

PINE RIVERS SHIRE COUNCIL

DESIGN MANUAL

CIVIL INFRASTRUCTURE DESIGN



DESIGN STANDARDS

Part 1 Design Standards for Roadworks

Part 2 Design Standards for Stormwater Drainage Works

Part 3 Design Standards for Water Supply Works

Part 4 Design Standards for Sewerage Works



PART 1

DESIGN STANDARDS FOR ROADWORKS

- Section 1 Introduction
- Section 2 The Residential Street
- Section 3 The Street System
- Section 4 The Major Urban Road System
- Section 5 Industrial Roads
- Section 6 Non-Urban Roads
- Section 7 General Requirements**

PINE RIVERS SHIRE COUNCIL

PART 1 - DESIGN STANDARDS FOR ROADWORKS



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7.1.0 INTRODUCTION

7.1.1 DEFINITION

"**General requirements**" include a number of aspects of detailed street and road design which are common to the various street and road categories discussed in the other Sections of the Design Standards for Roadworks.

Some of these aspects have been referred to in previous sections, but, for convenience, they are considered in detail in this section.

7.1.2 CONTENTS

The subjects discussed in this section are:-

- 7.2.0 Access to Allotments
- 7.3.0 Kerb and Channel and Swale Drains
- 7.4.0 Footpaths
- 7.5.0 Bikeways
- 7.6.0 Recreation Trails
- 7.7.0 Signs and Road Markings
- 7.8.0 Service Conduits
- 7.9.0 Sub-soil Drainage
- 7.10.0 Safety Barriers
- 7.11.0 Guide Posts
- 7.12.0 Bridge and Culvert Widths
- 7.13.0 Street Lighting
- 7.14.0 Park Barriers
- 7.15.0 Retaining Walls
- 7.16.0 Intersection Design Vehicles
- 7.17.0 Entry Treatments

7.2.0 ACCESS TO ALLOTMENTS

7.2.1 DESIGN PHILOSOPHY

The **objective** of allotment access design is to ensure that a satisfactory vehicular access can be provided from the street or road to every allotment having legal access to that street or road.

The **performance criteria** are provision of at least one possible access location to each allotment which provides:-

- ❖ **location** - acceptable for allotment development, street design and traffic operation criteria
- ❖ **grading** - satisfactory for accessing vehicles
- ❖ **verge cross-section** - conforming to street design criteria
- ❖ **sight distance** - satisfactory for the safety of accessing vehicles, through traffic on the street, and pedestrians on the verge

7.2.2 DESIGN AND CONSTRUCTION REQUIREMENTS

Design of vehicular access, to the extent of establishing that a satisfactory vehicular access can be constructed to every allotment, is required as part of the subdivisional design process.

Specific design of individual accesses, however, will generally only be required where there are identified constraints of location, from plan, grading or sight distance criteria.

Construction of accesses at subdivisional stage is **not** normally required, **except** in the following cases:-

- ❖ where an acceptable access can be provided to an allotment **only at a single location**, due to plan or geometric constraints. In such cases the Pine Rivers Shire Council may require construction of a vehicular crossing to ensure that future development of the allotment is oriented to the appropriate access location.
- ❖ In situations where the configuration of allotments adjacent to manoeuvring areas is such that, in the opinion of a Pine Rivers Shire Council Engineer it is unlikely a satisfactory individual access can be constructed to each allotment,
- ❖ integrated house and land development
- ❖ combined accesses serving more than one allotment, e.g. to rear allotments or off turning areas
- ❖ where the verge width is greater than 6.0m, to minimise resident complaints of access construction costs
- ❖ in or adjacent to low points in kerb and channel, where future incorrect location or levels of crossings may result in property flooding
- ❖ where kerb and channel is not constructed on allotment frontages (e.g. rural allotments, and possibly some rural residential allotments), construction of vehicular accesses in

accordance with the Pine Rivers Shire Council adopted standard drawing is required at subdivision construction stage, to ensure that future non-conforming access construction does not result in obstruction of the table drain, or washing of material on to the road.

Construction of access at building approval stage is normally required for multi-unit residential, commercial and industrial developments, generally an **industrial crossing** conforming to the Pine Rivers Shire Council Design Guideline for On-Site Carparking and Service Vehicle Facilities.

Construction of access to detached urban residential allotments is normally left to the discretion of the householder, except for circumstances noted above.

7.2.3 ACCESS LOCATION

Factors which may constrain the location of an access in **plan** are:-

- ❖ **Allotment shape**
The access location must be such that vehicles can manoeuvre within the site to a reasonable garage or parking location. This is more likely to be significant for industrial, commercial and multi-unit residential allotments.
- ❖ **Street design**
Allotment access may be inhibited by such street design elements as speed control devices, utility poles or pits, bus stops, pedestrian crossings, and proximity to intersections. The first two are more likely to be significant for residential allotment access, the latter three for larger developments.
- ❖ **Drainage design**
Location of gully pits or overland flow paths may constrain crossing locations.
- ❖ **Street operation**
Proximity to major intersections may constrain access locations to larger developments, due to through traffic and possible conflict between traffic entering and leaving the development.

The whole width of an access crossing should be located within the frontage of the allotment served, i.e. between the extensions of the side allotment boundaries.

Specific requirements for the location of accesses to **non-residential uses** are detailed in Design Guideline for On-Site Carparking and Service Vehicle Facilities.

7.2.4 ACCESS GRADIENT

The **desirable maximum** driveway gradient for residential, rural residential and rural allotments is **1:6**, and for industrial and commercial allotments **1:10**.

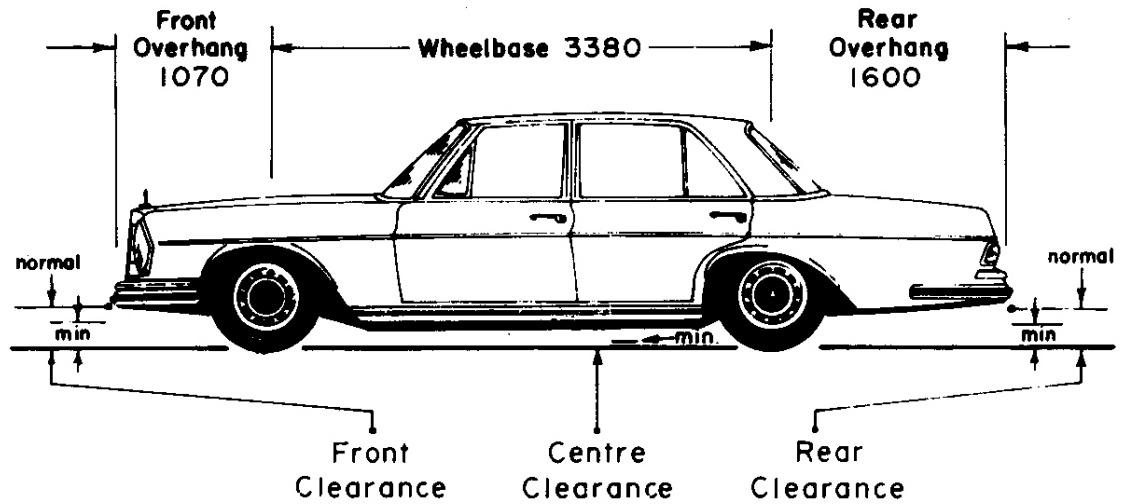
In difficult topography, however, these gradients may be increased with the Pine Rivers Shire Council approval to **maxima** of **1:4**, and **1:6** respectively.

The standard verge cross-sections and the standard crossing details provide for acceptable vertical curves at changes of gradient. Changes of gradient, however, should be checked for adequate clearances in the following cases:-

- ❖ **alternative verge cross-sections** - where approved by the Pine Rivers Shire Council
- ❖ **garage entrances** - for integrated house/land development on steeper side-slopes, particularly where set-backs to garages are reduced below the normal 6.0m standard
- ❖ **edges of driveways** - on steeper side-slopes combined with longitudinal street gradients, where the necessary "warping" of the driveway, from the kerb gradient to the level garage entrance, may result in considerably greater gradient changes at the edges of the driveway than on the centreline
- ❖ for environmental and amenity considerations - earthworks necessary for access to properties should be minimised. Extensive bulk earthworks within allotments will not generally be approved.

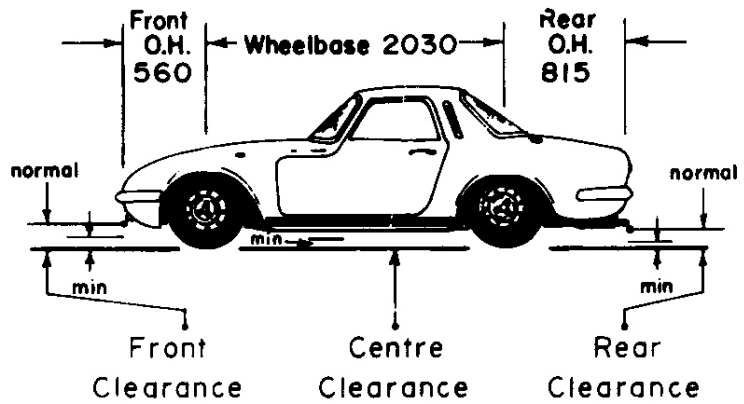
Templates for checking driveway clearances are provided in Figure 7.2.4A

The normal load condition shown in the template shall be used as the basis of design for accesses, however the effects of spring compression under load conditions should be checked.



	Front Clearance	Centre Clearance	Rear Clearance
Normal load	280	100	270
Front dive (braking)	180	65	300
Rear jounce	300	65	160
Full jounce	200	25	190

Clearance dimensions under various conditions for composite longest vehicle.



	Front Clearance	Centre Clearance	Rear Clearance
Normal load	150	125	115
Front dive (braking)	85	100	135
Rear jounce	160	100	45
Full jounce	100	75	65

Clearance dimensions under various conditions for composite shortest vehicle.

Scale 1 : 50

Figure 7.2.4.A
Driveway Clearance Templates

7.2.5 SIGHT DISTANCES

For **residential accesses**, the sight distance available between a vehicle leaving the allotment and a vehicle approaching on the frontage street should desirably be the **Safe Intersection Sight Distance (SISD)** appropriate for the street. This distance is numerically equal to the **general minimum sight distance** for the street design speed (see Section 2.11.4 of the Design Standards for Roadworks).

Generally, the vertical geometry of the street will provide such sight distance, but the following circumstances may reduce the available sight distance:-

- ❖ sub-standard street vertical alignment (e.g. a sharp crest with barrier lines)
- ❖ allotment access on the inside of a curve, where sight distance in plan may control
- ❖ access driveway falling from the street
- ❖ access in a cutting, on the high side

In such cases the actual sight distance available should be checked, measured between 1.15m eye height on the centreline of the driveway, 2.0m behind the kerb, and 1.15m height on the street centreline for minor streets, or centreline of the worst approach lane for major streets. The design should be adjusted, if necessary, to increase the available sight distance to the **general minimum**.

Sight distance between **pedestrians on the verge** and a vehicle leaving an allotment will rarely be constrained by access geometry, except in the case of a vehicle reversing from an access in a cutting. For such an access a 2m x 2m splay of the cut batter adjacent to the property boundary is appropriate. If there is (or may be) a **dual-use** path on the verge, this splay should be increased to 3.0m x 3.0m.

Specific requirements for sight distance at accesses to **non-residential** uses are given in Design Guideline for On Site Carparking and Service Vehicle Facilities.

7.2.6 VERGE CROSS-SECTION

In general the longitudinal section of the access driveway **must** conform to the **standard verge cross-section** for the frontage street or road; in the case of residential streets Figure 2.8.F of the Design Standards for Roadworks.

Since steeper gradients across the verge will compromise future footpath construction, variation will only be approved by the Pine Rivers Shire Council in special circumstances (see Section 7.2.7 of the Design Standards for Roadworks).

7.2.7 ALTERNATIVE STREET CROSS-SECTIONS

Where access is difficult, such as steep cross-slopes and/or significant cuts and fills, some variations of the standard street cross-sections may be acceptable, **but subject to the Pine Rivers Shire Council approval in each case:-**

- ❖ **Verge**
 - ❖ **delete provision for a paved footpath** - this option **may** be acceptable on both sides of a low-volume Access street, or on one side of a Collector street.
 - ❖ **relocate footpath against the kerb** - this may be acceptable on a low-volume Access street.
- ❖ **Carriageway**
 - ❖ **one-way crossfall with ground side-slope** - this may be acceptable, on Access streets, **provided** stormwater drainage design ensures that there will be no risk of flooding downhill properties, and that carriageway drainage is satisfactory (see Figure 2.10.E (A) of the Design Standards for Roadworks)
 - ❖ **offset crown** - on wider carriageways (e.g. Collectors)
- ❖ **Access modification (refer Design Standards for Roadworks)**
 - ❖ **single sided street** - with allotment access on one side only, normally the high side (see Figure 2.8.D of the Design Standards for Roadworks)
 - ❖ **split-level street** - with a retaining wall or batter between the upper and lower carriageways (see Figure 2.8.C of the Design Standards for Roadworks)
 - ❖ **constructed driveway/parking/garage sites** - on each allotment, excavated into the bank on the high side, and/or filled on the low side of the street, either perpendicular or parallel to the street alignment

7.3.0 KERB AND CHANNEL AND SWALE DRAINS

7.3.1 OBJECTIVE

The primary objectives of the use of **kerb and channel** or **swale drains** on streets and roads are:-

- ❖ to provide effective drainage of the verge and the carriageway
- ❖ to delineate the carriageway edge (kerb and channel)
- ❖ to improve stormwater runoff quality through the control of roadside erosion

7.3.2 ALTERNATIVES

The two general alternative forms of providing longitudinal drainage to a street or road are:-

- ❖ **kerb and channel**
- ❖ **grassed swale drains and table drains**

7.3.3 URBAN AND RURAL RESIDENTIAL STREETS

For **urban streets and roads, with direct frontage access to properties, kerb and channel** is an appropriate option, having the following advantages:-

- ❖ **minimises required verge width** and hence total area required for streets/roads
- ❖ **protects the pavement edge** against damage from vehicles, and obviates the need for shoulder maintenance
- ❖ **positive drainage of the verge** reduces residents' complaints of pondage, damage from vehicles on the verge, and assists verge maintenance
- ❖ **delineates the carriageway edge**, assisting safe driving, pedestrian safety and reducing casual encroachment of vehicles on to the verge
- ❖ **facilitates property access** obviating unsightly and potentially dangerous entrance culverts

Swale drains should be investigated in urban areas as an option, as part of an integrated stormwater quality management system where:-

- ❖ longitudinal slope does not exceed 5%
- ❖ total catchment does not exceed 2 ha
- ❖ top width to depth ration 6:1 or greater
- ❖ side slopes 3:1 (HIV) or flatter
- ❖ design flow velocity is less than 2m/sec
- ❖ underlying soils must have high permeability
- ❖ adequate (possibly additional) road reserve is provided to accommodate other verge elements

Detailed design of swale drains, including the provision of channel invert lining, (refer Section 7.3.10 of the Design Standards for Roadworks) is subject to the approval of a Pine Rivers Shire Council engineer.

The Pine Rivers Shire Council may direct that swale drains be used in accordance with “Best Management Practices” for achieving stormwater quality management (Refer the Pine Rivers Shire Council Design Standards for Stormwater Drainage).

7.3.4 MAJOR ROADS AND RURAL ROADS

On major roads without frontage access, and rural roads with infrequent access, **swale drains** are appropriate, for the following reasons:-

- ❖ **positive carriageway drainage** - obviating the risk of stormwater pondage on the carriageway, which may occur with kerb and channel, when the capacity of the drainage system is exceeded. This is of greater importance given the higher traffic speeds on major and rural roads.
- ❖ **reduced significance of edge maintenance** - with adequate carriageway width, there is little reason for vehicles to leave the carriageway
- ❖ **disabled vehicles** - can be readily moved from the carriageway, to minimise traffic disruption
- ❖ **economy** - of drainage provision is improved, as the typically much greater drainage catchments would be expensive to provide with kerb and channel and an underground system
- ❖ **stormwater runoff quality** - can be improved due to the removal of suspended solids by the vegetation lining the swale drain

7.3.5 KERB AND CHANNEL PROFILES

Standard kerb and channel profiles are:-

- ❖ **layback kerb and channel**
- ❖ **upright kerb and channel**

Layback kerb and channel is generally more appropriate, for the following reasons:-

- ❖ **access**
may be crossed at any point for property access, obviating the need for special crossovers
- ❖ **safety**
offers vehicle drivers and cyclists a much better chance of recovering control after accidentally striking the kerb
- ❖ **emergency parking**
while inhibiting casual parking on the verge, layback kerbs readily permit such parking when necessary (e.g. breakdown, or emergency parking)

- ❖ **maximising carriageway width**
drivers will drive and park closer to a layback kerb than to a barrier kerb
- ❖ **aesthetics**
has a "softer" profile and is more forgiving of minor construction variations

Upright kerb and channel is appropriate in special cases, e.g.:-

- ❖ **industrial roads** - to inhibit verge parking
- ❖ **bus stops** - to assist passengers boarding and alighting
- ❖ **traffic signals** - to protect the signal from damage

7.3.6 SPECIAL PROFILES

Kerb only profiles are appropriate where the carriageway crossfall is **away** from the kerb, e.g. on the high side of a one-way crossfall street or a super-elevated road, or at a central median or traffic island. Standard profiles in such cases are:-

- ❖ **layback type** - where layback kerb and channel is standard
- ❖ **barrier type** - where barrier kerb and channel is standard
- ❖ **semi-mountable type** - at medians and traffic islands
- ❖ **flush kerb or edge beam** - may be appropriate where delineation and protection of the pavement edge is desirable, but collection of surface runoff and discouraging vehicle crossing is not required. Examples include the high side of a one-way crossfall carriageway, along a ridge on a rural residential street, or intersections on a major road.

Standard profiles are shown in the Pine Rivers Shire Council standard drawing.

7.3.7 GRADING

The grading of kerb and channel will normally conform to the road centreline grading. Where the kerb and channel grading, however, is independent of the centreline gradient, e.g. at intersections, indented parking bays, superelevated curves etc the **minimum gradient shall be 0.40%** (1:250), and vertical curves shall be provided in accordance with Table 2.10.E of the Design Standards for Roadworks. An absolute minimum grade for kerb and channel of 0.25% (1:400) may be permitted in special circumstances subject to approval from a Pine Rivers Shire Council Engineer, however the provision of additional drainage may be required.

7.3.8 CROSSINGS

Special provisions are not necessary for vehicular crossings of **layback** kerb and channel, but any crossings constructed are to be in accordance with the relevant standard drawings for residential or industrial crossings.

For **barrier kerb**, a standard invert crossing should be provided at existing accesses, but for future accesses construction of a standard industrial crossing, in conjunction with building on the allotment, will normally be appropriate.

Kerb ramps, in accordance with the Pine Rivers Shire Council adopted standard drawing, will normally be required in all kerb and channel profiles, at all intersections and any other

nominated pedestrian crossing points.

7.3.9 ROOFWATER CONNECTIONS

A standard roofwater connection shall be provided in the kerb and channel opposite the low-side property boundary of every residential allotment.

The connection shall be a Pine Rivers Shire Council approved kerb entry adaptor, and the end shall be formed to suit the kerb profile. Connection to the kerb and channel shall be in accordance with the Pine Rivers Shire Council adopted standard drawing.

Where there is a paved footpath or bikeway in the verge, the connection shall be piped from the kerb to a minimum of 300mm behind the edge of the paving.

In general, the maximum diameter of stormwater pipe which may be connected to the kerb is 100mm, larger size pipes being connected to the underground stormwater drainage system.

Stormwater pipes are not to discharge to the kerb and channel within 5.0m upstream of a catchpit.

7.3.10 SWALE DRAIN LINING

Where swale drainage is provided the drain shall be lined with either a packed rock invert, or a concrete spoon drain, in the following cases:-

- ❖ on gradients steeper than 5% **or**
- ❖ where flow velocity is greater than the provisions of Part 2 of this manual, (generally 2m/sec) **or**
- ❖ where the Pine Rivers Shire Council considers that potential scouring of the swale drain so requires.

Alternatively, concrete kerb and channel may be provided, with a bitumen sealed shoulder of width in accordance with the standard road cross-section.

7.3.11 SUMMARY

A summary of the kerb and channel requirements for the various street and road classes is as follows:-

- ❖ **Residential and rural residential** - Access, Collector, and Bus Collector streets
- **layback type kerb and channel**

Except:-

- ❖ mountable kerbs to islands and medians
- ❖ barrier type kerbs and channel, and channel in special cases, as listed in Section 7.4.5 of the Design Standards for Roadworks.
- ❖ kerb only on the high side of a one-way crossfall carriageway

- ❖ swale drain may be appropriate in situations where there is no frontage access, e.g. adjacent to open space, or where approved by the Pine Rivers Shire Council, e.g. for environmental reasons on some residential and rural residential streets

❖ **Trunk Collector streets**

Generally as for **residential streets**, but swale drains may be appropriate on long street lengths with few intersections.

❖ **Industrial roads**

- Access and Collector

- **barrier type
kerb and channel**

Except:-

- ❖ that a swale drain may be appropriate where there is no frontage access, e.g. adjacent to an open space

❖ **Major roads**

- Sub-Arterial and Arterial

- **swale drains**

Except:-

- ❖ semi-mountable kerbs to islands and medians
- ❖ layback type kerbs and channels at intersections on auxiliary lanes, as an alternative in cuttings, or to minimise earthworks and tree cleaning
- ❖ barrier type kerbs at bus stops and traffic signals

❖ **Rural roads**

- Access and Collector

- **swale drains**

Except:-

- ❖ as for major roads

7.4.0 FOOTPATHS

7.4.1 DEFINITIONS

Within the context of these Design Standards, the following definitions apply;

- ❖ **Footpath**
A constructed pavement intended only for pedestrians, separate from the road or street carriageway, and located either within or outside a road reserve.
- ❖ **Pathway**
A strip of land solely or mainly for the purpose of accommodating a path e.g. a footpath, cycle path or dual-use path.

7.4.2 OBJECTIVES

The objective of **footpaths** is to provide for the safe and convenient movement of pedestrians, while preserving maximum possible visual amenity, all with reasonable economy.

7.4.3 THE PEDESTRIAN NETWORK

"Traditional" street design recognised the need to provide a constructed footpath on individual streets carrying other than minimum traffic volume, but paid little regard to the **overall planning** of a network of pedestrian pathways.

The "**pedestrian network**" must be designed to provide the shortest and most convenient possible links between each residential precinct and major traffic attractions such as schools, shops, sporting facilities, bus routes and railway stations.

The need for such a designed network is particularly important in street systems designed in accordance with the principle of minimising "**permeability**" (see Section 3.9.3 of the Design Standards for Roadwork), as the resulting "**fully branching, hierarchical**" street system generally requires additional pedestrian links to minimise pedestrian travel distances.

These links may be provided in pathway reserves connecting the heads of cul-de-sacs, or linking the street system to open spaces.

For smaller developments the Pine Rivers Shire Council will nominate the **pedestrian network** requirements, but for larger developments, the initial development planning must identify and provide for these requirements.

7.4.4 PROVISION CRITERIA

Pedestrian footpaths are therefore required:-

- ❖ on all identified **pedestrian network** segments whether in streets, roads, pathway reserves, or open space reserves
- ❖ on **individual streets** wherever traffic volume and/or speed is such that pedestrians can no longer safely share the carriageway. This limit is defined by the Pine Rivers Shire Council as **40 allotments traffic catchment**, for residential streets.

Where the traffic volume and speed are such as to inhibit pedestrian safety and convenience in crossing the street, a constructed footpath is required on **both sides** of the street.

In general, the footpath construction requirements on the various street classifications are:-

❖ **Residential**

Access Place	- nil
Access Street	- traffic catchment under 40 allotments - nil over 40 allotments - one side
Collector	- one side
Bus Collector	- one side
Trunk Collector	- both sides

❖ **Industrial**

Access	- one side
Collector	- both sides

❖ **Rural and rural residential**

All streets and roads	- nil
-----------------------	-------

❖ **Major roads**

Sub-Arterial and Arterial	- both sides
---------------------------	--------------

Notwithstanding the above general criteria, footpaths may be required:-

- ❖ **adjacent to pedestrian traffic generators** such as schools, shopping centres, etc
- ❖ **as nominated by the Pine Rivers Shire Council**, based on network planning considerations

7.4.5 DESIGN STANDARDS

Design criteria for pedestrian pathways shall be as follows:-

- ❖ **Width** **1.2m minimum** - residential and rural residential access and collector streets only

1.5m minimum - elsewhere

Except dual-use pedestrian/cycle path (see Section 7.5.4 of the Design Standards for Roadworks), or in a commercial area where paving for the full verge width may be required

- ❖ **Location** Standard location is required as shown on the relevant standard street/road cross-section. The location, however, should desirably be "meandered" within the verge for visual interest and to provide wider areas for consolidated landscaping (see Section 2.9.0 of the Design Standards for Roadworks).

- ❖ **Clearances** Minimum clearances from the edges of the footpath are:-

	Property	Kerb
Residential Access, Collector and Bus Collector	0.90m	1.50m
Trunk Collector and Sub-Arterial	1.00m	2.50m
Arterial	1.00m	3.00m
Industrial	0.90m	1.50m

- ❖ **Gradients** On streets, the footpath gradient will normally follow the kerb gradient. In major road reserves and open space areas, the **desirable maximum gradient is 10%**. Variation, however, may be necessary to provide for cyclists on dual-use paths, for disabled access requirements, or because of topographic constraints.
- ❖ **Vertical Curves** The longitudinal gradient of the footpath at sags should provide vertical curves appropriate for the drainage requirements of overland flow paths.
- ❖ **Crossfall**

Standard (and minimum)	1:40 (2.5%)
Maximum	1:20 (5%)

Crossfall is normally **towards** the carriageway. Where crossfall varies, the gradient line of the back of path (i.e. RP side) should normally be maintained.
- ❖ **Verge profile** Footpath elevation must conform to the relevant standard verge cross-section for residential streets, Figure 2.8.F of the Design Standards for Roadworks.

7.4.6 CONSTRUCTION DETAILS

Footpaths shall be reinforced concrete of a width nominated by the Pine Rivers Shire Council.

Construction details are to be in accordance with the Pine Rivers Shire Council adopted standard drawing.

Kerb ramps are to be provided at all intersections and pedestrian crossing points.

7.4.7 CROSSING POINT PRINCIPLES

Crossing points for pedestrians over streets or roads may be:-

- ❖ **un-designed** - on low volume/low speed streets where the low traffic volume and speed provide adequate safe crossing opportunities

- ❖ **designed** - where traffic volume and speed are higher (e.g. pedestrian refuge)
- ❖ **signal controlled** - where traffic volume and speed are incompatible with pedestrian safety and convenience
- ❖ **gradient separated** - where required both for pedestrian safety and convenience, and to maintain traffic capacity

Priority Crossings

While crossing points at appropriate locations may be specifically **designed**, "pedestrian priority" crossings (e.g. "zebra crossings") are **not** favoured, as it is considered that such crossings give pedestrians a **potentially dangerous false sense of security**.

Where traffic volume and speed are such that pedestrians can no longer cross with acceptable safety and convenience, a **signalised crossing** should be provided.

A signalised crossing should be combined with a traffic signal installation, to minimise both capital expense and traffic delay, but in some cases, such as a school, shopping centre or network pathway, a signalised intersection may be justified through pedestrian traffic considerations alone. This, however, will normally not occur on streets or roads below the **collector or sub-arterial class**.

In general, on an **Arterial road**, only a signalised or a gradient-separated crossing will be acceptable, while on a **freeway**, all crossings will necessarily be gradient-separated.

7.4.8 CROSSING POINT DESIGN

For **residential Access and Collector streets and Industrial Access roads**, no specific design is normally required, except perhaps at the crossing of a pedestrian network footpath across the street.

Designed crossing points are normally appropriate on **Trunk Collector streets, Sub-Arterial roads and Industrial Collector roads**, or possibly where a pedestrian network footpath crosses a lesser category street.

A **designed crossing point** should generally include a **central island**, of minimum 2.0m width, to separate the crossing of the two traffic directions. Such a crossing may be appropriately combined with a **speed control device** (e.g. central median), giving the added benefit of reduced vehicle speed at the crossing point. Where a parking lane is provided (e.g. Industrial Collector) **narrowing of the carriageway** to one moving lane each way is also desirable, either by varying the kerb line or by providing "blister islands" within the parking lanes. At pedestrian pathway crossings, **pedestrian barriers** to prevent direct crossing of the carriageway will generally be desirable (see Section 7.5.5 of the Design Standards for Roadworks).

Crossing point design and installation shall be in accordance with requirements of the Manual of Uniform Traffic Control Devices.

7.5.0 BIKEWAYS

7.5.1 OBJECTIVES

The objective of **bikeways** is to provide for the safe and convenient movement of cyclists, and to encourage the use of bicycle transport.

7.5.2 THE BIKEWAY NETWORK

As for the "pedestrian network" (see Section 7.4.3 of the Design Standards for Roadworks), provision for cyclists must be designed as an integrated "**bikeway network**", providing convenient links between residential precincts and the major traffic attractions such as schools, shops, work places and transport modes.

For smaller developments, the Pine Rivers Shire Council will nominate the bikeway requirements, based upon the Pine Rivers Shire Council adopted **bikeway plan**, but larger developments must identify and provide for bikeway network requirements in the overall development planning.

7.5.3 BIKEWAY CHARACTERISTICS

There are two distinct types of bikeway:-

- ❖ **commuter route** - where travel time is of major concern, e.g. between residential areas and work places or transport modes

In this case, cyclists **will** use the major road system unless the bikeway provides comparable or better standards of distance, alignment, grading and surfacing.

- ❖ **recreational route** - where travel time is less important, and cyclists will accept a lower design speed and a more meandering location

Failure to recognise this distinction may result in wasted funds due to inappropriate location of bikeways.

As bikeways will usually be combined with a vehicle traffic route (road or street carriageway) or a pedestrian route (dual-use path), the relative significance of design factors for the various users should be borne in mind when selecting their locations.

- Distance** is: -
- vitally important to pedestrians
 - slightly less important to cyclists
 - less important to motorists

- Gradient** is: -
- vitally important to cyclists
 - slightly less important to pedestrians
 - much less important to motorists

Given alternative routes, **pedestrians** will opt for the **shortest**, except where only a slight extra length results in a marked reduction of gradient, whereas **cyclists** may prefer a slightly longer route if the gradient is substantially less.

Both **pedestrians and cyclists** will use the major road system rather than special purpose pathways if the roads are more advantageous in length and gradient, and cyclists will use pedestrian pathways if the location is attractive.

To be effective, **bikeways must provide a more attractive route than any available alternative.**

7.5.4 NETWORK COMPONENTS

The bikeway network may include the following components:-

- ❖ **carriageways** of lower order streets or roads
- ❖ **separate lanes or shared parking lanes** on the carriageway of higher order streets or roads
- ❖ **separate paths** in the verge of higher order streets or roads
- ❖ **paths** in separate reserves or public open spaces

Carriageways on Access and Collector streets are generally acceptable for cycle traffic without any special provision.

If, however, volume of cycle traffic is unusually high (e.g. approaching a school), a separate path, or separate lanes on the carriageway, may be warranted.

Separate lanes on the carriageway of a Trunk Collector or Sub-Arterial road, are a possible option. Generally, a separate pathway within the verge is preferable for cyclist safety. In undulating country, however, and particularly for a commuter route, carriageway lanes may be the only practical means of providing acceptable alignment and grading.

A **one-way lane** should be provided **on each side** of the carriageway, to avoid cyclists riding against the flow of vehicular traffic.

Separate paths within the verge of major roads e.g. Trunk Collector, Sub-Arterial or Arterial, are the preferred option for bikeways following the alignment of such roads, **provided** that satisfactory alignment and gradient can be provided.

Paths in separate reserves or public open spaces may provide links, e.g. between cul-de-sac heads, to reduce cycle travel distance, or alternative routes parallelling major roads.

7.5.5 DUAL-USE PATHS

In general it must be assumed that pathways within the verge, or in separate reserves or public open spaces, **will be used by both cyclists and pedestrians.** Design attempts to segregate the two, by signage, separate parallel paths, central kerb, or different surfacing materials, have proved to be ineffective.

The possible exception is where the volume of cyclists on a cycle path is sufficiently high to present an obvious danger to pedestrians.

Hence in general, all separate paths, other than pedestrian footpaths on Access and Collector

streets or roads, should be designed as **dual-use paths**, for both pedestrians and cyclists.

7.5.6 CROSSING POINTS

Crossing points of bikeways across major roads should be designed on the same principles as **pedestrian footpaths** (see Section 7.4.7 and 7.4.8 of the Design Standards for Roadworks).

"Chicane barriers" should be provided where appropriate, in accordance with the Pine Rivers Shire Council adopted standard drawing.

Where a **central refuge** is provided, a clear width of 3.0m is required for cycles.

7.5.7 DESIGN STANDARDS

Detailed design of bikeways should be in accordance with the provisions of **"Bicycles, Guide to Traffic Engineering Practice"** (AUSTROADS, 1993).

Signage and marking of bikeways and dual-use paths is required to be in accordance with the Manual of Uniform Traffic Control Devices (Queensland Transport).

7.5.8 CONSTRUCTION STANDARDS

Bikeways shall generally be reinforced concrete of a width nominated by the Pine Rivers Shire Council.

Construction standards for bikeways are to be generally in accordance with the Pine Rivers Shire Council Bikeways Plan.

Kerb ramps are to be provided at all intersections and crossing points.

7.6.0 RECREATIONAL TRAILS

7.6.1 DEFINITION

A recreation trail is defined as a corridor, route or pathway used for non-motorised recreational pursuits such as walking, cycling, or horse riding that passes through or connects natural environments and/or human communities.

It is a route formally designated by the land manager and may take a variety of forms including fully developed tracks, road reserves (formed and unformed) or signed routes through the landscape.

7.6.2 RECREATIONAL TRAILS NETWORK

The Pine Rivers Shire Council has developed a Recreational Trails Master Plan to guide the planning and development of recreational trails throughout the Shire. The Recreational Trails Master Plan comprises of related documents: -

- ❖ **Part 1 - Trails Strategy**

This volume describes the suggested approach or strategy for developing an integrated recreation trails network within the Pine Rivers Shire. This is a strategic and summary document.

- ❖ **Part 2 - Trails Atlas**

The Trails Atlas lists and maps all suggested trails. It briefly describes the routes and classification. It is the key guide to the suggested routes and links.

- ❖ **Design Guideline - Recreational Trails: Planning, Construction & Maintenance**

A Design Guideline covering the planning, construction and maintenance of recreational trails is included in the Design Guidelines section of this Design Manual.

7.6.3 APPLICATION

The developer is to consult the Trails Atlas to determine whether recreational trails are proposed over, or fronting the proposed development area.

The atlas will provide information regarding the trail location, concept, the type of use proposed for the trail, (cycling, walking, horseriding etc.) and the class of trail required.

Once a requirement to establish a recreational trail has been determined, the developer is to address the procedures outlined in the Recreational Trails Guideline (Refer to the Design Guidelines section of the Design Manual) during the detailed planning, design and construction of the recreational trail.

7.7.0 SIGNS AND ROAD MARKINGS

7.7.1 OBJECTIVE

The objective of **signs and road markings** is to aid in the **safe and orderly** movement of traffic, in the interests of the safety and convenience of all road users.

7.7.2 SIGNS

Signs may be classified as:-

- ❖ **regulatory signs** - containing instructions which the road user is required by law to obey
- ❖ **warning signs** - advising of conditions on or adjacent to the road which may be unexpected or hazardous
- ❖ **guide signs** - giving information on directions, destinations, street names, etc.

7.7.3 ROAD MARKINGS

Road markings include:-

- ❖ **longitudinal lines** - delineating traffic lanes and carriageway edges
- ❖ **transverse lines** - supplementing certain traffic control devices
- ❖ **other markings** - such as diagonal and chevron markings, traffic messages on the pavement, parking bays, etc.
- ❖ **raised pavement markers** – retroreflective (RRPM) or non-retroreflective (RPM), augmenting or simulating painted markings

7.7.4 STANDARDS

All signs and road markings, and the application thereof, **must** be in accordance with the provisions of the Queensland Transport "**Manual of Uniform Traffic Control Devices**" (MUTCD) as amended from time to time.

7.7.5 LIMITATION OF SIGNING AND MARKING

In the case of **major roads** (e.g. Trunk Collector, Sub-Arterial and Arterial), signing and road marking will generally be required to the **full extent** of the provisions of MUTCD.

For **minor streets and roads**, however, (e.g. Access and Collectors), there may be some discretion in regard to the extent of signing and marking, particularly in regard to longitudinal road markings, and in regard to both signing and marking within residential precincts.

While **adequate** signing and marking is **essential**, over-provision of signs and road markings is undesirable, and can even be self-defeating, due to:-

- ❖ **unnecessary capital and maintenance costs** particularly in regard to maintenance of line marking
- ❖ **distraction from essential signage** by excessive or superfluous signs

- ❖ **visual amenity** adversely impacted upon by excessive signage and markings, particularly in residential precincts
- ❖ **safety hazard** which may be posed by unnecessary signs on small-dimensioned medians and islands in residential precincts (see Section 7.7.7 of the Design Standards for Roadworks)

7.7.6 SIGNS AND MARKING REQUIREMENTS

Without limitation to the Pine Rivers Shire Council discretion to require additional signage and road marking where it considers warranted, the following is the normal extent of works to be provided in subdivisional construction:-

- ❖ **Regulatory and warning signs**
Full signage as required by MUTCD, **except** as modified by Section 7.7.7 of the Design Standards for Roadworks for residential and rural residential.
- ❖ **Guide signs**
All street and road name signs, in accordance with the Pine Rivers Shire Council adopted standard drawing and such other guide signs as may be nominated by the Pine Rivers Shire Council.
- ❖ **Traverse lines, diagonal and chevron markings**
Full marking in accordance with MUTCD, except as modified by Section 7.7.7 of the Design Standards for Roadworks for residential and rural residential.
- ❖ **Longitudinal lines**
 - ❖ Major roads
 - Sub-Arterial, Arterial - in accordance with MUTCD.
 - ❖ Industrial roads
 - Collector road - **separation line** on the centre-line (barrier line where necessary) and **edge lines** to delineate the parking lanes.
 - Access road (greater than 4 ha traffic catchment) - **separation line** on the centre-line (barrier line where necessary).
 - Access road (less than 4 ha traffic catchment) - normally **no delineation** required, except at sharp bends or crests, where a separation line (or barrier line) is to be provided.
 - ❖ Rural residential streets
 - Collector street - **separation line** on the centre-line (barrier line where appropriate)
 - Access street/place - **no delineation**, except at widened sharp bends or crests, where a separation or barrier line is appropriate.

- ❖ Rural roads
 - Collector road - **separation line** on the centre-line (barrier line where appropriate), and **edge lines** on both sides.
 - Access road - **no delineation**, except at sharp bends or crests, where a separation or barrier line is appropriate.
- ❖ Residential streets
 - Trunk Collector street - **separation line** on centre-line of undivided streets, (barrier line where appropriate), and **edge line** on both sides, whether kerbed or un-kerbed.
 - Bus Collector, Collector street, Access street or Access place
 - no delineation, except on widened crests, crests or sharp bends, where a **separation or barrier line** is appropriate.
 - **parking bays** marked, where indented.
- ❖ **Existing areas**
 - where “infill” or redevelopment occurs in existing areas, the line marking requirements shall be determined by a Pine Rivers Shire Council engineer.
- ❖ **General**
 - the longitudinal line markings, chevron markings etc., are to be supplemented by raised pavement markers (RRPM or RPM), wherever appropriate.

Linemarking on asphalt surfacing that is frequently crossed by traffic (e.g. stop and give-way bars, turn lines etc.) shall be applied using thermoplastic marking.

7.7.7 RESIDENTIAL PRECINCTS

In residential and rural residential streets, which are designed in accordance with the **speed restrictive** principles set out in Sections 2.0 and 6.2.0 of the Design Standards for Roadworks, there is the opportunity to reduce the extent of signage required.

Part 13 of the MUTCD sets out relevant criteria for such reduced sign and road marking requirements, which are applicable, **provided** that appropriate pre-requisites are met, i.e. (in summary):-

- ❖ devices are within an area-wide scheme
- ❖ perimeter treatments are provided at all entrances to the area
- ❖ internal treatments are at recommended maximum spacings
- ❖ an area-wide speed limit is imposed

As noted above, minimising of signage and road marking in residential areas is highly desirable for aesthetic considerations, as well as economic and in some cases safety aspects, and hence the **criteria of Section 13 of MUTCD should be applied wherever practicable**. (See also the Pine Rivers Shire Council Design Guideline DG 04 – “Local Area Traffic Management”.)

7.8.0 SERVICE CONDUITS

7.8.1 OBJECTIVE

Service conduits are placed under the carriageways and verges of streets and roads to provide for the later installation, augmentation or replacement of utility services, without the necessity for excavation of the street pavement resulting in extra cost, traffic disruption, and loss of visual amenity.

7.8.2 LOCATION

Service conduits may be required at, or located in:-

- ❖ **cross-street** - to serve allotments on the opposite side of the street, from a main located on one side of the street (typically water reticulation)
- ❖ **longitudinal** - within the verge, to provide for future installation and replacement (typically electricity and telecommunication reticulation)
- ❖ **intersections** - (typically electricity, telecommunication and traffic signals)
- ❖ **frontage retaining walls** - to enable the passage of services (typically electrical, water and telecommunications)
- ❖ **along access ways** - to rear allotments
- ❖ **other cases** - e.g. under indented parking bays, consolidated landscaping features, or the carriageway where necessitated by a "meandering" alignment (see Sections 2.8.5 and 2.9.3 of the Design Standards for Roadworks)

7.8.3 WATER SERVICE CONDUITS

Conduits for the Pine Rivers Shire Council water reticulation shall be provided under all roads and streets where water reticulation is to be provided, either at the time of subdivision or in the future.

In general, conduits will be required across the street, opposite each alternate allotment boundary on the side of the street opposite to that on which the water main will be located, and/or at locations as specified by the Pine Rivers Shire Council.

Conduits shall be:-

- ❖ 100mm dia fibre reinforced cement pipes Class 2, with couplings and rubber rings;
- ❖ 100mm dia steel reinforced concrete pipe Class 2 with rubber ring joints; or
- ❖ 100mm dia u/O/M-PVC pressure pipe Class PN12 with rubber ring joints.

Installation details shall be in accordance with the Pine Rivers Shire Council adopted standard drawing.

Conduit markers in the form of brass discs, shall be cast into the top of the kerb at each end of every conduit. In areas where no kerb and channel is being constructed, the ends of conduits shall be marked in accordance with the Pine Rivers Shire Council adopted standard drawing.

7.8.4 CONDUITS FOR OTHER SERVICES

Conduits for other services, e.g.:-

- ❖ electricity
- ❖ telecommunication (telephone and cable TV)
- ❖ gas reticulation

shall be **supplied and installed** in accordance with the requirements of the relevant utility authority.

7.8.5 CO-ORDINATION OF SERVICE REQUIREMENTS

It is the responsibility of the **designing engineer** and/or supervising engineer to:-

- ❖ **advise all relevant service authorities** of the full extent and proposed staging of the proposed development
- ❖ **ascertain the service requirements** of all relevant utility authorities
- ❖ **co-ordinate the location** of all services, and obtains the approval of all utility authorities, to the proposed locations. This requirement is particularly important where "meandering" carriageway or property boundaries necessitate non-standard service alignments.

The written agreement of all relevant authorities to the proposed service locations is to be submitted to the Pine Rivers Shire Council with all subdivisional engineering plans.

- ❖ **co-ordinate the construction** of all relevant services and/or service conduits during the subdivisional construction.

7.9.0 SUB-SOIL DRAINAGE

7.9.1 OBJECTIVE

Sub-soil drainage is required to intercept and remove excessive sub-soil moisture, which otherwise may result in appreciable weakening of the pavement and the sub-grade.

7.9.2 SUB-SOIL MOISTURE

Sub-soil moisture may result from:-

- ❖ rainfall on the pavement and surrounding areas, particularly verges and unsealed shoulders
- ❖ permanent water tables
- ❖ perched water tables
- ❖ seepage through porous strata or fissured rock

It is very difficult to predict where seepages or saturated areas may occur, but side-sloping country with a relatively large catchment area on the high side and with permeable surface material, is susceptible. A small slope reduces the speed of overland flow and hence increases the potential for infiltration.

Seepage areas may occur at any location, due to moisture movement through porous strata, and a local perched water table may result from rock formations in these areas. While all these situations can be improved by sub-soil drainage it may not be possible to lower a permanent high water table, e.g. in a low-lying flood plain, by sub-soil drainage.

7.9.3 SUB-SOIL DRAINAGE DESIGN

Sub-soil drains are of two types:-

- ❖ **Side drains**
Located parallel to the street or road and adjacent to the outer edge of the pavement. These drains drain sub-soil moisture from the pavement and sub-grade, and intercept moisture flows, transverse to the road.
- ❖ **Mitre drains**
Located transversely to the street/road centreline, generally at approximately 45°, and connecting into the side drains. These drains are principally used to drain local areas of seepage or high perched water tables within the pavement or sub-grade.

Sub-soil drains shall be located and constructed in accordance with the Pine Rivers Shire Council adopted standard drawing, unless otherwise directed by the Pine Rivers Shire Council.

Drains must have a satisfactory outlet, normally discharging into gully-pits or manholes in urban roads and streets, or to a concrete headwall or turn-out point in rural areas.

Cleanout and flushing points shall be provided at **maximum 60 metre intervals or as directed by a Pine Rivers Shire Council engineer**. Construction details shall be as shown on the Pine Rivers Shire Council adopted standard drawing.

In roads with no kerb and channel, it may be necessary to deepen the table drain (or swale drain) so that the invert is below the bottom of the pavement, to intercept sub-soil moisture cross-flow.

7.9.4 SUB-SOIL DRAINAGE PROVISION

For design purposes, it should be assumed that **side-drains** will be required on both sides of the road/street, wherever the bottom of the pavement is below the natural surface, in all sub-grade materials other than sand. In urban areas, this will generally be both sides of the full street length, but, on steeper side slopes, a side drain may not be required on the lower side.

Since it is not possible to accurately predict the need for sub-soil drainage prior to construction, the required location of side and mitre drains will be determined by a Pine Rivers Shire Council engineer, after inspection of the sub-grade prior to the placing of any pavement material.

7.10.0 SAFETY BARRIERS

7.10.1 OBJECTIVE

The objective of safety barriers is to reduce the severity of accidents resulting from vehicles leaving the carriageway, where the risk or severity of such accidents cannot be reasonably alleviated by other design measures.

7.10.2 LOCATION

Typical occasions where safety barrier installation may be required, include:-

- ❖ **embankment geometry** - where an embankment is both steep and high
- ❖ **roadside obstacles** - large trees, poles, bridge end-posts or piers
- ❖ **roadside hazards** - rough rock cuts, watercourses, railways, narrow medians on divided roads
- ❖ **pedestrian and/or property protection**

7.10.3 WARRANTS

The justification for safety barrier installation varies with the traffic volume, speed environment, and the physical environment of the road. Installation is more likely to be required on rural or rural residential roads, but in some cases may be necessary on urban roads (e.g. bridge approaches, split-level roads, narrow medians, etc). Criteria for the installation of safety barriers should be based on “**Safety Barriers**” - 1987 NAASRA / AUSTRROADS, the Department of Main Roads’ Road Planning and Design Manual, and relevant Australian Standards. These criteria may be varied by the Pine Rivers Shire Council having regard to particular circumstances.

7.10.4 BARRIER TYPES

Standard types of safety barrier are:-

- ❖ **Blocked-out steel W-beam guardfence** ("Steel guardrail"), generally the most appropriate for most rural, and some urban conditions.
- ❖ **New Jersey concrete barrier** Either precast or cast in place, usually appropriate on, or adjacent to, bridges in narrow medians on divided roads, and in many urban settings.
- ❖ **Wire rope style barriers – longer distances on straights or large radii curves where a less visually- intrusive treatment is desirable.**

Other types of barrier may be approved by the Pine Rivers Shire Council, depending on circumstances. Final determination of an appropriate safety barrier shall be at the discretion of a Pine Rivers Shire Council engineer.

7.10.5 DESIGN AND CONSTRUCTION DETAILS

The detailed fabrication and installation of safety barriers is to be in accordance with the relevant Queensland Department of Main Roads standard drawings.

7.11.0 GUIDE POSTS

7.11.1 OBJECTIVE

The **objective of road edge guide posts** is to assist in delineating the edge of the road formation, or hazards such as bridges or culverts, to minimise the chance of vehicles leaving the carriageway.

7.11.2 LOCATION

Guide post installation is required on all major roads, rural roads, and rural residential roads where kerb and channel is not provided. Installation is not normally required on urban streets with kerb and channel, but may be required in special cases such as:-

- ❖ **partial construction** - such as half-width, or temporary terminations
- ❖ **bridges or culverts** - less than full road reserve width where safety barriers are not required
- ❖ **kerb and channel not provided**

7.11.3 POST TYPES

Posts are to be **timber** (100 x 50) or **tubular steel** (50 nominal bore), in accordance with the Pine Rivers Shire Council adopted standard drawing, unless otherwise approved by the Pine Rivers Shire Council.

7.11.4 INSTALLATION AND SPACING

The installation and spacing of guide posts is to be in accordance with the Pine Rivers Shire Council adopted standard drawing.

7.12.0 BRIDGE AND CULVERT WIDTHS

7.12.1 OBJECTIVE

The **objective** of the recommended bridge and culvert widths is to provide the maximum possible level of **safety** and **convenience** for all street/road purposes, including vehicular, pedestrian, cycle traffic, and utility services, consistent with reasonable **economy** of construction and maintenance.

7.12.2 PRINCIPLES

The recommended widths are based on the following principles:-

- ❖ **Minor structures**
Width should be sufficient to maintain the full facility of the cross-section for all traffic and verge functions.
- ❖ **Major structures**
Width should be sufficient for safe vehicular, pedestrian and cycle traffic operation, and for utility service requirements, but in the interests of economy some reduction in convenience and amenity may be reasonable.

7.12.3 REFERENCE

The provisions herein are based on the recommendations of AUSTRROADS "**Bridge Design Code**", Section 1.3 adapted to the Pine Rivers Shire Council standard road and street classifications.

The recommendations of this reference should be applied to any other aspects of bridge geometry and clearances (e.g. vertical clearance).

7.12.4 STRUCTURE CLASSIFICATION

The distinction between a **minor structure** and a **major structure** is based on the **length** of the structure, measured parallel to the road centreline.

The relevant length is greater for higher road classes, on the basis that the more important the road and the higher the traffic volume and speed, the more appropriate it is to maintain the full road cross-section.

These relevant lengths apply whether the structure is a bridge, multiple box culverts, or multiple pipe or arch culverts. In the case of a bridge the length is the distance between the rear faces of the abutments, measured on the road centreline, while for a culvert it is the length of the headwall, excluding angled wingwalls, measured parallel to the road centreline.

Minor structures are classed as those with a length **equal to or less** than the following:-

- ❖ **Residential**
 - ❖ Access Place or Street - 9m
 - ❖ Collector - 15m
 - ❖ Bus Collector - 15m

- ❖ **Rural Residential**
 - ❖ Access (1 lane) - 6m
 - ❖ Access (2 lane) - 9m
 - ❖ Collector - 15m
- ❖ **Industrial**
 - ❖ Access - 15m
 - ❖ Collector - 15m
- ❖ **Rural**
 - ❖ Access - 6m
 - ❖ Collector - 9m
- ❖ **Major roads**
 - ❖ Trunk collector - 15m
 - ❖ Sub-arterial - 15m
 - ❖ Arterial - 30m

Structures with **greater lengths** than above are classed as **major structures**.

7.12.5 MINOR STRUCTURES

The standard width criteria for minor structures, unless otherwise approved by the Pine Rivers Shire Council, are:-

- ❖ **Urban streets/roads (including major urban roads)**
Full width of the road reserve, plus batters in excess of the standard cross-section, if necessary.
- ❖ **Rural residential streets**
Carriageway width plus pathway area or shoulder area each side, in accordance with standard verge profiles, plus batters if necessary.
- ❖ **Rural roads (including major rural roads)**
Full width of the road formation (i.e. carriageway plus standard shoulders), plus batters if necessary.

Widths as specified are measured at right-angles to the street/road centreline.

In the case of **rural residential streets and rural roads**, additional width may be required to provide for specified footpaths, bikeways, pony trails or major services.

7.12.6 MAJOR STRUCTURES

In general, all major structures should have a **traffic barrier** on both sides of the carriageway, whether or not there is a pedestrian footway. The relatively high traffic and pedestrian volume in urban areas, and the lower volume but higher traffic speeds in rural areas, indicate the need for a separation structure where traffic and pedestrians are in such close proximity.

The width between the faces of the traffic barriers should be the sum of the **moving lanes** equal to that on the normal road cross-section, and **edge clearance** each side, varying with the traffic volume.

Appropriate **widths between traffic barriers** for the various road classes are:-

❖ Residential streets		
❖ Access Place (less than 12 allotments and structure less than 20m length)	(3.5 + 2 x 0.5)	* 4.5m
❖ Access Place, Street, Collector and Bus Collector Streets	(6.0 + 2 x 0.75)	7.5m
❖ Rural residential streets		
❖ Access (one lane)	(3.5 + 2 x 0.5)	* 4.5m
❖ Access (two lanes)	(6.0 + 2 x 0.75)	7.5m
❖ Collector	(7.0 + 2 x 1.0)	9.0m
❖ Industrial roads		
❖ Access	(7.0 + 2 x 1.0)	9.0m
❖ Collector	(7.0 + 2 x 1.2)	9.4m
❖ Rural roads		
❖ Access (one lane)	(3.5 + 2 x 0.5)	* 4.5m
❖ Collector	(7.0 + 2 x 1.0)	9.0m
❖ Major roads		
❖ Trunk collector and sub-arterial	(7.0 + 2 x 1.2)	9.4m
❖ Arterial (each carriageway)	(7.0 + 2 x 1.2)	9.4m
* Note: - A single lane bridge is only appropriate where a single lane carriageway has been approved for the relevant section of street or road.		

7.12.7 FOOTWAY PROVISION

Footways, **in general**, will be required to be provided on major structures as follows; unless otherwise approved by the Pine Rivers Shire Council:-

❖ Residential Access, Collector and Bus Collector	- one side
❖ Trunk Collector	- both sides
❖ Rural residential Access and Collector	- one side
❖ Industrial Access	- one side
❖ Industrial Collector	- both sides
❖ Rural	- one side (see Note)
❖ Sub-Arterial and Arterial	- both sides (see Note)

Note:-

The requirement for provision of footways on major structures for rural, Sub-Arterial and Arterial roads will be determined by the Pine Rivers Shire Council in accordance with footway / bikeway system planning.

Footways may only be omitted from a major structure upon written approval from the Pine Rivers Shire Council.

7.12.8 FOOTWAY WIDTHS

The minimum **clear width** for footways, between rails or barriers shall be:-

- | | | |
|---|--|------|
| ❖ | Pedestrians only
(Up to 300 peds/h. Greater width may be required for higher volume) | 1.8m |
| ❖ | Dual-use
(Two way cycling and pedestrians) | 2.5m |

Additional width may be required by the Pine Rivers Shire Council in accordance with footway/bikeway system planning.

7.12.9 SURFACE TREATMENT

A bridge or box culvert structure with deck at road level shall be surfaced with asphaltic concrete of minimum thickness 40mm.

7.13.0 STREET LIGHTING

7.13.1 OBJECTIVES

The **objectives of street lighting** are to increase the safety and convenience of night-time traffic operation on the street, for vehicles, cyclists and pedestrians, and to improve personal and property security for pedestrians and frontage residents.

7.13.2 LIGHTING CLASSIFICATIONS

The relative significance of these objectives vary between the **major roads** which are primarily **traffic routes**, and the **minor streets and roads** whose primary function is **property access**.

On **major roads** the principal objective is the safety and convenience of traffic operation, which requires a relatively high, uniform illumination of the whole carriageway. This type of lighting is referred to as **route lighting** and is classified in relevant standards as **Category A** lighting.

On **minor streets and roads** the principal objective is the safety and convenience of pedestrians and vehicles, and the discouraging of illegal acts. This requires adequate general illumination over the full street reserve width, but to a lesser and less uniform level than for route lighting. Lighting of specific hazards such as bends, intersections, traffic control devices, etc. is also required. This type of lighting is classified in relevant standards as **Category B** lighting.

7.13.3 RELEVANT STANDARDS

The provision and detailed design of street lighting installations are to be in accordance with the following standards, except as otherwise specified in this manual, or nominated by the Pine Rivers Shire Council:-

- ❖ **Guide to Traffic Engineering Practice - Part 12, Roadway Lighting** - AUSTRROADS, 1988
- ❖ Queensland Department of Main Roads Road Planning and Design Manual
- ❖ **AS1158, Public Lighting Code** - Standards Association of Australia, 1986, or revised.
- ❖ **ENERGEX Policies and Standards**

7.13.4 CLASSIFICATION OF STREETS AND ROADS

For the purpose of street lighting design in accordance with the above standards, the relevant **lighting category** generally applicable to each of the Pine Rivers Shire Council standard street and road classifications, is as follows:-

- ❖ **Major roads**
 - ❖ Sub-arterial A3
 - ❖ Arterial A2

❖	Residential	
❖	Access place and street	B2
❖	Collector street	B2
❖	Bus Collector Street	B2
❖	Trunk collector street	B1 (i)
❖	Industrial	
❖	Access road	B2 (ii)
❖	Collector road	B2 (ii)
❖	Rural residential	
❖	Access and collector streets	special lighting only
❖	Rural	
❖	All roads	Nil (iii)

Notes:-

- (i) A3 where pedestrian/cyclist volume are higher.
- (ii) A higher category may be appropriate where a collector road is a through road, or where there are land uses such as retailing or entertainment (e.g. A3 or A2).
- (iii) Special lighting at traffic hazards may be required, if electricity reticulation is available (see Section 7.13.5 of the Design Standards for Roadworks).

The above classification applies also to streets and roads in **group title developments**, as well as to normal freehold title subdivisions.

Notwithstanding the above, **the Pine Rivers Shire Council may vary** the required street lighting category for any street or road, in consideration of special circumstances.

In addition to “through” lighting in accordance with the requirements for the relevant Category, **special lighting** is required to be provided at points of special hazard (see Section 7.13.5 of the Design Standards for Roadworks).

7.13.5 SPECIAL LIGHTING

In addition to the “through” lighting in accordance with Section 7.13.4 of the Design Standards for Roadworks, additional lighting may be required in the following circumstances:-

- ❖ intersections
- ❖ roundabouts
- ❖ sharp bends
- ❖ traffic control devices
- ❖ pedestrian crossings
- ❖ cul-de-sacs
- ❖ bridges

In all cases such lighting is to conform to the **relevant standard**, or the Pine Rivers Shire Council nominated requirements.

7.13.6 PATHWAY LIGHTING

Pedestrian pathways or bikeways in public open spaces or in separate pathway reserves shall be provided with appropriate lighting.

Lighting standards may vary according to local conditions. **Final determination** of an appropriate lighting standard, for any particular pathway location, **shall be at the discretion of a Pine Rivers Shire Council engineer.**

The following general minimum requirements (lighting categories) apply:-

❖ pathways between residential allotments	B2
❖ general pathways in open space areas	C3
❖ commuter links	C2
❖ other locations	subject to individual assessment

The following special requirements apply:-

- ❖ **power supply** for pathway lighting **shall be underground**
- ❖ all pathway lighting shall be on **Rate 2 Tariff**
- ❖ a light is to be provided:-
 - ❖ at the entrance to each pathway (may be an existing or proposed street light)
 - ❖ at every bend or change of alignment
 - ❖ at every obstruction or hazard e.g. bridge, stairway, etc

In addition:-

- ❖ crossing points of pathways across roads or streets are to be lit in accordance with standards for the relevant street/road
- ❖ in pathways between or in proximity to allotments, cut-off luminaries will usually be required to prevent glare problems to the adjacent houses
- ❖ pedestrian underpasses or tunnels are to be lit in accordance with relevant standards

7.13.7 GENERAL REQUIREMENTS

- ❖ Street lighting poles and luminaries are to be **standard ENERGEX patterns**, which will be supplied and maintained by ENERGEX at standard **"Rate 1" Tariff for in road reserve locations and "Rate 2" Tariff in other than road reserve.**
- ❖ Street light poles are to be located on **standard alignments** as shown on the relevant street/road standard cross-section drawing.
- ❖ In general, street light poles are to be located **opposite allotment boundaries**, to minimise potential interference with vehicular access, and complaints about glare from residents.

- ❖ Pole location should avoid **likely vehicle conflict points**, to minimise the risk of damage to both poles and vehicles, and injury to vehicle occupants. Consideration should be given to potential paths of **vehicles accidentally leaving the carriageway**, e.g. at intersections, bends and speed control devices, and also the swept path of **oversize vehicles** which must necessarily leave the carriageway to manoeuvre, e.g. in cul-de-sac turning areas, speed control devices, and some intersections.
- ❖ Where poles are in **vulnerable locations**, e.g. in small islands or roundabouts, consideration should be given to the use of frangible poles.
- ❖ **Colour consistency** (e.g. mercury or sodium) should be maintained with existing adjacent street lighting.
- ❖ **External roads**, to which new subdivisional roads connect, may require upgrading of street lighting to appropriate standard. Where such roads are declared roads, the approval of the Department of Transport is required.

7.13.8 STREET LIGHTING DESIGNS

- ❖ Street lighting design is a specialist process, and designs submitted for the Pine Rivers Shire Council approval must be prepared by a specialist consultant with qualifications and experience acceptable to the Pine Rivers Shire Council.
- ❖ Street lighting plans shall be in accordance with the development layout plan approved by the Pine Rivers Shire Council, and indicate all internal and external roadworks (including speed control devices) and pathways associated with the development. A copy of the Pine Rivers Shire Council letter of approval for roadworks and stormwater drainage design shall be submitted, to verify the approved layout.
- ❖ Street lighting plans are to include:-
 - ❖ a locality plan
 - ❖ all approved street names (not road numbers)
 - ❖ all kerb lines, road reserve boundaries, and allotment boundaries
 - ❖ outline of all traffic islands, central medians, speed control devices, etc.
 - ❖ design vehicle swept paths
 - ❖ details of all proposed street lighting installations, e.g. poles, luminaries, cables, etc.

7.13.9 SPECIAL SUBDIVISIONS

Street lighting requirements for special subdivisions or similar developments (e.g. group title subdivisions) shall be in accordance with the requirements for similar “normal freehold title” subdivisions.

Note:-

“Normal freehold title” subdivision is a subdivision under Section 5 of the Local Government (Planning and Environment) Act.

7.14.0 PARK AND RESERVE ACCESS CONTROL

7.14.1 OBJECTIVE

The objective of vehicle exclusion devices is to optimise public access whilst preventing the entry of unauthorised or inappropriate users; facilitate the access of maintenance, emergency and other vehicles authorised by Pine Rivers Shire Council; and minimise adverse impacts on the cultural, ecological and landscape values of the site.

7.14.2 VEHICLE EXCLUSION DEVICES

Vehicle exclusion devices must be provided along road frontages of parks and reserves to prevent the entry of unauthorised users. Devices must be in accordance with the Pine Rivers Shire Council standard drawings.

7.14.3 VEHICLE ACCESS

Removable access sliprails or removable bollards must be provided at suitable locations to provide for the entry of authorised vehicles. The location of the entry points shall be agreed with the Pine Rivers Shire Council's Manager Parks Reserves and Landscape Services. Devices shall be constructed and installed in accordance with the relevant Pine Rivers Shire Council standard drawings.

7.14.4 PEDESTRIAN / CYCLIST ACCESS

Chicane treatments are to be provided where major pathways and bikeways exit onto an adjacent road. Chicanes are to be installed in accordance with the relevant Pine Rivers Shire Council standard drawings.

7.14.5 SIGNAGE

Pine Rivers Shire Council standard park signage shall be provided on the boundary of the park or reserve in a location either nominated by Pine Rivers Shire Council or in an agreed location in accordance with an approved plan of development.

Signage may include: -

- ❖ park name
- ❖ permitted and/or prohibited uses
- ❖ prohibited access
- ❖ bicycle / pedestrian signage in accordance with relevant standards

7.15.0 RETAINING WALLS

7.15.1 OBJECTIVE

The objective of a **retaining wall** is to provide adequate support to land or structure while achieving a vertical difference in adjacent finished surface levels, in a minimum horizontal distance.

7.15.2 GENERAL PRINCIPLES

The use of retaining walls should be minimised as far as possible, as they are:-

- ❖ **visually intrusive**
- ❖ **high in capital cost**
- ❖ **a potential maintenance liability**

Retaining walls should not be used in non-urban areas without specific prior approval from a Pine Rivers Shire Council engineer.

In general, a grassed or landscaped batter is preferred. This batter slope limit will vary with the nature of the in-situ soils, but general limits are:-

❖ **Road Reserve**

- | | |
|-------|--|
| ❖ 1:6 | desirable maximum |
| ❖ 1:4 | general maximum |
| ❖ 1:3 | absolute maximum (limit of a moving tractor) |

Steeper batter slopes may be considered in accordance with the relevant verge profiles provided that a Pine Rivers Shire Council engineer is satisfied that the batter slope is stable and maintenance requirements are minimized.

❖ **Allotments**

- | | | |
|-----------|-------|-------------------------------------|
| ❖ In cut | 1:1.5 | general maximum |
| | 1:1 | absolute maximum (special approval) |
| ❖ In fill | 1:4 | general maximum |
| | 1:2 | absolute maximum |

Note, however, that flatter slopes are required for vehicular access (see Section 7.2.4 of the Design Standards for Roadworks).

7.15.3 DESIGN ELEMENTS

The elements to be considered in selection of wall type, and detailed design, include:-

- ❖ **structural integrity** of the wall, considering both the wall itself and the geotechnical nature of the foundation material and the material retained
- ❖ **durability** of the wall material, to reduce future maintenance to a minimum **visual amenity** to minimise visual impact and to complement the local environment as far as possible

7.15.4 LOCATION

In subdivision design, retaining walls may provide for level variations:-

- ❖ **between divided carriageways** of a street or road, where the natural surface slope across the road reserve is very steep
- ❖ **between the road reserve and allotments** where the road gradient and/or the crossfall require the carriageway to be in considerable cut or fill
- ❖ **between allotments** on the side or rear boundary of allotments, where very steep natural surface slopes require significant level differences between building sites

7.15.5 WALLS IN STREETS/ROADS

Specific requirements for retaining walls within street or road reserves are as follows:-

❖ **Wall type**

Durability is a major requirement, a service life of 50-100 years being appropriate. Acceptable wall types include:-

- ❖ cast in place concrete (gravity or "L" type)
- ❖ precast concrete (e.g. "L" type)
- ❖ concrete block masonry
- ❖ concrete crib block (special approval required)
- ❖ grouted rock (gravity)
- ❖ "reinforced earth" (or similar)

❖ **Structural design**

Every retaining wall in excess of 1.0m in height shall be designed and certified by a registered structural engineer.

❖ **Street cross-section**

The cross-section of a street with a retaining wall between divided carriageways should be in accordance with the Pine Rivers Shire Council adopted standard drawing.

Where a retaining wall is on the street boundary, the reserve width should be increased sufficiently for the wall and any associated drainage works (e.g. spoon drains above or below the wall) to be completely within the reserve.

❖ **Visual amenity**

The type and facing of the wall should complement the visual amenity of the area, and each individual proposal will be considered by Pine Rivers Shire Council on its aesthetic merits.

Where appropriate a decorative treatment, e.g. rock facing, or a cast surface pattern, should be applied to a plain wall.

7.15.6 WALLS IN ALLOTMENTS

Where retaining walls within allotments cannot be reasonably avoided by other design measures, the following specific requirements apply to their design:-

❖ **Wall type**

All wall types listed in Section 7.15.5 of the Design Standards for Roadworks are acceptable, and in addition **treated timber walls**, either crib or tied-back, are acceptable for walls up to a maximum height of 2.0m, subject to approval under the Pine Rivers Shire Council design and material criteria.

❖ **Structural design**

All allotment retaining walls over **1.0m in height** must be designed and certified by a registered structural engineer.

Walls must be capable of supporting two storey “heavy construction” buildings at the Pine Rivers Shire Council minimum setbacks.

❖ **Engineering drawings**

All proposed allotment retaining walls must be fully detailed on the engineering drawings for the proposed development.

❖ **Building approval**

A formal **building approval** is required for **all** retaining walls in excess of 1.0m in height within allotments, to ensure that such retaining walls are registered on the Pine Rivers Shire Council records for the relevant allotment.

❖ **Wall location**

The whole of the retaining wall and associated drainage works should be located within **one allotment**, to establish the maintenance responsibility, and to allow a fence to be constructed on the real property boundary.

In general, the wall should be located within the **lower allotment** as:-

- ❖ maintenance is easier from the lower allotment
- ❖ the wall is more clearly seen from the lower allotment, and hence owners of that allotment have more incentive for adequate maintenance and preservation of visual amenity
- ❖ clearance from the top of the wall to a potential building site on the higher allotment is maximised, thereby limiting additional loading on the retaining wall

7.15.7 DRAINAGE

Retaining wall design must include provision for the collection and disposal of surface stormwater runoff and sub-soil moisture.

In most cases, a concrete dish drain is required along both the top and the base of the wall, with the drains piped to an acceptable point of discharge, e.g. the street kerb and channel, street pipe drain system or intra-allotment drainage system.

Weepholes must be provided through the wall, to prevent the build up of hydrostatic pressure behind the wall. Sub-soil drainage is generally required behind the base of the wall.

7.15.8 SERVICE CONDUITS

Service conduits may be required under or through retaining walls located either between split-level carriageways, to provide for cross-street service connections, or on allotment frontages, to provide for services to enter the allotments. (See Section 7.8.0. of the Design Standards for Roadworks)

7.16.0 INTERSECTION DESIGN VEHICLES

7.16.1 OBJECTIVE

The objective of nominating particular **design vehicles** for use in the design of intersections of the various classes of streets and roads is to provide intersection geometry which is an appropriate compromise between the ideals of **safe** and **convenient** traffic operation, **visual amenity** and **economy** of construction and maintenance.

7.16.2 SIGNIFICANT FACTORS

Significant factors in intersection design, which are affected by the selection of appropriate design vehicles, include:-

❖ **Traffic volume and speed**

Where traffic volume and speed are low (e.g. in residential access streets) traffic safety and convenience are not significantly affected by the occasional larger vehicle slowing significantly, or encroaching across the centreline, to turn.

At higher traffic volume and speed, however, this becomes unacceptable from considerations of safety and convenience.

❖ **Heavy vehicle volume**

Where the operation of larger vehicles is rare (e.g. in residential streets) the occasional "non-standard" manoeuvre by larger vehicles can be tolerated, but where the large vehicle proportion is high, as in industrial roads, such operation may not be appropriate even in low-volume roads, and design must be based on the larger vehicle.

❖ **Pedestrian safety and convenience**

Where street and turning speeds and traffic volume are low and crossing distance short, pedestrians may cross the street with relative safety and convenience. As speed and volume increase, however, and crossing distances become greater due to the necessarily more liberal intersection geometry, design measures such as refuge islands and/or signalisation are required. The position of these obstructions should be checked against vehicle turning paths.

❖ **Visual amenity and economy**

Large intersections, with considerable area of carriageway, and multiplicity of islands and traffic signs, can be visually intrusive, and in residential areas are incompatible with the "scale" of the neighbourhood. Such intersections are also expensive in land and capital cost, and are also more expensive to maintain.

7.16.3 DESIGN PHILOSOPHY

Based on the above considerations, the adopted philosophy in the selection of intersection design vehicles is as follows:-

❖ **General**

In the interests of visual amenity, economy and pedestrian crossing safety, intersection geometry should be no more liberal than necessary for safe and convenient traffic operation.

❖ **Design vehicles**

Design vehicles nominated for each category of intersection may be denoted as:-

❖ **Standard**

The largest type of vehicle commonly operating on the street or road class (e.g. the car in residential streets, and coach on Bus Collector streets).

Design should allow this vehicle to turn from and to the normal operating lane for all movements, at either "low" or "medium" speed, as appropriate for the street/road.

❖ **Occasional**

The largest type of vehicle which operates on an "occasional" basis - not common, but not rare (e.g. a refuse truck in residential streets).

Design should allow this vehicle to operate within the carriageway, but in some cases turns may acceptably encroach into lanes other than the "normal operating lanes", and/or a reduced turning speed may be acceptable.

❖ **Rare**

The largest type of vehicle which may only rarely operate in the street (e.g. an articulated furniture truck in a residential street).

Design may in some cases allow this vehicle to encroach on to the verge and/or islands, and to turn at minimal speed.

7.16.4 **STREET AND ROAD CRITERIA**

The degree to which it is acceptable for larger vehicles to encroach on to other than normal operating lanes, or to turn at lower than normal operating speed, varies with the street or road class. Criteria for each class as follows:-

❖ **Residential and rural residential streets (Access and Collector)**

In these streets traffic volume and speed are kept low by deliberate design, and traffic operation is on the principle of vehicles occasionally having to give way to opposing vehicles.

Encroachment by larger vehicles, and reduced turning speed, are hence quite consistent with design philosophy.

Design vehicle criteria are:-

- ❖ Occasional vehicle

The occasional vehicle will be adequately served by accommodating the Coach as the design vehicle.

- ❖ Rare vehicle - articulated vehicle (at low speed)

Encroaching on to the verge, and occupying the full street reserve if necessary, provided that the crossfall is reasonable and that street lighting poles, signs etc are located clear of the swept path.

- ❖ **Trunk Collector street**

Though designed on a speed-restrictive basis, as for residential streets, the higher design speed and higher traffic volume make vehicle encroachment and low-speed turns less acceptable.

Design vehicle criteria are:-

- ❖ Standard vehicle - large car (medium speed)

All turns to/from left lanes of both streets.

- ❖ **Occasional vehicle - heavy rigid vehicle** (medium speed)

Turns to/from left lane of Trunk Collector, full carriageway of minor street.

Except where **Trunk Collector streets intersect Collector streets** which may be designated bus routes, the design vehicle should be a **coach/tourist bus** (medium speed) turning to and from left lanes of Trunk Collector streets and occupying two "lanes" of the Collector streets.

- ❖ Rare vehicle - articulated vehicle (medium speed)

Within the full carriageway of both Trunk Collector and minor street.

- ❖ **Industrial Roads**

The relatively high traffic volume, non-restrictive design speed, and high proportion of heavy vehicles in these roads is such that the **articulated vehicle** turning at medium speed is appropriate as the **standard** design vehicle, and hence the "occasional" and "rare" design vehicle categories are not relevant.

Turning should be assumed to be from left hand moving lane to left hand moving lane in most cases, except where auxiliary left or right turn lanes are provided (see Section 5.11.5 of the Design Standards for Roadworks).

- ❖ **Rural roads (Access and Collector)**

These roads have generally low traffic volume, but speeds may be relatively high.

Design vehicle criteria are:-

- ❖ Standard vehicle - large car (medium speed)

Turning left lane to left lane

- ❖ Occasional vehicle - heavy rigid vehicle (medium speed)
Turning within the carriageways of both roads.

Except where the collector street may be a designated bus route, the design vehicle should be a **coach/tourist bus** (medium speed).

- ❖ Rare vehicle - articulated vehicle (medium speed)
Turning within the carriageways and shoulders of both roads.

- ❖ **Major roads** (Sub-Arterial and Arterial)

For these roads, traffic volume, traffic speed, and heavy vehicle percentage are such that encroachment into other than the normal operating lanes, and excessive speed reduction, are potentially incompatible with traffic operating safety and convenience.

Hence the design **articulated vehicle**, turning at medium speed, is the **standard** design vehicle, with turning always being from and to the appropriate lanes of both roads.

7.16.5 DESIGN VEHICLES

Details of the various design vehicles identified in Section 7.16.4 of the Design Standards for Roadworks, and references to turning templates for use in design, are:-

- ❖ **Design car - medium speed turn** (approx. 15 km/h)
 - ❖ **large car** - (CAR) turning radius 8.0m

The turning template for the above design vehicle is contained in Part 3 of this manual.

- ❖ **Heavy vehicles - medium speed turn** (approx. 15 km/h)
 - ❖ **refuse vehicle** - (RV) turning radius 15.0m
 - ❖ **heavy rigid vehicle** - (HRV) turning radius 15.0m
 - ❖ **coach/tourist bus** - (BUS) turning radius 15.0m
 - ❖ **articulated vehicle** - (AV) turning radius 15.0m

Clearances of 600mm are to be provided on both sides from the swept paths to kerb lines, etc.

- ❖ **Heavy vehicles - low speed turn** (e.g. 5-10 km/h)
 - ❖ **refuse vehicle** - (RV) turning radius 11.0m
 - ❖ **heavy rigid vehicle** - (HRV) turning radius 12.5m
 - ❖ **coach/tourist bus** - (BUS) turning radius 12.5m
 - ❖ **articulated vehicle** - (AV) turning radius 12.5m

Clearances of 500mm are to be provided on both sides from the swept paths to kerbs etc.

Templates for the above design vehicles are contained in Council's Standard Drawings.

It should be noted that the "**manoeuvring templates**" also included in these Design Standards are **not appropriate for general intersection design**, as these templates assume a turn at full lock, from a stopped condition. Manoeuvring templates may be

used in the design of local area traffic management treatments in accordance with Design Guideline DG 04 - Local Area Traffic Management.

7.16.6 DETAILED INTERSECTION DESIGN

❖ **Standard kerb radii**

"Standard" kerb radii which satisfy design vehicle criteria for:-

- ❖ T-intersection forms
- ❖ 90° intersection angles
- ❖ no channelling

are quoted in Section 2.12.5 for residential streets (6.0m kerb radius for Access and Collector Streets), and Section 5.11.5 for Industrial roads (12.0m radius) of the Design Standards for Roadworks.

All intersections, however, which differ from the above, require specific design, based on the provisions of this section, and the design references listed below.

❖ **Design references**

Detailed design of intersections is to be in accordance with the following:-

- ❖ **AUSTROADS** "Guide to Traffic Engineering Practice"
"Part 5 - Intersections at Grade" 1988; and
"Part 6 - Roundabouts", 1993
- ❖ **Queensland department of Main Roads Road Planning and Design Manual**
- ❖ **Pine Rivers Shire Council Design Guideline DG01 - "Roundabouts"**.

7.16.7 SUMMARY OF DESIGN VEHICLES

Table 7.16.A shows the appropriate design vehicles for intersections between various street and road classes.

As there are, however, variations in the acceptable degree of encroachment for the "occasional" and "rare" design vehicles, reference is also required to the provisions of Section 7.16.4 of the Design Standards for Roadworks.

Intersecting Streets/Roads	Design Vehicles					
	Standard		Occasional		Rare	
	Vehicle	Turn Radius	Vehicle	Turn Radius	Vehicle	Turn Radius
Residential and Rural Residential streets						
Access - Access	CAR	8m	RV	11m	AV/HRV	12.5m
Access – Collector	CAR	8m	RV	11m	AV/HRV	12.5m
Access – Bus Collector	COACH	12.5m	-	-	AV	12.5m
Collector - Collector	CAR	8m	RV	11.5m	AV	12.5m
Collector – Bus Collector	COACH	12.5m	-	-	AV	12.5m
Access - Trunk Collector	CAR	8m	HRV	12.5m	AV	12.5m
Collector - Trunk Collector	COACH	12.5m	-	-	AV	15m
Bus Collector - Trunk	CAR	8m	BUS	15m	AV	15m
Collector - Major Road	AV	15m	-	-	AV	-
Trunk Collector - Major	AV	15m	-	-	-	-
Industrial Roads						
All	AV	15m	-	-	-	-
Rural Roads						
Access - Access	CAR	8m	HRV	15m	AV	15m
Access - Collector	CAR	8m	HRV	15m	AV	15m
Collector - Collector	CAR	8m	HRV	15m	AV	15m
Collector - Collector (Bus Route)	CAR	8m	BUS	15m	AV	15m
Collector - Major	AV	15m	-	-	-	-
Major Roads						
All intersections	AV	15m	-	-	-	-

Table 7.16.A

7.17.0 ENTRY TREATMENTS

7.17.1 OBJECTIVE

The objective of an "**entry treatment**" may be to define and highlight the entrance to a land development for commercial sales purposes, and/or to define the relative traffic importance and priority of streets at intersections.

7.17.2 ENTRY TREATMENT FORM

Commercially oriented entry treatments are intended to create an "entry statement" into a development. Typical features include a change in carriageway paving material, and within the verge and/or median, landscaping and ornamental walls or structures, usually incorporating the estate name.

Traffic oriented treatments generally rely on a change of carriageway paving, but in some cases may include landscaping to reinforce the traffic message (e.g. a "modified T-intersection" LATM device).

7.17.3 FEATURE WALLS AND STRUCTURES

All proposed feature walls and other structures require Pine Rivers Shire Council approval and, if classified as building work under the Building Act, are subject to lodgement and approval of a formal building application, including payment of relevant fees.

The **design and location** of all walls or structures must be acceptable to a Pine Rivers Shire Council engineer in regard to:-

- ❖ safety and convenience of pedestrians
- ❖ adequate traffic sight distance
- ❖ aesthetics and visual amenity
- ❖ access to utility services (e.g. in conduits)
- ❖ servicing requirements (e.g. lighting or irrigation water supply)
- ❖ use of low maintenance materials or surfaces

Temporary walls or structures, which are intended only to remain during the estate sales period, must be maintained and removed at the end of the sales period, to the satisfaction of the Pine Rivers Shire Council. If this period exceeds the development maintenance period, an appropriate bond for maintenance and removal will be required to be lodged with the Pine Rivers Shire Council.

Features intended to be **permanent** are generally required to satisfy the following additional criteria:-

- ❖ location to be clear of the normal verge width, on separate allotment(s)
- ❖ construction to be in minimum maintenance materials
- ❖ anti-graffiti protection to be applied
- ❖ estate names which are not official place names are to be removed at completion of the sales period if ordered by a Pine Rivers Shire Council engineer

7.17.4 ALTERNATIVE PAVING

The use of **contrasting carriageway paving** material at an entry treatment can assist in establishing the street hierarchy and traffic priority, the "through" or major street having unchanged surfacing, while the minor street has a band or area of contrasting surfacing across its entrance.

While such treatment is acceptable in principle, the **approval of a Pine Rivers Shire Council engineer** is required in each case.

Significant considerations in each case include:-

- ❖ **safety** of vehicles, cyclists and pedestrians (particularly in regard to non-skid/slip characteristics)
- ❖ **maintenance** requirements
- ❖ **visual amenity**
- ❖ **noise amenity**

Preferred materials, as an alternative to asphaltic concrete, and subject to specific approval in each case, are:-

- ❖ **stamped concrete** with a shallow pattern, to minimise vehicle traffic noise, indentations generally to a maximum 5mm depth and 12mm width
- ❖ **exposed aggregate concrete** with an approved crushed aggregate
- ❖ **colour modified concrete** provided that the colour is full-depth, and that selected colours will not unduly show traffic effects such as oil and rubber stains

7.17.5 SPOON DRAINS

A **spoon drain** (also referred to as a "dish drain" or an "invert"), may be provided across a minor street at an intersection, to serve the dual functions of stormwater drainage and as an **entry treatment**. Its use may:-

- ❖ assist in defining the "through" street and the traffic priority at an ambiguous intersection (e.g. a "modified T-intersection"), thereby improving the "legibility" of the street layout
- ❖ reduce the length of underground stormwater drainage required near the head of a catchment

Criteria for the use of spoon drains are:-

- ❖ **location** - across an access place or access street only, at intersections with another access place or street, or with a collector street
- ❖ **alignment** - to be continuous with the channel line of the through street
- ❖ **drainage design** - to be in accordance with the flow limit criteria of the Pine Rivers Shire Council Drainage Manual
- ❖ **material** - normally to be concrete, in accordance with the Pine Rivers Shire Council adopted standard drawing. The drain, however, may be incorporated in a more extensive entry treatment, subject to the approval of a Pine Rivers Shire Council engineer. In such a case, criteria will include a finish which will not be a potential safety hazard, or detrimental to visual amenity, by retaining washed material.
- ❖ **grading** - of the minor street to conform to the standard of Figure 7.17.A.

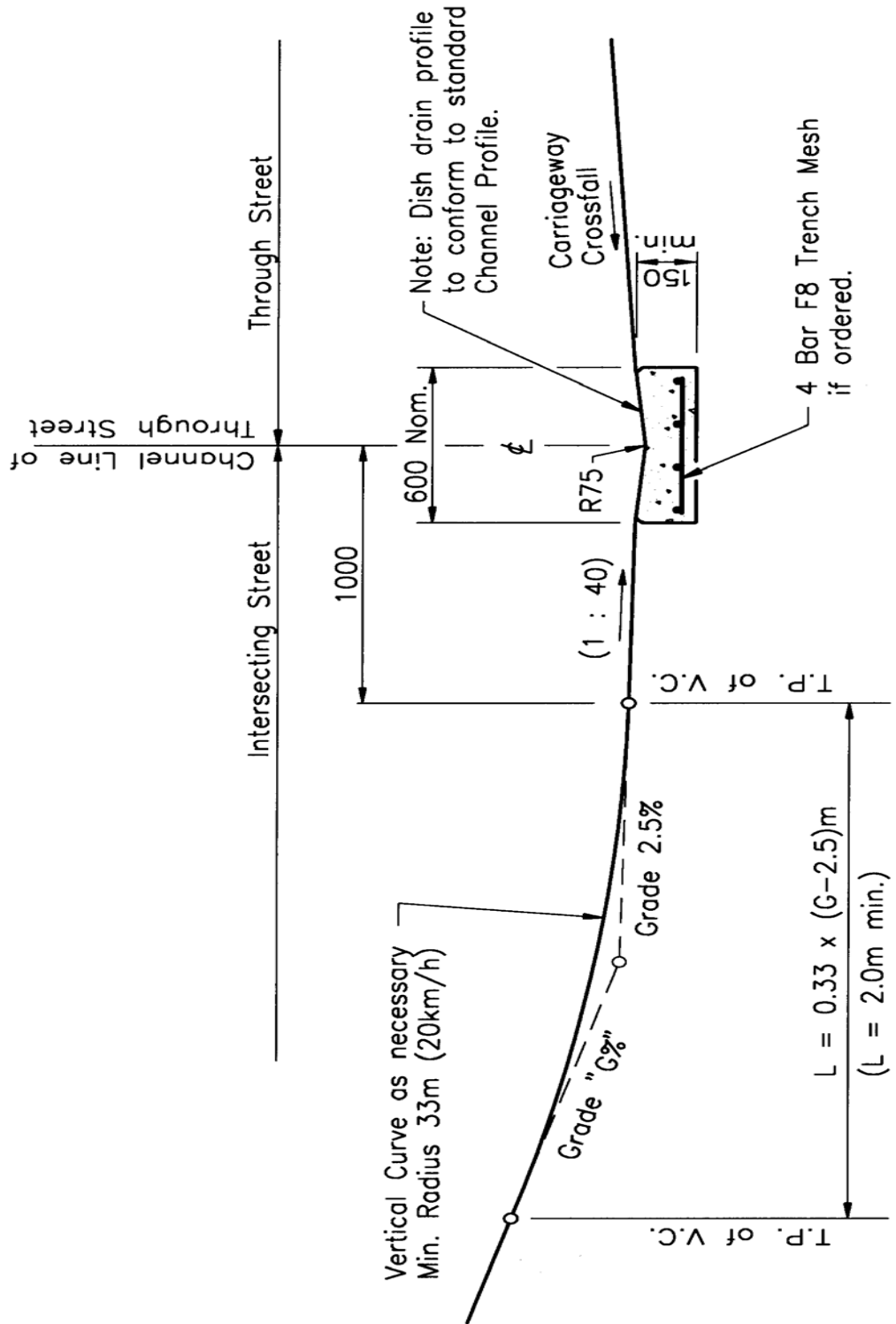


Figure 7.17.A