25m

Figures 4.5.A and 4.6.A show typical minimum cross-sections.

Note:- Additional reserve width will be required at intersections, bus bays etc.

4.11.0 GEOMETRIC DESIGN

4.11.1 GEOMETRIC ELEMENTS

Geometric design includes a number of inter-related design elements, including:-

- sight distance
- horizontal alignment
- superelevation
- curve transition
- vertical curves
- grades

4.11.2 BASIS OF DESIGN

Unless otherwise specified in these Design Standards, the detailed design of the above elements should be in accordance with the provisions of **NAASRA "Guide to the Geometric Design of Rural Roads – 1989" Sections 3 and 6 to 10 inclusive**, using the appropriate design speed as selected by the criteria of Section 4.9.3 of the Design Standards for Roadworks.

4.11.3 VARIABLE CRITERIA

The following values of variable criteria in the above reference should be used:-

- reaction time (for stopping distance)
  - Sub-Arterial roads - 2.0 seconds
  - Arterial roads - 2.5 seconds

- maximum superelevation
  - Sub-Arterial roads - 1:16.7 (6%)
  - Arterial roads - 1:25 (4%)

- maximum vertical acceleration (riding comfort)
  - Sub-Arterial roads - 0.10g
  - Arterial roads - 0.05g

4.12.0 BUS STOPS

4.12.1 GENERAL

It is the Pine Rivers Shire Council policy to incorporate provision for public transport facilities into all development planning, and the location of bus routes and bus stops is part of the concept planning process of a residential development (see Section 3.5 of the Design Standards for Roadworks).

Both arterial and sub-arterial roads will generally be bus routes.

While bus stops are commonly located on sub-arterial roads, only in special circumstances should they be located directly on arterials due to the potential hazard of buses decelerating and accelerating in the higher traffic speeds of arterials.

At bus stops, kerb and channel should be provided over the bus standing length, for passenger safety and convenience, where not used over the street generally.

Note: - The position of bus stops shall be approved by Pine Rivers Shire Council.

4.12.2 SUB-ARTERIALS

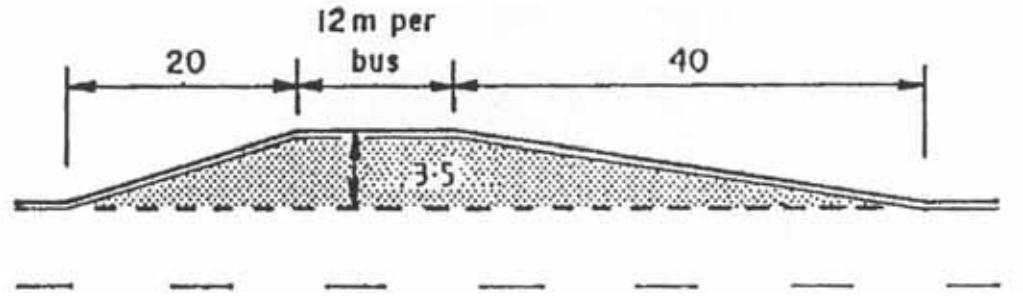
On the Sub-Arterial road system, bus stops will naturally be located adjacent to major passenger traffic generators such as schools and shopping centres and where the designed pedestrian routes access the Sub-Arterials.

In general, bus stops should not be located closer than 400m to avoid excessive traffic interference.

The preferred location is mid-block or on the far side of an intersection, rather than on the approach side of an intersection.

Pedestrian crossing facilities should be provided adjacent to the bus stop, preferably behind rather than ahead of the bus stop, for pedestrian safety.

Design should be in accordance with Figure 4.12.A



Recessed Bus Bay
Figure 4.12.A

4.12.3 ARTERIALS

If bus stops are located on arterials, the stopping area must be well clear of the through lanes, and deceleration and acceleration lanes and tapers, of length appropriate to the road design speed, should be provided.

4.13.0 PEDESTRIAN AND CYCLIST FACILITIES

4.13.1 CONCEPT PLANNING

Facilities for pedestrians and cyclists in the vicinity of major roads must be provided in accordance with an overall concept plan, in the case of cyclist facilities this being the Pine Rivers Shire Council adopted **Bikeways Plan**.

Desirably, pedestrian and cycle routes should be located in alternative parallel locations, such as within residential streets or park areas, rather than within the actual major road reserves.

4.13.2 PATHWAY LOCATION

Where location within the reserve of a major road is necessary, the pathway should be located as far from the road carriageway as possible and the pathway grading should not be substantially steeper than the road carriageway so as to avoid the temptation, for cyclists especially, to use the roadway in preference to the path.

The Pine Rivers Shire Council standard drawings for typical major road cross-sections indicate pathway locations within major road reserves.

4.13.3 CROSSINGS

The pedestrian and cycle concept plans should minimise the number of crossings required over major roads, and carefully locate those crossings which are essential.

In general, crossings over major roads should be of the following type:-

- Freeways - grade separated only (overpass or underpass)
- Arterial - grade separated or signal controlled
- Sub-Arterial - signal controlled

Signal controlled crossings should generally be at signalised road intersections, both for economy and to minimise major road traffic interruption.

In some cases uncontrolled crossings (“zebra crossings”) may be necessary on sub-arterial roads only, particularly in the vicinity of roundabouts. In these situations the location and detail of the crossing must be carefully planned to ensure that:-

- adequate sight distance is available
- interruption to traffic movement is minimised (e.g. not at roundabout exit where traffic will back up into circulatory area)
- driver decisions are separated (e.g. not across roundabout entrances where drivers must look for gaps in circulating traffic and watch for pedestrians at the same time)
- pedestrian decisions are separated (e.g. a central median enables crossing of each traffic direction separately

Details of pedestrian crossing marking and signage must conform to the “Manual of Uniform Traffic Control Devices”, and crossings must be lit in accordance with AS.1158.

Where kerb and channel is not constructed on the road generally, it should be provided in the vicinity of the crossing, for pedestrian safety and convenience.

4.14.0 AESTHETICS AND APPURTENANCES

4.14.1 The aesthetics of major road location and detailed design is to be based on the principles set out in the Queensland Department of Main roads “Road Planning and Design Manual”.

4.14.2 The principles and design details for the provision of appurtenances to a major road are also to be in accordance with the Queensland Department of Main roads “Road Planning and Design Manual”.

4.15.0 SERVICE STREETS

4.15.1 As referenced in Section 4.2.3 of the Design Standards for Roadworks, where a proposed development involves the construction of a major road, either in whole or part, adjacent to existing frontage access properties, the design is to accommodate the construction of a separated service street for access to those properties and to act as a buffer between the major road and the existing properties.

4.15.2 Where development works involve only partial construction of the major road, sufficient detailed design shall be carried out to the satisfaction of a Pine Rivers Shire Council engineer to demonstrate that the adequate reserve width is provided for the future construction of the service street facility.

4.15.3 Where development works involve the full construction of the major road, or the completion of construction in an existing area, construction of the service street facility shall be deemed to form part of the works.

4.15.4 Service streets shall be designed as either one way or two way pavement, with a minimum carriageway width of 6.0m and 3.5m wide verge and 3.0m minimum width outer separator depending on the availability of suitable turning opportunities. Final design parameters, including the provision of noise attenuation measures, will be determined by the Pine Rivers Shire Council for specific locations.

4.15.5 Service streets shall be designed specifically to minimise disruption of traffic on the major road while preserving the amenity of the existing frontage access properties.

4.15.6 Additional design information for service streets is provided in Section 3.7.7 of the Design Standards for Roadworks.