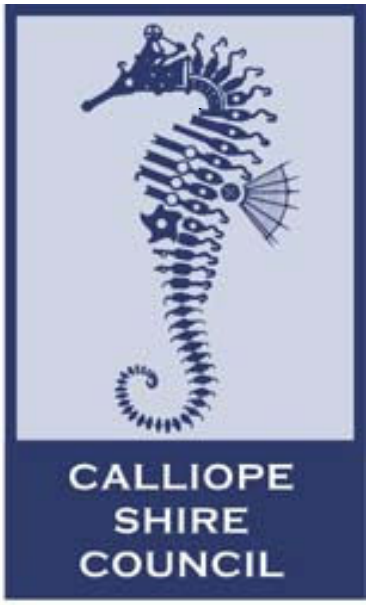
ENGINEERING AND DEVELOPMENT GUIDELINES



Community, Environment & Industry in Partnership

ROADS AND TRANSPORT STANDARD 2005

Incorporates the "Queensland Streets" (1983) and Commentary Pages (1993)

Status: Approved

ROADS AND TRANSPORT STANDARD

2005

LOCAL GOVERNMENT	***ADOPTED***	***AMENDED***
Calliope Shire Council	6 May 2005	Not Amended
Gladstone City Council	27 April 2005	Not Amended

CONTENTS

SECTION 1. - INTRODUCTION

1.1 PURPOSE

This standard has been prepared for the guidance of Consulting Engineers, Surveyors and Planners engaged in the preparation of reconfiguration proposal plans, and documentation of Operational Works for roads and other works within the Shire.

It is anticipated that by setting out Council's design criteria for such works, time and effort will be saved on the part of both designers and Council staff, by reducing the necessity for amendment of submitted designs.

1.2 INTENTION

This standard is intended to provide guidance as to the acceptable practices for roads and transport for CSC and GCC. It is appreciated that there may be circumstances where a departure from the recommendations herein can be justified.

It is not intended that issue of this standard should inhibit the submission by Consultants of alternative designs, based on professional experience and established engineering practice in such situations, and such alternative solutions will always be considered by Council on their merits.

1.3 COUNCIL'S RIGHTS

The distribution of this standard does not imply limitation in any way of Council's rights to impose differing conditions when approving proposals for reconfiguring of a lot, nor limitation of Council's discretion to interpret engineering requirements in respect of a particular subdivision, or situation, having regard to good engineering practice.

SECTION 2. - OVERVIEW ROAD AND TRANSPORT STANDARD

This Road and Transport Standard is intended for used for the compilation and completion of development applications in conjunction with the requirements of Council's Planning Scheme. Council's Planning Scheme is an integrated document outlining the requirements for earthworks, stormwater, flood control, road reserve, locations etc.

Where practical, these policies and standards put forward acceptable solutions that have been based upon "Queensland Streets" produced by the IPWEAQ. Persons involved with the design, supervision or construction of subdivision development should obtain a copy of this standard.

2.1 GENERAL DESIGN PHILOSOPHY

Whilst the Planning Scheme and the Engineering and Development Guidelines provide the majority of requirements, other documents need to be referenced to provide a more complete standard. The following table is intended to direct the designer and contractor towards documents that will be used in the delivery of appropriately engineered infrastructure, "**primary**" meaning the first call for direction (dominant) and "**secondary**" meaning may be used to support the primary document.

Document	Application Of Document	
	Minor Roads	Major and Rural Roads
Planning Scheme	Primary	Primary
IPWEAQ "Queensland Streets" May 1993	Primary	Primary
AUSTROADS' "Guide to Traffic Engineering Practice" Series:		
Part 5 – "Intersections at Grade"	Secondary	Primary
Part 6 – "Roundabouts"	Secondary	Primary
AUSTROADS:		
"Pavement Design – A Guide to the design of Road Pavements"	Secondary	Primary
"A guide to the design of new pavements for lighter Traffic"	Primary	N/A
Main Roads' :		
"Manual of Uniform Traffic Control Devices"	Primary	Primary
"Road Planning and Design Manual"	Secondary	Secondary
"Guide to Pavement Markings" (2000)	Secondary	Secondary

In most cases the latest revision of the above documents will be used for the basis of design.

"Queensland Streets" has been amended in 1993 to include the “Commentary Pages” (orange pages) updating the body of the text. These amendments have come about through the experience of the users of the document. The commentary pages will be used by Council in considering the design of roadworks. Council recommends that the designers obtain a copy of this commentary.

Council’s intention of adopting "Queensland Streets" is to provide some uniformity between the standards of particular Councils, however there is always different interpretations on and localised variations on the document.

"Queensland Streets" does not cover every aspect of road design and additional specification is required to encompass items like rural roads, construction standards, pavement design, road furniture, allotment fill, submission requirements etc.

Council may from time to time reference other road related publications from inside the Department of Main Roads web site.

2.2 STANDARD DRAWINGS

Works shall be constructed in accordance with the standard drawings in SECTION 15. - Appendix B (Standard Drawings) of this Standard as modified by sections of this standard. Instead of “re-inventing” standard drawings, this Standard in some instances calls up standard drawings from other sources such as the Department of Main Roads/Queensland Transport.

The standard drawings called up in the Index of the standard drawings in SECTION 15. - Appendix B (Standard Drawings) of this document form part of this Standard and shall be used to specify components contained on the drawings.

2.3 APPLICATION OF PREVIOUS ROAD DESIGN STANDARDS

Applicants may request their development be assessed under the previous standard, being the Road Design Standard (1989). Council maybe agreeable to the use of this standard where development abuts roads constructed in accordance with this standard, particularly to complete short lengths of existing roads.

New precincts/ green field sites will be excluded from the use of this standard.

SECTION 3. - DEVELOPMENT AND THE TRANSPORT NETWORK

Council has Road Network Layouts and preferred development patterns for developing urban areas to ensure integration of the transport and access needs of the growing communities. Council intends to extend the Road Network Layouts to include bus routes and bikeways to form an overall strategy for these services.

The location of bicycle and pedestrian links can also be determined by Council's Bikeway Strategies and the provision of open space in accordance with the Council's Parks policies.

Prior to lodging an application for reconfiguration, it is advised to consult with Council as to the integration of the proposed development with these plans and other factors listed in Sections 7.1 and 7.2 of "Queensland Streets" .

In order to optimise the liveability and efficiency of development in the area, Council is looking for some well thought out development concept plans when considering development applications, showing the residential precincts and the connections to the transport and infrastructure network that take up the philosophies of "Queensland Streets".

SECTION 4. - URBAN ROADS AND TRANSPORT

The Urban transport network comprises of a number of forms of transport besides cars, being pedestrians, cyclists, and public transport.

4.1 PEDESTRIAN FACILITIES

Provision for pedestrians is to be primarily on footpaths within road reserves, although walkways through developments, residential subdivisions and open space areas, particularly as linkages to public transport routes, schools, commercial areas and other attractive activity nodes, are also required.

Verges are normally to be at least 4.0m wide, with a 1.2m footpath. In commercial and high activity areas footpaths are to be fully paved.

Footpaths are to be provided along both sides of all major roads and along one side of Collector Streets that serve as bus routes. On low speed, low volume Access Streets, pedestrians may share the carriage way with vehicles and bicycles, but nothing stops the developer from providing concrete paths as a lifestyle enhancement.

Pedestrian walkway links (also Linear parks) through developments and residential estates linking two streets, are to be at least 50% as wide as the road reserve of the smaller road being linked. No pathway reserve shall be narrower than 6m wide. The minimum sealed path width shall be 1.2 metres for Calliope Shire Council and 2.0m for Gladstone City Council, which is to be increased to 2.5m when required to provide a shared facility with bicycles.

Walkway links are to be as wide and short as is feasible to make them as obvious, convenient and secure as possible, e.g. the ideal walkway between a residential cul-de-sac and a major road has the full width residential street right of way contiguous with that of the major road, so that a concrete strip of the order of only 15m length would form the link. Refer also Parks requirements for such links.

Where a desire line for pedestrian traffic crosses a major road, crossing points or refuges etc may be required to be installed. Kerb ramps will be required on both sides of a kerb turn out for all roads and median/island crossings. AUSTROADS' "Guide to Traffic Engineering Practice" Part 13 should be used as a guide to the design and installation of such points.

4.2 CYCLIST FACILITIES

Cyclist facilities are generally to be provided on all of the major road system and parks in accordance with the Development Permit conditions or a Council Bikeway Plan where applicable.

Bikeways should be provided by means of marked bicycle lanes, wide kerb side lanes, on verges, or in linear parks depending on the use of the adjoining land and the type of rider expected.

Bikeways on verges with a low speed "high conflict" environment are not attractive to commuter cyclists and are mostly provided in the vicinity of primary schools for school children and for recreational cycling. On-carriageway facilities may be required to be accommodated.

Council's policy of acquiring *waterfront land* along the River bank has formed an important part of the Bikeway system. Bikeways will be required to be built along the foreshore where designated in accordance with the Development Permit conditions or Council's Bikeway Plan where applicable. Refer also parks documents in the planning scheme.

On the minor road system, cyclists share the carriageway with other road users.

Because of conflicts between cyclists and pedestrians, in some situations shared pathways are not appropriate and segregated facilities are required. Bikeways are to be a minimum of 2.0m wide, 3.0m being required in areas of heavy usage.

Where a desire line for bicycle traffic crosses a major road, crossing points, refuges etc may be required to be installed, as well as bicycle slow points on the approaches. Crossing facilities will also be required at intersections

Kerb ramps will also be required. AUSTROADS' "Guide to Traffic Engineering Practice Part 14 – Bicycles" should be used as a guide to the design and installation of such points. Refer also 6.4.5 Pedestrian and Cyclist and SECTION 10. - PEDESTRIAN AND BICYCLE FACILITES for further construction details.

4.3 PUBLIC TRANSPORT

Public transport relies fundamentally on pedestrian access to stations, terminals and stops for its success and viability. Provision for pedestrian access is often required through developments, subdivisions and open space areas. It is desirable to encourage highest people generating land uses to locate as close as possible to public transport facilities and conversely, not give over valuable land in the vicinity of these facilities to car parking or passive open space.

The maximum straight line distance is to be 400m to existing and future stops on a public transport route for 90% of the lots proposed in a subdivision.

The preference is for buses to be routed on roads of collector standard or higher in the road hierarchy. Indented bus bays and associated facilities are to be provided where appropriate along the route, in particular at intersections that enable pedestrians to cross safely. Pedestrian linkage is also a factor in determining bus bays.

It is difficult to achieve speed control on Collector Streets if they are to be used as bus routes. Buses are to travel at a maximum of 40kph, the same as other vehicles. The most appropriate treatment are roundabouts, narrowings and curve-linear design. Mounting of kerb lines and vertical displacement at speed control devices by buses is not acceptable.

Pedestrian links are to be provided from adjacent minor roads and particularly from cul-de-sac heads to public transport routes.

In large developments provision for public transport interchanges may be required.

4.4 ROAD HIERARCHY

Road hierarchy maps are available from Council. The road hierarchy enables the development of a safe and efficient road system catering for the movement of people and goods while maintaining the amenity of urban areas. The provision of services and utilities is also a consideration.

The road hierarchy is divided into two broad categories:

- MINOR ROADS, which provide for local movement and individual property access. They comprise the larger proportion of the road system and hence provide the majority of walkways, bikeways and local utilities
- MAJOR ROADS, which provide the major movement function for people, goods, and trunk utilities

The intent for each of the components of the Road Hierarchy is described in the following paragraphs.

4.4.1 MAJOR ARTERIALS

Major Arterials provide intra-city connections between major activity centres and residential areas of the region.

It is intended that Major Arterials will:

- be designed for the efficient and safe movement of high volumes of people and goods
- be designed to help present attractive landscaped entrances and routes through populated areas
- incorporate design measures to minimise environmental impacts on surrounding land uses
- avoid pedestrian, bicycle and vehicular traffic conflicts
- where practicable be designed to provide bikeways on the carriageway of the road
- typically have four lanes when fully developed
- ideally have no direct property access.

4.4.2 MINOR ARTERIALS

Minor Arterials (sub-arterial) connect arterial roads through and around suburbs. It is intended that Minor Arterials will:

- be designed for the efficient and safe movement of moderate to high volumes of people and goods
- be designed to present attractive landscaped routes
- incorporates design measures to minimise environmental impacts on surrounding developments
- avoid pedestrian, bicycle and vehicular traffic conflicts

- where practicable be designed to provide bikeways on the carriageway of the road
- typically have two to four lanes when fully developed
- ideally have no direct property access.

4.4.3 SUB-ARTERIAL ROUTES

Sub-Arterial routes carry primarily district based traffic. It is intended that Sub Arterials will:

- be designed to carry freight associated with the local or suburban area
- minimise environmental impacts on surrounding activities
- provide walkways and bikeways and bus routes.
- Where practicable, bikeways should be provided on the carriageway of the road
- typically have two lanes
- ideally have no direct vehicle access.

Many of these routes have direct property access allowed and therefore traffic management is to reflect and protect residential amenity while providing the traffic movement function.

4.4.4 COLLECTOR STREET

Collector Streets collect low volumes of local traffic. It is intended that Collector Streets will:

- provide direct property access
- minimise environmental impacts on surrounding activities
- be designed to provide safe use by pedestrians and cyclists and avoid conflicts between pedestrians, bicycles and vehicular traffic
- Can provide for busses if designated as route.

4.4.5 ACCESS STREET

Access Streets provide for individual property access. It is intended that Access Streets will:

- minimise environmental impacts on surrounding activities
- provide a pedestrian and cyclist preferred environment
- be designed to provide safe joint use by pedestrians and cyclists and avoid conflicts between pedestrians, bicycles and vehicular traffic.

4.4.6 INDUSTRIAL/COMMERCIAL ACCESS

Industrial/Commercial Accesses provide for individual property access. It is intended that industrial/commercial accesses will:

- minimise environmental impacts on surrounding activities
- provide a pedestrian and cyclist preferred environment
- be designed to provide safe use by pedestrians and cyclists and avoid conflicts between pedestrians, bicycles and vehicular traffic

- serve industrial areas and link directly to Sub Arterial routes.

Where Major industry with an average lot size greater than 10ha is to serviced, Council may consider the use of a class 2 rural collector.

4.5 MAJOR ROADS

The location of existing and proposed major roads are available on maps provided by Council.

Direct access to new developments and allotments is usually not appropriate to these roads which currently carry or in the future will be carrying in excess of 3,000 vehicles per day at speeds generally in excess of 60kph.

Major roads are used as bus public transport routes and commuter cycling routes.

The typical cross-sections used in Council are to determined by Council. Although bikeways on the verges maybe used, they are infrequently used in practice, because of commuter preference for on-carriageway facilities and other design factors. The 6m median is used to enable most vehicles to completely shelter during crossing or turning manoeuvres and to provide for landscaping. Table 4.6.3 provides a summary of road design elements applicable to major roads.

The choice of intersection type on Major roads will depend on the room available, their compatibility with pedestrians and cyclists and characteristics in terms of capacity, coordination, control of priority and driver performance.

4.6 MINOR ROADS

Table 4.6.3 provides a summary of road design elements applicable to minor roads. The following approach is used for the planning and design of elements of the minor road system for subdivisions, both residential and industrial.

4.6.1 RESIDENTIAL SUBDIVISIONS

While drivers have the expectation of high speed/high traffic volume conditions on major roads, they should expect that speed and volumes are constrained in residential areas.

Although speed control is commonly achieved by the use of speed control devices, it is not the preferred approach. In retro-fitting exercises, such as in local area traffic management (LATM) schemes where the road network is fixed, alternatives are usually not possible.

In new subdivision layouts, however, speed control by providing short road lengths and changing the horizontal alignment of the road is the acceptable approach. Speed control devices in green field sites is a sign of poor design by all persons associated with the development. Speed control devices generally are not well perceived by either road users or nearby residents, and designers should look to better alternatives where practicable. If the installation of speed control devices has to be resorted to, acceptable standards are given below.

Road design in higher density residential areas is similar to that used in lower density areas, but with the exception that the requirements for on-road parking are greater.

In rural residential areas, higher maximum speeds are appropriate and on-road parking needs are lower.

4.6.1.1 Layout design

Following are the guidelines for layout design:

- circulation between near neighbourhoods is to promote travel via roads used for local access rather than state controlled roads
- good pedestrian/cyclist connectivity internally and to the road network is to be provided
- cul-de-sac and loop layouts are to ensure strict control of traffic speeds and volumes.
- loop road are preferred for ease of servicing by refuse, transport and emergency vehicles
- no more than three minor roads should need be traversed from the most remote lot to the nearest accessible Sub Arterial
- travel time for a vehicle in a low speed residential environment should be no greater than 90 seconds
- for network legibility, consistent forms of speed control treatment are to be used along Collector Streets
- priority at intersections is to be defined by means of paving or a concrete strip across the minor leg. This will also assist network legibility
- to minimise maintenance commitments and improve visual amenity, signs and pavement markings would not normally be used, except at:
    - roundabouts
    - entrances to low speed residential areas, where ‘Local Traffic Area 40kph ’ signs are to be used
    - locations where isolated devices might be installed, where standard manual of uniform traffic control devices (MUTCD) practice applies
- speed control devices are to be conspicuous at night time by the placement of street lighting and reflector markers on kerb faces where considered appropriate
- Street name signs
- Vehicle manoeuvring is as per 4.8 and 5.5 RURAL DESIGN VEHICLES.

4.6.1.2 Volume limits on minor roads

Following are the guidelines for volume limits on minor roads:

- to determine traffic volumes on individual roads, assume a generation rate of 10 vehicles per day (vpd) per lot in a typical low density subdivision and 6vpd per residential unit for a higher density development. Allow greater provision for higher generating development, such as where shops, sporting venues or schools are proposed. (refer section *4.7 URBAN TRAFFIC GENERATION RATES* for details)
- potential rat-running is to be prevented through appropriate layout design, i.e. ensure that a local residential neighbourhood is not permeable to vehicular traffic although it should be to pedestrians and cyclists
- individual lot access is to be permitted only on minor roads that will ultimately carry less than 3,000vpd
- maximum acceptable volumes are 3,000vpd on minor roads with 7.5m pavement (Collector Street), and 750vpd on minor roads with 5.5m pavement (Access Street)
- where a residential area is accessed by one road and that road is likely to carry more than 1,000vpd, alternative emergency access maybe required to be provided.

4.6.1.3 Speed control

Satisfactory speed control can be achieved by restricting car paths (2m wide between lines of kerb) to particular radii for the desired speed reduction.

Following are the design guidelines for speed control:

- designers are to aim to restrict vehicle speed to a maximum of 40kph on Collectors and 30kph on Access Streets. Speed control by tight bends is preferred although speed control devices may also be used.
- Restricting car paths to a maximum of 20m radius, typically at spacings of 120m in a 40kph zone and 75m in a 30kph zone. Horizontal deflection devices are preferred to the vertical deflection type. A tight bend has an inside kerb radius of 10m.
- the most useful devices are:
    - deflected T (shown in Figure c)
    - traffic islands (shown in Figure d)
    - roundabout (12.9m outside radius)(shown in Figure e).

  Where centre-median traffic islands are used, mountable kerbing is required so as to encourage trucks to mount the islands rather than the verges. Landscaping in the locations shown in the figures, as well as discouraging mounting of verges, also contributes to the slowing effect and is to be included for installations.

  In green field sites, deflected T intersections with splitter islads are to be discouraged as refuse, fire and building material trucks will simply mount the island and damage both the trucks and the islands over time.

- effective speed control for cars through use of devices typically requires negotiation by a design refuse vehicle mounting kerbs, usually internal to the device. Mountable kerb height and profile on islands/medians are to be as per *this standard* . Concrete running strips are required behind kerbs to cater for vehicle manoeuvres in accordance with Section 9.
- the overall length of treatments and of islands within treatments are to be minimised to reduce impact on access to abutting allotments and to on-road parking.
- For rural residential development, speed control should be implemented through curve linear design and minimising straight lengths of road.

Access may be required to be restricted by Council to an allotment to ensure that speed controls are not modified for driveways. A core filled concrete block wall 600mm high shall be provided, otherwise an access restriction strip is acceptable to Council.

Refer also section 6.4 ROUNDABOUTS for other roundabout requirements.

4.6.1.4 Cross-sections

The design of the following roads is to be based on the '*single moving lane concept*. Special passing provision is usually not required in residential minor roads. Following are the guidelines for cross-sections:

- **Access Street** - pavement width is to be a minimum of 5.5m for up to 750vpd (750 vpd equates to 75 lots in a Low Density Residential Area catchment). This 5.5m width provides for one moving lane and one parking lane
- **Collector Street not carrying buses** - pavement width is to be 7.5m up to 3,000vpd (300 lots in Low Density Residential Area catchment) - this provides for one moving lane and two parking lanes
- **Collector Street carrying buses** - pavement width is to be a minimum of 6m plus two 2.5m wide parking lanes - this provides for two moving lanes and two parking lanes with kerb build-outs primarily to narrow the effective width of the street and enhance landscaping opportunities.
- **Rural Residential Access** – pavement width is to be 6.0m for up to 1000vpd providing two mainly moving lanes as parking requirements are minimal with large lots. Parking bays maybe required at cul-de-sac heads and near lots with restricted house sites.
- **Rural Residential Collector** – pavement width is 8.0m allowing for two moving lanes with adequate setback for road noise. This width is adequate for the carriage of bus.
- *verges* are as per Table 4.6.3. These may be reduced to 3m at localised points of constriction such as at speed control devices or at cul-de-sac heads.

4.6.1.5 On-road parking

Following are the guidelines for on-road parking:

- parallel parking is generally to be adequately provided for within the standard carriageway cross-section
- visitor parking is to be available at the rate of 1.5 space on road per 2 residential lots; in higher density areas more is required

- Cul-de-sac locations may require, in addition, indented bays or other special provision. Additional on-road parking space may also be required near parks and other community facilities
- Cul -de-sac design is to ensure the refuse vehicles are not blocked by parked vehicles by appropriate location of driveways at heads.
- Parking capacity is not counted within 5m of a slow point, or for 8m of frontage for each lot.
- Parking to be provided within 15m of the property it is proposed for.

Where dedicated parking bays are provided, access restriction may be required to adjoining properties to ensure the function of parking areas provided is maintained. This maybe by providing a core filled concrete block wall 600mm high on the verge at the boundary. An access restriction strip may be volunteered by the developer with all costs being met by the developer.

4.6.1.6 Geometric design

Section 2.10 of Queensland Streets (p46) outlines the requirements for geometric design of roads. Following are the guidelines for geometric design:

- general minimum *sight distances* - from eye height to eye height - should be 60m in a 40kph zone and 40m in a 30kph zone. Eye height from a car is to be taken to be 1.15m. Sight lines should not cross property boundaries
- curve widening is required on tight bends on 5.5m wide streets -1m for less than radius 20m and 0.5m for radii between 20m and 30m (refuse vehicle turning)
- a kerb return radius of 7.5m at street intersections is generally appropriate
- a typical approach at an intersection between a Collector Street and a major road is shown in *Figure g* in Appendix A
- a typical approach to alter the priority of one street with another at a T-intersection is shown in *Figure h* in Appendix A.

4.6.2 INDUSTRIAL SUBDIVISIONS

Industrial subdivisions require wide carriageways and large turnaround areas to accommodate semi-trailers and possibly larger design vehicles such as B-doubles.

A 12.8m carriageway is used for all industrial minor roads to provide for movement, manoeuvring, parking and facilitate on-road bicycle movement.

Loop roads are preferred in industrial areas as the stresses on the seal and truck components of doing a U-turn creates significant wear and tear. Parked vehicles in cul-de-sac or dead ends further deteriorate the reliability of turning areas.

4.6.3 SUMMARY TABLE – URBAN ROAD HIERARCHY

Table 4.6.3 on the following page summarises the requirements of the urban road hierarchy.

Road Design Criteria	Minor Roads					Major Roads			
	Access Street	Neighbourhood Collector		Rural Residential		Industrial/ Commercial Access	Sub - Arterial	Minor Arterial	Major Arterial
		Non bus	Bus Route	Access	Collect-or				
Individual lot access to road	Y	Y	Y	Y	Y	Y	N	N	N
Reserve Width (min)	14m	16m	19.5m	20m	22m	22.5-26m	19.5-24m	33-41.5m	41.2-58.5m
Verge Width (min average)	4.25m	4.25m	4.25m	5m min	7m	4.25-6.5m	4.25-6.5m	6m	6m
Traffic Catchment [4]	75 lots	300 lots	300 lots	100 lots	300 lots				
Traffic Volume (range)	0-750 vpd	750-3000 vpd	750-3000 vpd	0-1000 vpd	3000 vpd max		3,000 – 15,000 vpd	15,000-35,000 vpd	>35,000 vpd
Design Speed	30km/h max	40km/h max	50km/h max	45km/h max	60km/h max	60km/h max	60km/h min	80km/h min	80km/h min
Carriageway - width [5]	5.5m	7.5m	11m (7m)	6.0m	8.0m	12.8m	14m	2x7- 9.3m +6m median	2x11-12.7m +6m median
- moving lanes	1	1	1 or 2	2	2	2	2	2 - 4	2 - 6
- Parking on-street	0.75 veh per lot	0.75 veh per lots	0.75 veh per lot	nil	nil	2 veh per lot	none	none	no parking
Constructed footpath	No	One side	Both sides	Network only	Network only	Both sides	Both sides	Both sides	Both sides
Cycle Provision	On road	On road	On road	Network only	Network only	On road	On road	On road	On road
Grades - Desirable maximum	10%	10%	6%	10%	10%	6%	6%	6%	6%
-Absolute maximum	16.7%	16.7%	10%	16.7%	16.7%	10%	10%	10%	10%
Sight distance	As per Qld Sts	As per Qld Sts	As Per Austroads	As per Qld Sts	As per Qld Sts	As Per Austroads	As Per Austroads	As Per Austroads	As Per Austroads
Concrete Road Edges	Y	Y	Y	Y[7]	Y	Y	Y	Y[7]	Y[7]

Table 4.6.3 Urban Road Hierarchy

1. Verge and Reserve widths may vary with the requirements for services and bikeways
2. Parking requirements may vary with adjoining uses.
3. Urban minor roads to be asphalt surfaced unless approved otherwise.
4. Refer also travel time constraint where applicable.
5. Carriageway widths measured from invert of kerb and channel or toe of kerb. Maybe narrower at slow points (width).
6. Concrete road edges includes kerb and channel, concrete edge strips appropriate to the road use and water sensitive urban design.
7. Kerb and channel may be omitted where permitted by Council where table drains are appropriate. Rural standards may apply in this case.

4.7 URBAN TRAFFIC GENERATION RATES

Traffic generation rates as per Table 4.7 are to be used as a guide for the design of urban roads:

Land use	**Traffic Generation Trips generated per day***
Residential per lot	10 trips/day
Rural Residential per lot	8 trips/Day
Industrial Light/Service/Retail industry per 100m2 GFA Medium to heavy industry per 100m2 GFA Default industrial generation	 9 trips/day 4-5 Trips/day 400 vpd/ha of land with 20% heavy vehicles
Commercial per 100m2 GFA	9 trips/day
Local Shops per 100m2 GFA	6 trips/day
Flats, units, town houses per unit	6 trips/day
Luxury units or likely multi-family units per unit	10 trips/day
Retirement village units per unit	4 trips/day
Primary School per school	500 trips/day
Small Local Sporting and similar facilities	100 trips/day

Table 4.7 - Urban Traffic Generation Rates * Source : Queensland Streets.

A trip is defined as one traffic movement eg from home to work.

4.8 URBAN DESIGN VEHICLES

Roads shall be designed to cater for the use by the design vehicle as shown in Table 4.8 below. The Design vehicles mentioned are to be used in accordance with Austroads' "Design Vehicles and Turning Path Templates", (SAA HB72 1995).

These design vehicles will also be considered in the design of pavements and the allowable use of roads of roads by vehicles for particular uses.

Four types of vehicles manoeuvres are denoted as follows:

L = Lane Discipline – will not encroach on coming traffic lane
F = Full width road – Able to use full width of road to manoeuvre
M = Able to use designed kerb mounting provisions to achieve manoeuvres
NA = Not Accommodated
O = Optional

Design Vehicle -> **Road Classification**	**5m Car**	**Service Vehicle 8.8m**	**Single unit truck/Bus 12.5m**	**Semi-Trailer 19m**	**Long Rigid Bus 14.5m**	**Prime mover &long Semi 25m**	**B-Double 25.0m**
Residential							
Access Street	F	F	M	NA	NA	NA	NA
Collector Street	F	F	F	M	M	NA	NA
Collector Street Bus Route	L	L	L	F	F	M	NA
Rural Residential							
Access Street	F	F	F	F	F	M	NA
Collector	L	F	F	F	F	M	NA
Industrial/Commercial							
Access	L	L	L	L	L	F	L+M
Sub Arterial (Collector)	L	L	L	L	L	L	L+M
Major and Minor Arterial	L	L	L	L	L	L	L

Table 4.8 – Vehicle Manoeuvres Types for Road Classification

For design purposes, use the 12.5m service vehicle with a 12.5 turning radius for a refuse vehicle unless agreed otherwise with Council.

SECTION 5. - RURAL ROADS

Rural roads shall be provided for rural development such that the level of service meets the transport requirements of the use of the allotment. These roads may be suitable for properties greater than one hectare in plan area, depending on the Development Permit conditions.

Larger allotments tend to have less trips than the smaller subsistence rural properties closer to the centres of employment. Therefore a higher standard of road is generally required closer to the population centres. Rural roads shall be designed generally in accordance with the provisions of the following Documents:

Classes	Description	Design Guidelines
1 to 4	Rural Bitumen Roads	AUSTROADS "Geometric Guide to Rural Roads" and
5 to 7	8m Gravelled Roads	ARRB "Unsealed Roads Manual"

5.1 ROAD CAPACITY

In all cases, traffic requirements must be based on the total traffic that will use a road, and not only on the requirements of the subdivision under consideration.

5.2 DESIGN SPEEDS

The design speeds shown in Table 10 are a range of absolute minimum and expected maximums depending on the terrain. Designers should aim to be above the average of these two figures. The designer should also look at the speed environment such that the speed of the vehicle is graduated by restrictive geometry to avoid sudden unexpected curves. Refer to the "Geometric Guide to Rural Roads" for more information.

5.3 RURAL TRAFFIC GENERATION RATES

The following traffic generation rates should be used when assessing the impact of traffic from development in rural areas.

Rural Parcels Location	Property Size (ha)	Traffic Generated
Greater than 20km from "Town"	>250ha	4 trips/day
Greater than 20km from "Town"	<250ha	6 trips/day
Less than 20km from "Town"	>250ha	6 trips/day
Less than 20km from "Town"	20-250ha	8 trips/day
Less than 20km from "Town"	<20ha	10 trips/day

For Calliope Shire Council -"Town" meaning Calliope, Boyne Tannum, Benaraby, Mount Larcom, & Yarwun. For Gladstone City Council – "Town" means any residential area.

Traffic generation rates may increase with higher intensity land use (eg Feed lots, industry, tourism etc) and may be varied at the discretion of Council. Where actual traffic figures are unavailable for minor road intersections, assume 10% of AADT for peak hour traffic.

5.4 RURAL ROAD HIERARCHY

Table 5.4 indicates a summary of the typical cross sections for rural roads. Figure B2 assists in defining the terms used in the table.

Table 5.4 - Rural Roads - Summary

RURAL ROAD HIERARCHY							
Road Type	Minor Roads					Major Roads	
	Formation only	5m Gravel Road	8m Gravel Road	Bitumen single Lane	Bitumen two Lane	Rural Collector	Rural Arterial
Class →	***7***	***6***	***5***	***4***	***3***	***2***	***1***
Design Criteria ↓							
Individual lot access to road	Y	Y	Y	Y	Y	Y	N
Reserve Width *	20m	20m	22m	25m	25m	40m	50m
Minimum Cleared Width	10m	12m	16m				
Travel Width	4m	5.5m	8m	3.8m seal	6.3m seal	7m seal	7.4m seal
Formation Width	5.5m	7m	10m	-	-	-	-
Shoulder Width	-	-	-	2m	1m	1.5m	1.8m sealed
Traffic Catchment	1-2 lots	2-15 lots	15-30 lots	-	-	-	-
Traffic Volume (range)	4-8vpd	8-60 vpd	60-150vpd	150-500	500-3000 vpd	3000-5000 vpd	>5,000 vpd
Design Speed	30-70km/h	40-80km/h	50-100km/h	50-100km/h	50-100km/h	60-100km/h	80-100km/h
Maximum Grades							
- Desirable	6%	6%	6%	10%	10%	8%	6%
-Absolute	12%	12%	12%	16%	16%	10%	8%
Sight distance Reference	"ARRB"	"ARRB"	"ARRB ""	As Per Austroads	As Per Austroads	As Per Austroads	As Per Austroads

* *Reserve widths may be varied with future traffic requirements of Council and extents of earthworks. Road reserves shall also include any cuts, fills, cut-off drains or any other part of the road that will require maintenance as well as a 4m buffer for batter maintenance and services.*

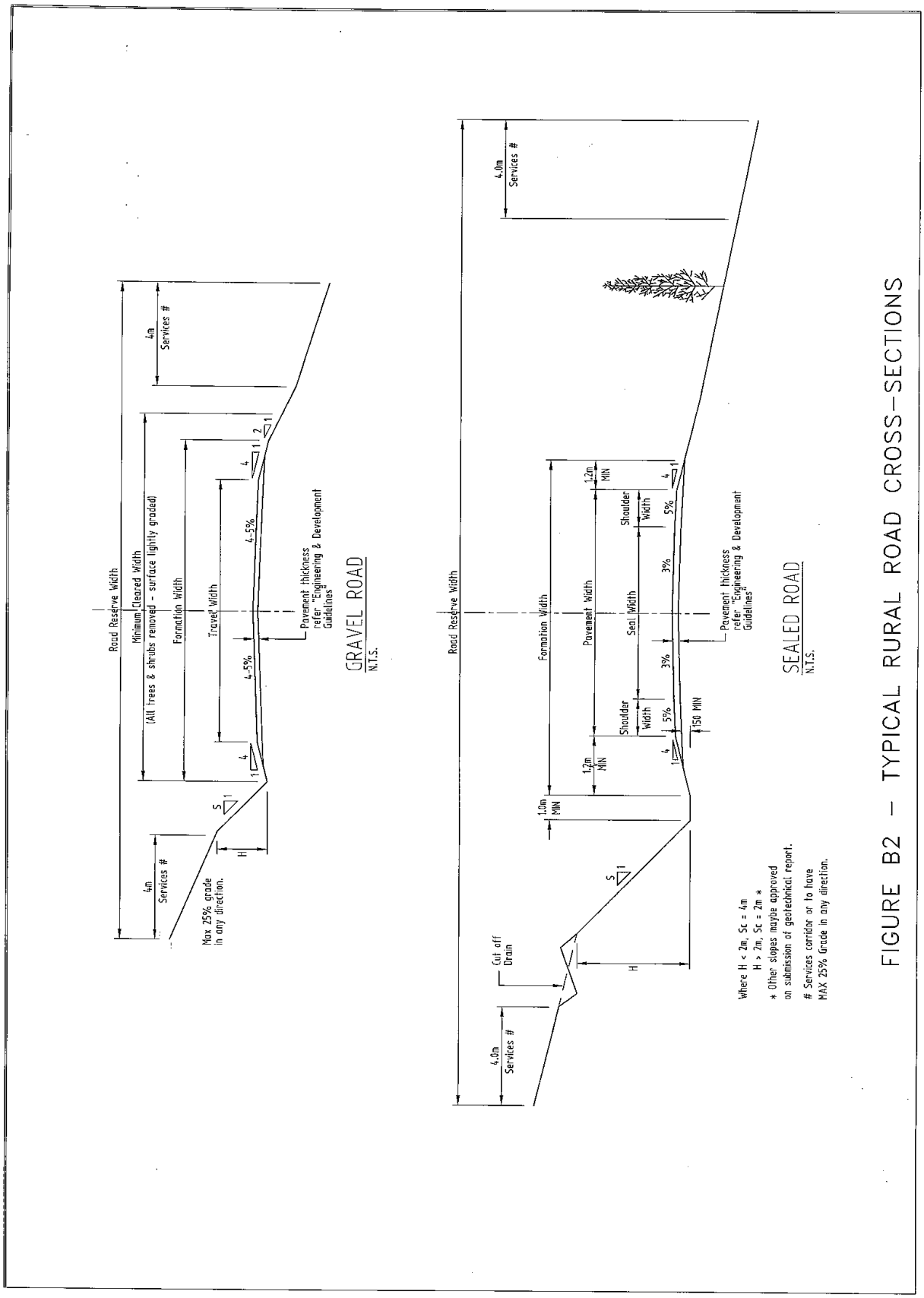


FIGURE B2 – TYPICAL RURAL ROAD CROSS-SECTIONS

Trees shrubs and other obstacles shall be removed from the "cleared width" which shall be centred on the travel width of the road. The "cleared width" will also be graded to tie into the formation and allow vehicles to comfortably pull off the road where practical. The sealed width may also vary with earthworks and sight distance requirements of the road.

Class 4 single lane bitumen roads may be required to be provided with widenings to class 3 standard over crests and around curves.

Road construction to class 7 standard is based on the subgrade being able to be traversed in moderately wet conditions by a truck with an 8t axle load without significantly rutting the surface. Where the surface can not be traversed by the truck, the road surface will have to be topped with a suitable gravel material until rutting is prevented. Creek crossing structures will also need to be remain functional after large flows.

To minimise maintenance of table drains and protect the environment from sediments, Council reserves the right to require that rural roads be provided with scour protection for the table drains, such as rock spalls, check dams, concrete V drains, sealed shoulder widening and/or kerbs. Subsoil drainage may also be required to protect widening.

5.5 RURAL DESIGN VEHICLES

Roads shall be designed to cater for the use by the design vehicle as shown in Table 10.3 below. The Design vehicles mentioned are to be used in accordance with AUSTROADS' "Design Vehicles and Turning Path Templates", (SAA HB72 1995). These design vehicles will also be considered in the design of pavements and the allowable use of roads by vehicles for particular uses. Four types of vehicles manoeuvres are denoted as follows:

L = Lane Discipline – will not encroach on coming traffic lane
F = Full width road – Able to use full width of road to Manoeuvre
M = Able to use designed kerb mounting provisions to achieve manoeuvres. Vehicle expected on a rare occasion such as removal van or construction vehicle.
NA = Not Accommodated – vehicle prohibited from using road.
O = Optional – written approval of Council required to operate this type of vehicle on this type of road.

Design Vehicle -> **Road Classification**	5m Car	Service Vehicle 9m	Single unit truck/Bus 12.5m	Semi-Trailer 19m	Long Rigid Bus 14.5m	Prime mover & long Semi 25m	B-Double 25.0m
Formation	F	F	F	O	NA	NA	NA
Gravelled	F	F	F	F	F	O	NA
Bitumen Single Lane	F	F	F	F	F	O	NA
Bitumen Two Lane	L	L	L	F	F	M	O
Major Roads	L	L	L	L	L	L	L

Table 5.5 – Vehicle Manoeuvres Types for Road Classification

SECTION 6. - INTERSECTIONS AND MEDIANS

Intersections are required to be designed at the junctions of roads such that the conflict between cars, bikes and pedestrians using the intersection can be managed to minimise the risk of injury to each user.

Intersections shall be generally provided in accordance with the following documents as amended by the Road and Transport Standard.

6.1 TYPES OF INTERSECTION

Appropriate types of intersections are “T” intersections and roundabouts. Four way intersections without traffic signals or roundabouts are unacceptable.

6.2 SIGHT DISTANCE

Intersections shall be located such that sight distance is adequate and appropriate on all legs of the intersection. Intersection sight distance for intersections is based on Section 5.2 of Part 5 of AUSTROADS’ “Guide to Traffic Engineering Practice – Intersections at Grade”. "Queensland Streets" maybe used in residential areas, with attention given to the effect of possible fencing of corner lots.

6.3 GENERAL REQUIREMENTS

6.3.1 DESIGN VEHICLES

Design vehicles for intersection design and vehicle manoeuvring criteria are nominated in sections 4.8 URBAN DESIGN VEHICLES and 5.5 RURAL DESIGN VEHICLES.

The turning templates in SAA HB72-1995 are the absolute minimum turning paths for a design vehicle. The **actual** path the vehicle takes depends on:

* The make of the vehicle and replacement steering components used.
* The skill of the Driver
* The surface the vehicle is turning on.

The make of the vehicle has a bearing with different steering components and drive systems having significantly different turning ability. As a general rule, front wheel drive cars can not turn as tightly as a rear wheel drive, and an American truck will not turn as tight as a European manufactured one.

Drivers’ skills vary significantly between different persons. The more complex the turning manoeuvre is the more room should be provided for misjudgement. Where the designer is able to move a template a number of times or use a computer simulation, a driver only gets one go in real life.

If the road surface is loose or slippery, the front wheels will not grip tightly and slide the turn to a larger radius, particularly for trucks with double axle drive trains. Conversely, if the screwing area for a triple axle set has too much grip, it will not allow the vehicle to turn as tight either.

The Australian Design Rules for heavy vehicles only requires that the vehicle be able to turn between two walls 25m apart. In particular, field testing has proven that long rigid vehicles such as busses have a wheel path turning diameter of about 27m. This is further backed up by AUSTROADS' the SAA HB72-1995 which describe the type of template and physical allowances required to accommodate turning vehicles.

Given the above, an allowance of up to 1.0m should allowed outside of the normal template to ensure the manoeuvre can be carried out the first time by 99% of the vehicles and drivers.

6.3.2 TRUNCATIONS

Truncations shall be provided such that the minimum average verge width is provided between the kerb and channel and the property alignment. Additional road truncation maybe required to accommodate the geometric requirements of the intersection.

For a standard T intersection, the minimum truncation of the real property boundary, at an intersection of 90^{o} shall be by three (3) equal chords to a circle of radius equal to the following:-

Access road to any road	R	6.0m
Minor Collector or Collector to Minor Collector, Collector, Sub-Arterial or Arterial	R	8.0m
Sub-Arterial or Arterial, to Sub-Arterial or Arterial	R	10.0m

Where the intersection angle is other than 90^{o}, the truncation shall be by a chord or chords to a circle of radius as specified above with truncations of similar lengths. Boundary radii may need to be adjusted to suit specific intersection treatments to retain minimum verge widths as required by Council.

6.3.3 INTERSECTION LEVELS AND CONTOURS

The finished levels of an intersection shall be such that the pavement cross fall of the through road is continuous out to the kerb line, so traffic on the through road does not go over a "hump" which is caused when the crowned centre line of the side road. Adequate numbers of contours shall be shown on intersection details in order to adequately indicate appropriate cross fall and drainage of the intersection has been achieved. Road cross fall shall be between 2% and 5%. Depth of ponding for over land flow at sags should be limited to 0.3m.

6.3.4 KERB LEVELS

Where kerb or kerb and channel is required on the intersection, adequate levels shall be shown on the kerb and channel for construction. Levels are required at intervals between 4 and 6m around a kerb turnout. Kerbs extruded on the surface of the pavement with out specific drainage considerations may rely on the pavement contours for level information.

6.3.5 PAVEMENT MARKING AND SIGNING

Line marking and signing shall be in accordance with Section 9.6 SIGNS PAVEMENT MARKING AND GUIDE POSTS. Pavement marking of intersections should designed and marked using the typical arrangements in Section 4.2 of the Main Roads' "Guide To Pavement Markings" (2000) as examples.

6.4 ROUNDABOUTS

Roundabouts shall be generally designed in accordance with Part 6 of AUSTROADS' *"Guide to Engineering Practice – Roundabouts"* and Part 14 of the Queensland Department of Main Roads' "*Road Planning and Design Manual*". These documents present most of the design information required for roundabouts, however the following requirements over ride these documents.

The following design requirements have been compiled for unconstrained sites and amendment may be considered by Council depending on the constraints of the roundabout site.

Speed control in minor urban streets may require variation to these requirements. Section 4.6.1.3 Speed control outlines some other requirements and illustrates a typical minor roundabout in a residential area.

6.4.1 ROUNDABOUT SIZE

The size of a roundabout as referred to by Council is the *Inscribed Circle Diameter* or the outer diameter of the circulating lane. For a definition of *Inscribed Circle Diameter*, refer page xi of the above Guide.

The size of a roundabout should be large enough to allow heavy vehicles to manoeuvre ***easily*** without mounting the outside of the roundabout, minimise screwing forces on pavements and allow comfortable reaction times for less competent drivers to enter the roundabout.

For sites without constraints, the minimum size of a single lane roundabout is determined by the classification of the largest road entering the roundabout as shown in the Table 6.4.1 following.

Road Classification	**Minimum *Inscribed Circle Diameter.***
Access Street	25.8m
Residential Collectors, bus routes, Rural Res Access/Collector,	27m
Industrial Access or Collector	30m
Arterial Roads	45m

Table 6.4.1 – Roundabout size

Otherwise, the roundabout geometry should comply with section 4 of Part 6 of AUSTROADS' "*Guide to Traffic Engineering Practice*", and Sections 5 and 6 Part 14 of the Queensland Department of Main Roads' "*Road Planning and Design Manual*".

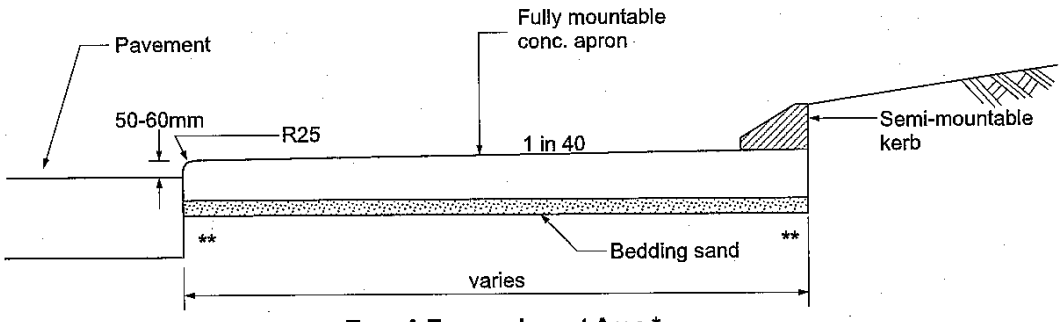
6.4.2 CENTRE ISLANDS AND CIRCULATING LANES

The width of the circulating lane(s) and the type of centre island is determined by the design vehicle for each type of road classification, using Table 4.1 of Part 6 of AUSTROADS' "Guide to Traffic Engineering Practice" as a guide only.

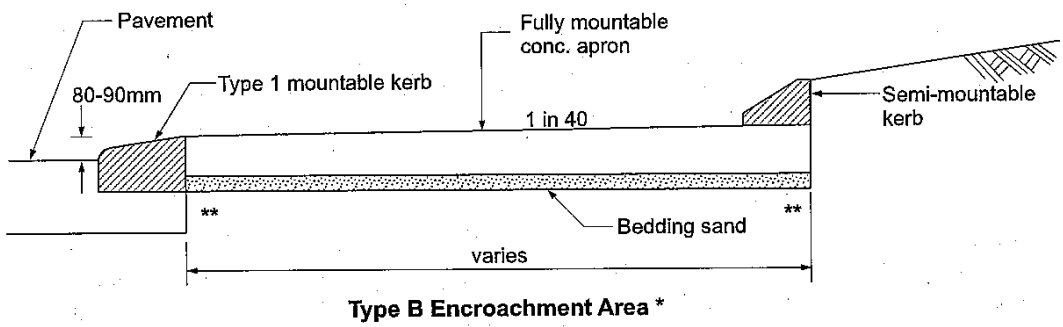
Vehicles may be allowed to negotiate the centre island of the roundabout in one to two modes: *clear* or *mounted* mode. A *clear* negotiation means that the design vehicle clears the inscribed circle and the centre island with a 0.6 metre clearance either side of the vehicle. Section 14.6 of the "Road Planning and Design Manual" outlines circulating lane widths for various design vehicles which generally comply with this requirement.

A *mounted* negotiation is where the particular design vehicle has to mount or encroach on to the centre island to negotiate the roundabout. A raised concrete pavement shall be provided for vehicles to run on with a further kerb to the inside to prevent short cutting across the island. A 0.6 metre clearance is also required from the vehicle path to the inner edge of the mounting ring.

Where vehicles must encroach over the centre island, a concrete mounting ring shall be provided as per the following diagram. The table following outlines the appropriate mounting for each situation.



Type A Encroachment Area *



Type B Encroachment Area *

* Alternative profiles which discourage drivers of passenger cars to mount but enable relatively smooth passage by heavy vehicles.

** Subsoil drainage may be required in these zones.

Table 6.4.2 indicates the negotiation mode for design vehicles for various classifications of roads.

Road Classification	Refuse Vehicle	Bus	Semi-Trailer	B-Double
Access Street	Clear	Mounted (type A)	Mounted (type A)	No provision
Residential Collectors	Clear	Clear	Mounted (type A)	No provision
Rural Residential/Rural access/collector	Clear	Clear	Clear	No provision
Arterial, sub arterial, Industrial Access/collector	Clear	Clear	Clear	Mounted or clear (type B)

Table 6.4.2- Design vehicle Manoeuvres For Road Classification.

The design of the concrete pavement in the mounting ring shall be in accordance with the Cement And Concrete Association of Australia Concrete "*Industrial Floor and Pavement Design*" (1995) the default being 200mm of 30MPa concrete with F82 mesh placed with 50mm of top cover. Type (b) transverse construction joints shall be at 10m centres using Y28 bars 400mm long. Concrete to be placed on gravel sub-base which shall give suitable support to the concrete (75mm minimum).

6.4.3 SPLITTER ISLANDS

Splitter islands are to be provided on all roundabouts to prevent right turning against the flow of traffic. The minimum width of entry or exit between kerbs shall be 5m for minor roads and 5.5m for other roads.

6.4.4 ROUNDABOUT VEHICLE DEFLECTIONS

Deflection paths through a roundabout shall restrict the speed of most vehicles to below 50km/h. (refer Figures 4.7 & 4.8 of Part 6 of AUSTROADS' "Guide to Traffic Engineering Practice")

Entry deflections shall be provided on roundabouts with a speed environment on the approach which is greater than 60km/h. Section 14.7 of the Main Roads' "Road Planning and Design Manual" gives some guidance with respect to this. Vehicle path deflections on the entry of the roundabout may be the controlling deflection in some instances.

Vehicle deflection paths for either side of through roads through a roundabout should be approximately equal to remove the temptation for vehicles to use the wrong side of the roundabout.

Tighter vehicle deflection curves may be required to control maximum speed in urban areas. Refer Section 4.6.1.3 Speed control.

6.4.5 PEDESTRIAN AND CYCLIST ROUNDABOUT FACILITIES

The following table describes when pedestrians and cyclists facilities will be provided for in the design of the roundabout.

Road Classification	Pram Ramps	Pathways	Cyclists Facilities
Access Streets & Rural Residential Access	Yes	No	No
Residential and Rural Residential/ Collectors & Arterials.	Yes	Yes	*
Industrial Access/Collector/ Arterial	Yes	Yes	*

* required where intersection links with bikeway/bike lane or as specified by Council.

Table 6.4.5 – Pedestrian and Cyclist Facilities at Roundabout

Pram ramps shall be provided on all splitter islands and kerb turnouts as per Figure 5.2 of the AUSTROADS' Roundabout Guide.

6.4.6 LIGHTING

Provision should be made for lighting of the roundabout to AS 1158 or this standard including the provision of lighting conduits to island where required. Refer Section 12.2 STREET LIGHTING in this Standard.

6.4.7 LANDSCAPING AND IRRIGATION

The centre island of the roundabout shall be landscaped. A landscaping plan shall be submitted to Council for approval or alternatively Council may quote to provide such a plan. Refer Section 4.2.7 of the AUSTROADS' "Part 6 -Roundabouts" for sight distance criteria to be observed.

The centre island of roundabouts on Major Roads shall have a concrete mounting strip at least 3.0m wide which will allow a maintenance vehicle to drive on and park in order to carry out maintenance on the island. Landscaping on the centre island shall be at least 3.0m from the traffic lane for safety purposes, this may mean additional width of concrete behind the inner kerb of the island.

Each island containing landscaping shall have a water service conduit provided in a practical location. Water from irrigation systems may reduce tyre grip on the road surface and thus irrigated water from the island shall not be able to be blown onto the roundabout or its approaches.

6.4.8 ROUNDABOUT DESIGN PLAN REQUIREMENTS

Vehicle deflection paths through a roundabout and their radii shall be shown for through roads on the design plans for the roundabout. The plans should also show the outline of the vehicle paths for the larger design vehicles for all manoeuvres.

6.5 INTERSECTIONS WITH RURAL TYPE ROADS

A type of intersection can be selected by using traffic generation figures contained in the Transport and Traffic Facilities Planning Scheme Policy and Figure 5.23a in Part 5 of AUSTROADS' "Guide to Traffic Engineering Practice - Intersections at Grade" (1988). However traffic growth of 10 and 20 years and completion of staged development should be considered in the selection of the intersection type.

The following treatments from in Part 5 of AUSTROADS' "Guide to Traffic Engineering Practice" "Intersections at Grade" 1988 will generally be required, ***where the major road is sealed and Minor road is*** as per Table 6.5

Minor Road Classification **Check these are latest**	**Right Turn Lanes** Figure 5.21	**Left Turn** Figure 5.17	**Throat Treatment** Figure 5.16
Rural Classes 5-7 (Unsealed) Rural Residential Access	Type A Intersection with sealed shoulder*	Nil	"Minimum Treatment"
Rural Classes 3 & 4 (Bitumen) Rural Residential Collector % Industrial Access	Type B Intersection	Nil	"Desirable Treatment"
Classes 1 & 2 Industrial Collector to a Major Road Arterial or industrial Collector to a Highway	Type C Intersection	Type B#	"Desirable Treatment"

* Sealed width from centreline to shoulder to pass right turn vehicle is 5.5m for a distance of D2 either side of the intersection.

% Rural Residential kerbs to extend around turnout.

\# Provision depends on location of intersection with respect to main traffic flow.

Table 6.5 – Intersection Treatments for Rural Roads.

Throat treatments for all intersections shall be as per the above table and Figure 5.16 "Desirable Treatment" of Part 5 of AUSTROADS' "Guide to Traffic Engineering Practice" "Intersections at Grade" 1988 including kerbs extruded onto the bitumen seal. These kerbs are to be backfilled with asphalt at a slope of 1V to 2H or flatter. Class 4 rural roads shall have 27m of full width sealed pavement from the lane of the through road of the intersection.

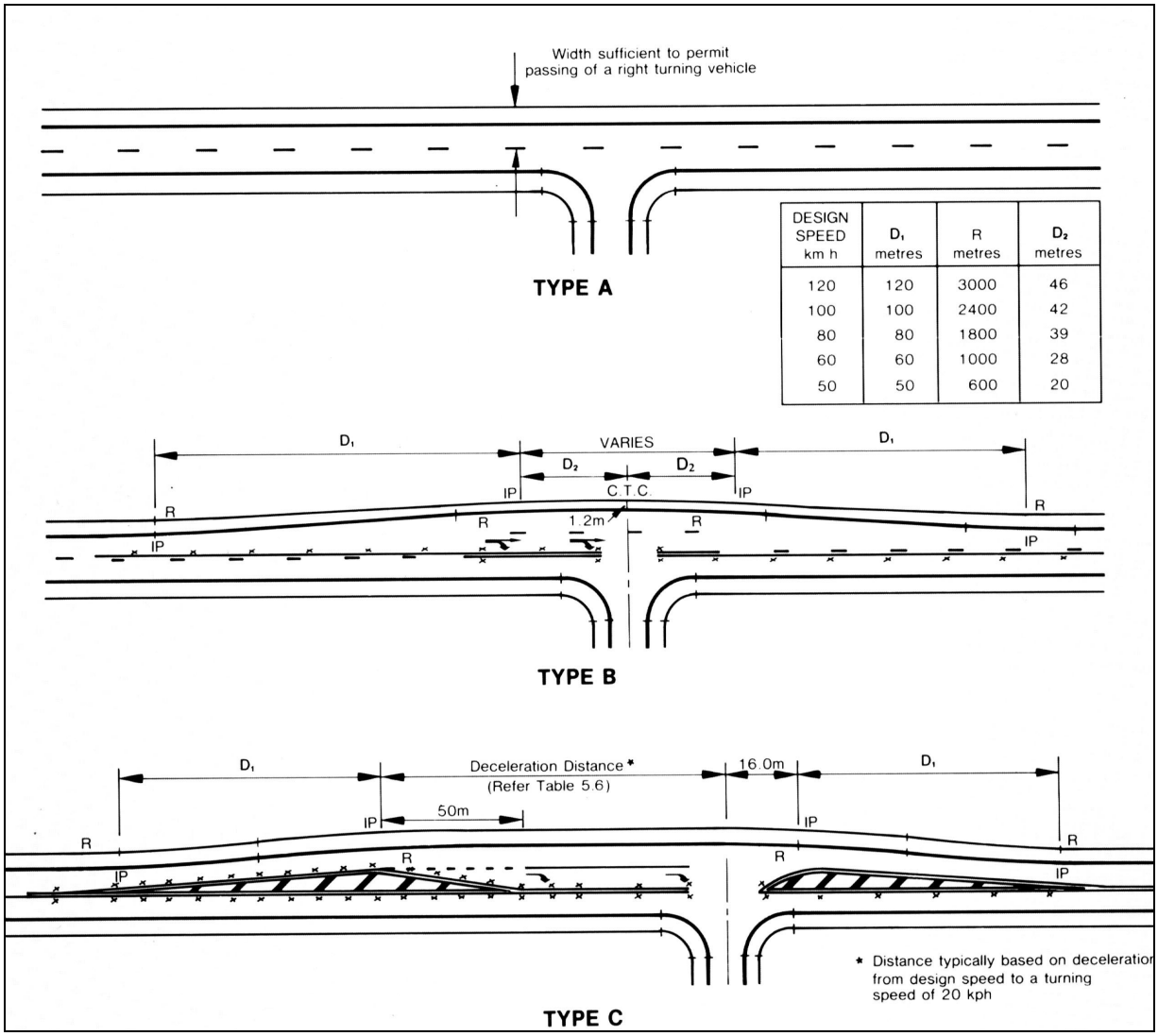


Figure 5.21 – AUSTROADS' "Intersections at Grade"

6.5.1 MEDIANS AND ISLANDS

Raised medians will generally be required for a Type C intersection treatment, however, where Council determines that power is not practical for intersection lighting, painted medians with RRPMs may be accepted.

Traffic islands may be necessary on the side road of Types B & C to prevent heavy vehicle traffic cutting the corner. Raised traffic islands will generally be required, however where Council determines that power is not practical for intersection lighting, painted medians may be accepted.

6.5.2 REFLECTORISED PAVEMENT MARKERS

Where painted medians and islands are provided, reflectorised pavement markers will be required to supplement the line marking on the road surface. For median Treatments using raised reflective pavement markers refer Section 4.2, Main Roads' "Traffic Engineering Manual" Vol. 2.

6.6 CHANNELISED INTERSECTIONS

It is not practical to standardise the design of channelised layouts as this depends on the traffic patterns and volumes, area economically available, topography, pedestrian movements, parking arrangements, planned ultimate development and layout of existing roads.

6.6.1 WARRANTS

Warrants for the provision of channelisation at intersections will be traffic volumes and intersection layout. The Developer should first consult with Council for any specific requirements or policies that apply. If no requirements or policies apply, then the developer shall perform a traffic study to establish what type of channelisation or auxiliary lanes are required

Planning horizons of 10 and 20 years are usually required to be catered for, or impact of the development - which ever is greater. Left turn, right turn and auxiliary lanes to be provided where warranted in AUSTROADS' *Guide to Traffic Engineering Practice Part 5 Intersections at Grade*.

Generally the ultimate layout for the intersection will need to be designed to determine land requirements and to locate interim intersection to best suit future construction.

6.7 MEDIANS AND TRAFFIC ISLANDS

All traffic islands shall be designed with geometry and line marking in accordance with AUSTROADS Part 5 and the following requirements.

Concrete infill shall be provided where the median width is less than 2.0m or cross slope greater than 1 in 6. Generally grass surfacing is provided full width where the median is wider than 2.5m and the length of grass is greater than 50m. Trees or shrubs can be expected to be planted in urban medians areas wider than 4 metres and longer than 50 metres. Trees should not be planted within sight distance constraints for signals, intersections, pedestrian crossings or areas of expected high pedestrian traffic.

Concrete semi-mountable type kerb is generally used for medians and traffic islands. All medians and traffic islands in urban areas shall have pram ramps to accommodate the crossing each leg of the intersection by pedestrians or cyclists. A driveway ramp shall be provided for a mower to access grassed areas on the median. Wider mountable kerb may be required by Council to separate mowers and maintenance vehicles from the through traffic.

Concrete infill to traffic islands shall be generally constructed in accordance with the specifications for footpaths, including a 50mm sand bed under and 10mm expansion material provided between the concrete and the kerbs. The surface treatment of the concrete shall be either an approved exposed aggregate or oxide colouring treatment.

Where trees or shrubs are expected to be planted in the median, subsoil drains shall be provided between the plants and the pavement as a root blocker.

All channelised intersections with raised traffic islands shall be provided with intersection lighting. Refer section 12.2 STREET LIGHTING.

Medians shall be provided with sub-soil drainage around the periphery of the permeable surface of the island. ie landscaped or grassed areas.

Where grassing or landscaping is provided to centre medians near town water and power, conduits for power and water shall be provided to each island and an irrigation system installed. Landscape plans including botanical names, garden details and planting plans shall be provided to ensure species, methods and locations are appropriate.

6.8 LANE WIDTHS

Where lane widths are not specified for road types, the following width of travel lanes shall be provided:

Travel lanes	Arterial	3.7m
	Sub-arterial/collector	3.5m
	Absolute Minimum	3.0m
Parking Lanes	Minor Road	2.6m
	Major Road	3.5m
Turning lanes	absolute min. width	3.0m
	desirable width	3.7m

The width of separate turning lanes shall be adequate to accommodate the design vehicle as required by Design Vehicle provisions in SECTION 4. - URBAN ROADS AND TRANSPORT.

6.9 LATM DEVICES

Local area traffic management (LATM) devices in residential areas shall be designed to minimise interference with driveways and property access through narrowing or traffic islands, signs etc. The height of LATM islands should be between 75mm and 100mm above the adjoining pavement to allow for mounting of the device by the design vehicle appropriate to the road.

LATM devices in residential areas should not take up more than one third of the frontage of any allotment and allow for easy entry and exit to each allotment with the manoeuvring of a car with a trailer such as a medium sized boat or caravan.

LATMS used to control speed by horizontal deflection should minimise the attraction to the driver to use the wrong side of a central island by making deflection paths through the device approximately equal. The speed through the device for speed environment design shall be governed by the radius of a 2m wide deflection path through the device using $e+f=0.22=V^2/127R$ where V is in km/h. For further information on spacing of LATMS for speed control refer "Queensland Streets".

Refer also section 4.6.1.3 Speed control for other requirements for LATMS.

SECTION 7. - TURNIING FACILITIES AND CULS-DE-SAC

The design of culs-de-sac and turning facilities at the end of roads shall satisfy vehicle manoeuvring and parking requirements as set down by the appropriate Design Vehicle provisions in Section 4.

The primary design criteria for *residential* turning facilities is for the refuse collection vehicle to be able to turn with cars parked to capacity using a three point turn.

For *industrial* turning facilities, a 25m semi – trailer shall be able to turn in a single movement with vehicles parked around the cul-de-sac, and a B-double to be able to mount kerbs to get around. The turning circle of large vehicles is diminished by replacement steering components, loose material on the road surface and driver estimations. Generally loop roads shall be provided in industrial subdivisions.

7.1 GEOMETRIC PROPERTIES

A turning facility shall be provided at the end of every terminating road. Where a through road is temporarily finished and is longer than 60m, a temporary turning facility shall be provided.

7.1.1 CULS-DE-SAC

For culs-de-sac the minimum radius of the kerb and channel shall be as per the following table:-

Road Type	Cul-de-sac Head	Approach
Residential or Rural Residential Subdivision	9.0m	15m
Industrial and Commercial Subdivision	20m	40m

7.1.2 VERGE WIDTHS

Verge widths around a turning facility shall be not less than those stated in the Traffic and Transportation Planning Scheme Policy at any point around the cul-de-sac, turning facility or approach curve.

7.1.3 PARKING

Additional parking spaces may be required to be provided at road terminations to comply with the parking requirements of SECTION 4. - URBAN ROADS AND TRANSPORT.

7.1.4 MAXIMUM CROSS GRADES

The maximum grades on a turning facility for the stability of high vehicles is 10%. ie the maximum centre line grade of the cul-de-sac head is 10%.

7.1.5 OTHER TURNING FACILITIES

Other types of turning facilities may be approved by Council on application based on those shown in "Queensland Streets" however the turnaround area should remain functional when cars are parked in the turning facility as allocated to satisfy the parking requirements for the development. Minimum road and verge widths apply to the legs of T or Y type turning facilities. (ie 5.5m minimum width of residential T legs)

7.1.6 LARGE VEHICLES IN RESIDENTIAL STREETS

Section 4 specifies the manoeuvres of larger vehicles that have to be accommodated and how they are to be accommodated. If a terminated road is longer than 60m from the nearest intersection of collector or larger road, some mounting facilities such as a strategically placed heavy duty driveway maybe required to accommodate the turning of a 19m semi trailer such as a removal truck or building materials delivery vehicle. The light poles around the cul-de-sac may have to be placed strategically to avoid obstructing these manoeuvres.

7.1.7 TEMPORARY TURNING FACILITY – ROAD END

Where a road is intended to be extended into a future stage or an adjoining property, and the end is 60 metres from an intersection or turning facility, a temporary turning facility shall be provided.

At the road end, the road surface and kerb and channel shall be constructed through to the property boundary where practical and finished with a concrete edge strip. Temporary pavement or concrete shall be provided behind the kerb and channel with a radius as required above or so as to form a circle 0.6 metres off the property boundary. If concrete is used, an isolation joint shall be used between the kerb and the concrete to allow easy removal of the concrete at a later date.

SECTION 8. - PROPERTY ACCESS

A property access is the driveway between the road edge and the property boundary used by persons wanting to access their property. The road edge for an urban area would be the kerb and channel and in rural areas the travels lane.

As the driveway will be constructed on the road reserve, Council may require the person to obtain a permit for the driveway. The kerb and channel is Council property and should not be cut without the permission of Council.

The property owner is responsible for the maintenance of their driveway.

8.1 SURFACE TREATMENTS

Pedestrians will use the portion of the footpath crossing the verge and as such the skid resistance of the driveway shall be within the acceptable limits of the relevant AUSTROADS' Guidelines.

Broom finished concrete, segmental pavers or stencilled concrete provide a good textured finish and are preferred. Exposed aggregate, and loose surfaces are not preferred in urban areas, as dirt and other material are washed into gutters or stormwater drains and may draw fines under the Environmental Protection Policy (Water). Slick coatings are not preferred because of its skid resistance in wet weather.

Kerbs or edge strips with a protrusion of 30mm are not permitted across a footpath unless constructed to full road standards complete with pram ramps.

8.2 RESIDENTIAL DRIVEWAYS

This section sets out the requirements for residential accesses and driveways. Driveways shall be generally constructed in accordance with Australian Standard AS 3727 for medium traffic loadings.

Driveways for single dwelling unit or duplex development shall generally be in accordance with Standard Drawing RT-0055.

Access to multi-unit residential development should generally be in accordance with Section 10.9 of "Queensland Streets" amendment 7 12 2002.

8.2.1 PRACTICAL ACCESS FROM SUBDIVISIONAL ROADS

A check of driveway design is important for the design of roads to ensure practical access is maintained to each allotment. The main consideration is that the *grades* in the vertical profile of the driveway allows vehicles to physically able to access and egress the property without dragging the bottom of the car at the middle, front or rear of the vehicle.

Other considerations also come into play such as crossing water courses, sight distance, and ensuring house sites can be practically connected to the road.

Where practical access can not be demonstrated using ramps, the applicant maybe required to provide a joint Operational Works (development Permit) and Building Works (preliminary approval) application to Council showing the integration of the access into the proposed dwelling.

8.2.2 DRIVEWAY GRADES

The desirable maximum driveway grade is 16% (1 in 6) for all development. Driveways with grades steeper than 16% shall be constructed with a sealed pavement suitable for the traction of the appropriate two wheel drive to traverse the driveway (preferably concrete). Absolute maximum grades for residential/rural driveways is 25% which may be approved in certain circumstances.

Car tracks across the footpath tend to rut between the tracks over time and present an unacceptable pedestrian risk.

Transitions shall be provided between changes in vertical grades stated above to ensure design vehicle clearances in accordance with the templates in Figure 3-1170 contained in the Main Roads' "Urban Road Design Manual" Volume 1 and other publications such as "AS 2890 Parking Facilities – Off Street".

8.2.3 ALTERNATIVE SOLUTIONS TO STEEP DRIVEWAYS FOR SUBDIVISIONS

Where steeper side slopes than 16% are encountered, the following variations of the standard cross-section may be adopted, used either separately or in combination, subject to the approval of Council.

(a) Excavation of garage sites on lots on the high side of the road is a possible solution where only a small number of lots (e.g., 4 or 5) is affected, such as in a short cutting or at the end of a cul-de-sac.

(b) Excavation of driveways up to half of the depth of the block at 1 in 4, provided the cuts steeper than 1 in 3 are stabilised and minimum useable area of the block is greater than that required by the Planning Scheme.

(c) Modification of the footpath cross section on the downhill side of the road, by reducing the width of the area graded to the kerb at 3% to an absolute minimum width of 2.0m may be carried out subject to the approval of Council.

(d) A split level road will permit access to allotments on each side of the road, on side slopes up to the maximum acceptable for subdivision.

8.3 INDUSTRIAL AND COMMERCIAL ACCESS

An access or driveway creates a new intersection whose configuration is to satisfy the basic traffic design criteria for all intersections with regard to driver behaviour, safety of pedestrians and vehicle characteristics. Access treatments range from minor concrete crossovers to major signalised intersections.

The number of driveways accessing a particular site is to be kept to the minimum necessary to allow satisfactory traffic operation for the site. Generally, only a single access point (entrance/exit) will be approved for any particular development. However, this may be relaxed where it can be demonstrated that safety and traffic operation on the road are not compromised, or where pedestrian safety can be improved by such a design.

All developments are to provide internal traffic circulation to avoid use of the public road system for movements between car parking and/or servicing areas of a site.

Developments with access via signalised intersections or roundabouts may need to dedicate and as public roadway to ensure lawful priority of traffic movements under current Queensland traffic law.

Access to developments is preferred via minor roads rather than major roads, provided the traffic generated by the development will not compromise the amenity of that road. In some cases, ameliorative works may be required in the minor road/s to alleviate possible amenity impacts.

For new commercial or industrial accesses, the developer maybe required by the Council to apply for a permit for the access to be constructed on the road reserve as a part of their local laws. In such permit, the developer shall nominate the service vehicles expected to utilise the access. As such the access shall be approved for that type of vehicle only.

8.3.1 DRIVEWAY TYPE

The type and width of driveway appropriate for a development depends on:

- the volume of traffic generated at that driveway by the development
- the type of road to which access is sought
- the existing and predicted future traffic volumes of the road to which access is sought
- the number of car parking spaces served by the driveway
- the size and type of the largest vehicle likely to use the driveway on a regular basis (usually a service vehicle)
- the number of service bays served by the driveway.

Driveways are to be constructed in accordance with *Figure d* .

For roads under the control of the Department of Main Roads, its separate design requirements will be determined by the Department of Main Roads.

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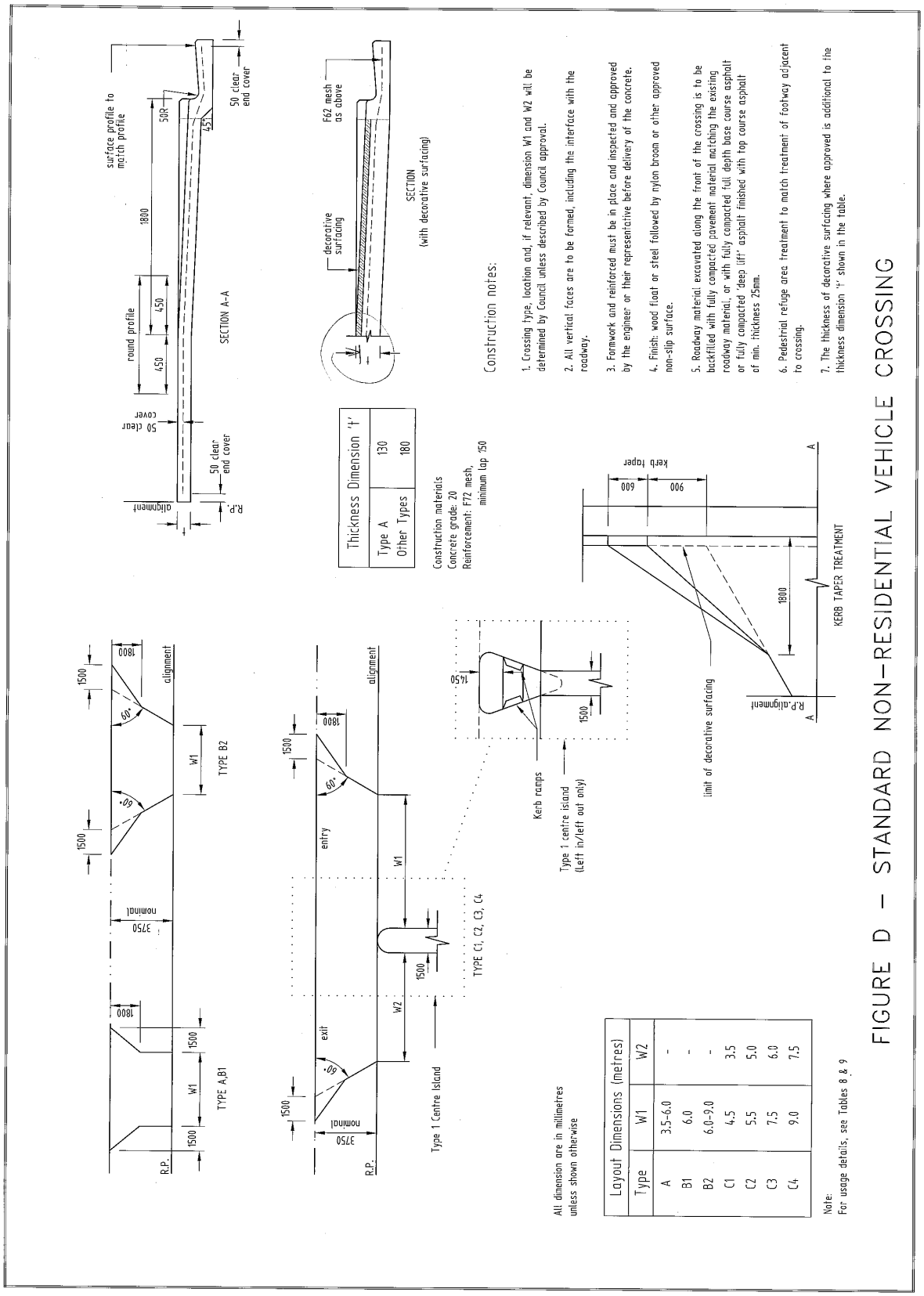


FIGURE D – STANDARD NON-RESIDENTIAL VEHICLE CROSSING
SECTION A-A
surface profile to match profile
round profile
1800
450
450
50R
45°
50 clear end cover
50 clear cover
alignment
R.P.
SECTION
(with decorative surfacing)
F62 mesh as above
decorative surfacing
Thickness Dimension 't'
Type A 130
Other Types 180
Construction materials
Concrete grade: 20
Reinforcement: F72 mesh, minimum lap 150
Construction notes:
1. Crossing type, location and, if relevant, dimension W1 and W2 will be determined by Council unless described by Council approval.
2. All vertical faces are to be formed, including the interface with the roadway.
3. Formwork and reinforced must be in place and inspected and approved by the engineer or their representative before delivery of the concrete.
4. Finish: wood float or steel followed by nylon broom or other approved non-slip surface.
5. Roadway material excavated along the front of the crossing is to be backfilled with fully compacted pavement material matching the existing roadway material, or with fully compacted full depth base course asphalt or fully compacted 'deep lift' asphalt finished with top course asphalt of min. thickness 25mm.
6. Pedestrial refuge area treatment to match treatment of footway adjacent to crossing.
7. The thickness of decorative surfacing where approved is additional to the thickness dimension 't' shown in the table.
kerb taper
600
900
A
A
1800
R.P.
alignment
KERB TAPER TREATMENT
limit of decorative surfacing
1500
1800
W1
TYPE B2
60°
1500
nominal
3750
1800
1500
W1
1500
TYPE A,B1
R.P.
alignment
1800
1500
60°
entry
W1
1500
W2
1500
exit
60°
1500
nominal
3750
R.P.
Type 1 Centre island
TYPE C1, C2, C3, C4
1:4.50
1500
Kerb ramps
Type 1 centre island
(Left in/left out only)
All dimension are in millimetres unless shown otherwise
Layout Dimensions (metres)
Type | W1 | W2
A | 3.5-6.0 | -
B1 | 6.0 | -
B2 | 6.0-9.0 | -
C1 | 4.5 | 3.5
C2 | 5.5 | 5.0
C3 | 7.5 | 6.0
C4 | 9.0 | 7.5
Note:
For usage details, see Tables 8 & 9

8.3.2 DRIVEWAY SELECTION

A driveway type should be selected according to its function with regard to car parking or service vehicle requirements, or both. The following procedure is recommended for this purpose:

- determine driveway function and select driveway type from relevant table:
  - -cars only, Table 8.3.2.1
  - -service vehicles only, Table 8.3.2.2
- where a driveway provides access for both cars and service vehicles, a driveway suitable for both functions should be selected.

Seven types of standard driveways are shown in *Figure d*. For developments that generate large volumes of traffic, and where the use of a standard driveway would cause unacceptable delays or hazard to traffic, a fully channelised intersection may be required.

To ensure adequate visibility between vehicles on a driveway and pedestrians on the footpath, where the driveway leaves between two obstructions sight splays are to be provided at the property boundary

8.3.2.1 Driveways for parking areas.

Each driveway of a parking area having multiple points of access is to be designed on the basis of the number of spaces effectively served by that driveway. The driveway type should then be selected from *Table 8* .

Table 8.3.2.1 Driveway selection for cars only

Turnover rate of car parking area (1)	Type of frontage road	Type of driveway for the number of spaces in car parking area			
		1-25	26-250	251-500	Over 500(2)
Low/Med	Minor	A (3)	B2	C1	C3
Low/Med	Major	B1 (6m)	C1	C2	C3
High	Minor	B1 (7m)	C1	C2	C3
High	Major	B2 (7m)	C2	C3	C3

(1) Low to medium parking turnover rates are likely to be generated by residential, industrial and commercial developments. High parking turnover rates are likely to be generated by entertainment, transport, retail and fast food developments.

(2) Car parking areas containing over 500 spaces or generating more than 1,000vpd are to be assessed for the need of an appropriately designed channelised access intersection.

(3) On minor roads, residential (Type A) driveways less than the 6m wide are acceptable for streetscape enhancement, provided normal manoeuvring and queuing requirements are satisfied.

8.3.2.2 Driveways for service vehicles.

Driveway types for service vehicles are determined according to the turning path requirements of the relevant design vehicle nominated in an application for a driveway permit. The appropriate driveway is selected from Table 8.3.2.2 .

The following details also apply to driveway selection for service vehicles:

- where traffic is required to be restricted to left in/out movements only, a type 2 driveway centre island is to be used
- for entry or exit only driveways, the relevant half of a Type C driveway is to be used
- where the volume of traffic generated by a development contains a substantial proportion of service vehicles and exceeds 500vpd, then a channelised access intersection may be required in place of a standard driveway.

Table 8.3.2.2 Driveway selection for service or other large vehicles

Type of driveway			
Frontage road	Minor road	Major road <100vpd	Major road
Nominated design vehicle (1)	Driveway type		Driveway type
Car and Trailer	A (6m)		C1
Service Vehicle 8.8m	B2 (7m)		C2
Single unit truck 12.5m	B2 (7m)		C2
Refuse Collection Vehicle	B2 (7m)		C2
Bus	B2 (9m)		C4
Prime Mover	B2 (9m)		C4
B - double	B2 (9m)		C4

Where semi-trailers, B-doubles or coaches are to negotiate the driveway and internal roads, a plan showing the swept and wheel paths of the vehicles is required to be submitted to Council to demonstrate how the vehicle will practically access the property with and driver unfamiliar with the access. ie access manoeuvres are one smooth action with reasonable clearances to obstacles.

8.3.3 SIGNS AND PAVEMENT MARKINGS

Direction, regulatory, warning and information signs and pavement markings are to be erected on site to control traffic movements and driver behaviour and to warn of any potential safety hazards. Signage also includes pavement markings.

Signs are to be provided on site to clearly indicate the existence and location of access points to carparking areas:

- where parking areas are located at the rear of a development

- where access to the carparking area is not from the main frontage road
- where visitor parking is provided for multi-unit residential developments and is not visible from the frontage road or access driveway
- where ingress/egress is via one way driveways.

All traffic/parking control signs and pavement markings are to conform with the requirements of the *Manual of Uniform Traffic Control Devices (Queensland)*.

Where developments are expected to generate vehicular traffic movements during hours of darkness, self - illuminated and/or reflectorised signs and pavement marking complying with current State or national standards are to be provided.

All signs and pavement markings are to be maintained and replaced such that they retain their function and remain in accordance with state or national standards and rules.

Temporary accesses to industrial/commercial properties shall be sealed across the verge of the road reserve in order to prevent ravelling of the edge of the seal and the tracking of dirt and material across the sealed road.

8.4 RURAL PROPERTY ACCESSES

Accesses to rural allotments shall be as per RDS 40. The driveway should be located such that the sight distance requirements are satisfied using the visibility triangle.

Where access is required across a table drain, a pipe should be installed including a sloping pre-cast headwalls. The size of the pipe to be installed depends on the flow in the table drain – writing advise must be sought from a Council Engineer regarding the size of the pipe. The minimum size pipe is a 375mm diameter reinforced concrete pipe. The table drain will need to be at least 375mm deep from the shoulder of the road to the bottom of the drain to accommodate the pipe. If this is not the case and the table drain has adequate slope, the table drain may need to be re-graded.

The driveway should not force water out on to the travel lane of the road. ie the access is higher than the shoulder of the road. A guide post shall be placed either end of the pipe/slab to denote the location of the access. The pipe may also be moved towards the property to shorten the length of pipe required, provided the table drain is relocated properly and services are not interfered with.

If the table drain has inadequate depth and slope and it is impractical to fit the pipe, a concrete driveway shall be provided through the table drain 125mm thick with F72 steel mesh placed centrally such that the Council grader will be able to traverse it during maintenance operations on the road and not damage the concrete. Advice shall be sought from Council regarding the level of the slab with respect to the table drain before construction.

The quality and compaction of the gravel driveway shall be such that the surface is tight. Without undertaking testing, the following are indications of adequate gravel driveway construction:

* The gravel cannot be kicked out with the heal of a shoe.
* A car or truck should indent in the surface of the gravel.
* The ground under the gravel is not spongy when a vehicle runs over it.

SECTION 9. - DETAILED DESIGN OF ROADS

This section outlines the requirements for kerb and channel, pavements, bitumen surfaces, line marking, signage, guide posts, guard rails, and balustrades.

9.1 KERBS AND CHANNELS

Concrete kerb and kerb and channel shall be provided as per the Road Hierarchy tables in Sections 4 and five of this standard or as required by the Planning Scheme or Development Permit. Kerbs may also be required at intersection turnouts.

9.1.1 TYPES OF KERBS AND CHANNELS

Standard kerbs and channels for each Council are shown in table 9.1.1 and standard drawing IPWEAQ R-0080.

Application	Acceptable Kerbs and Channel Types	
	Calliope Shire Council	Gladstone City Council
Layback kerb and channel	M1 , M2, (M5 as kerb)	M1, M3
Industrial Access and Collector Roads	B1 (450mm channel)	B1
Where high pedestrian volumes are likely such as shopping centres, parks schools and major sporting facilities	B1 (450mm channel)	B1
Rural intersection turnouts and medians generally	SM3, SM4	SM3, SM4 (200mm high)
Median	SM5	SM5

Table 9.1.1 – Types of Kerb and Channel

Additional depth of the kerb and channel is required in commercial and industrial applications.

Should a developer require a kerb/kerb and channel profile not listed above, the developer may be required to provide to the Council a suitable extrusion mould and trowels at no cost to Council such that Council can maintain the kerbs. Kerb profiles should still be able to also fit a generally available roof water adaptor alternative means of discharge is provided.

9.1.2 VARIATIONS TO STANDARD

It is recognized that pollutants from roadways are most economically treated by grassed buffer areas directly adjacent to the road. As a result, Councils are willing to consider alternative arrangements to accommodate this without compromising the function of the road and kerbs.

The kerb acts as a barrier to deter vehicles from leaving the pavement and driving on the verge. The kerb separates vehicles from areas which would be damaged by vehicles particularly in wet whether. The kerb helps protect pedestrians and infrastructure on the verge including any maintenance personnel. The kerb is a maintenance measure that also prevents vegetation (grass) from encroaching through and onto the pavement and channel. Keeping the grass away from the channel prevents build up at the edge of the road and keeps the edges of the pavement free draining. If the kerb is removed, these functions will need to continue and provide Council with a low maintenance option.

For example, concrete edge strips could be used to separate the grass, however a drop off of 30-40mm is required to keep the edge of the pavement free draining. Bollards or mounds could be used to keep vehicles from driving on the verge. However the detail of these options will have to be considered by Councils on a case by case basis, until some efficient options are developed that can be standardised.

9.1.3 GRADING

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

(a) Minimum kerb and channel grade shall be 0.50% (1 in 200).

Council may approve flatter grades in extenuating circumstances where the ground is not expansive or susceptible to or subsidence. Approval in writing must be sought before submitting plans with flatter grades or they will not be considered.

Every endeavour shall be made to improve the appearance by providing vertical curves of as long a length as possible, at all changes of grade.

9.1.4 PRAM RAMPS

Prams ramps shall be provided for the use of cyclists, pedestrians with prams and disabled persons where all pathways meet the kerb and channel and at mid points of kerb turnouts in accordance with Council's Standard Drawings.

Pram ramps in commercial and industrial areas will require the installation of tactile indicators in accordance with AS1428. (see IPWEAQ Standard drawings R-0084-86.)

9.1.5 CONSTRUCTION

Kerb and channel shall be constructed in accordance with Main Roads' "Standard Specification Roads" specification MRS11.03 (Section 20).

9.2 KERB ADAPTORS

In residential areas, two kerb adaptors per allotment shall be installed with the placement of new kerb and channel at the subdivision stage of the development. Kerb adaptors shall comply with the Australian Standard 3500, to which most uPVC adaptors do not comply. Kerb adaptors shall be provided in accordance with Standard Drawings RT-0083 and IPWEA R-0081.

On roads with one-way crossfall, kerb adaptors are not required on the higher kerb. Instead, an inter-allotment drainage line or an engineered under-road connection to a stormwater line shall be provided to service the allotment to at least one metre inside the boundary of the side and front boundary of the allotment.

9.3 PAVEMENT CROSSFALL

On straight lengths of two-way road the pavement cross-section will normally be graded with the high point (crown) on the pavement centre line, with a fall to each channel.

However, on minor roads with steep side slopes, the crown may be offset towards the higher side of the road to obtain better conformity of road levels with the natural side slope.

On residential access roads, one way cross fall may be accepted with a kerb only on the high side for roads serving less than 30 residential dwellings/units.

On divided roads each pavement will normally be graded to fall from the median to the outer channel.

Some variation may be considered by Councils for stormwater quality purposes.

9.3.1 NORMAL CROSS FALL

The normal cross fall of pavement and shoulders on straight alignment shall be:-

Surface Type	Cross fall
Asphalt Concrete surfaced pavements	2.5% (1 in 40)
Bituminous sealed pavements	3.0% (1 in 33)
Gravelled roads & gravel shoulders	5.0% (1 in 20)
Formation only	5.0% (1 in 20)

9.3.2 MAXIMUM AND MINIMUM CROSS FALL

Where steeper or flatter cross-falls than the normal are required, for example on kerb and channel bitumen widenings, at intersections or turning circles of cul-de-sacs, the maximum and minimum permissible pavement cross-falls shall be:-

Maximum Cross fall	Minimum Cross fall
5% (1 in 20)	2% (1 in 50)

9.4 PAVEMENT DESIGN

The design and specification requirements for pavements in this section have been based on the following documents.

AUSTROADS:

"Pavement Design – A Guide to the design of Road Pavements"

"A guide to the design of new pavements for lighter Traffic"

MAIN ROADS:

"Pavement Design Manual"

"Standard Specification for Roads"

9.4.1 PAVEMENT DESIGN BASIS

General - Pavements shall be designed for a 20 year life in service. The total pavement depth shall be based on the soaked California Bearing Ratios (CBR) of the subgrade material, the thickness and CBR of the various pavement layers (base, sub-base, etc), and the number of repetitions of Equivalent Standard Axles (ESA) for the life of the pavement.

The sub-grade profile shall extend the full road width (e.g. back of kerb to back of kerb) and with cross falls equal to the finished pavement cross falls.

The top of the sub-soil drainage (where required) shall be at the finished sub-grade level making allowance for a minimum of 75mm of pavement under the kerb and channel. The sub-base material shall be placed directly on top of the sub-soil drain, with no other material in between them.

Design Pavement depths shall be subject to confirmation by Council following an inspection and further testing of the pavement box if required, prior to placement of the pavement material. The Council may require either local or general variations of the design pavement depth, dependent on the actual sub-grade condition encountered.

Pavement requirements for the different road types are as per the tables immediately following.

Urban Roads

Road Design Criteria	Minor Roads					Major Roads			
		Collectors		Rural Residential					
	Street Access	Non bus	Bus Route	Access	Collector	Industrial/ Commercial Access	Sub Arterial	Minor Arterial	Major Arterial
Pavement Type	A	B	C	B	C	E	D	F	G
Design Traffic	$2x10^4$	$2x10^5$	$4x10^5$	$2x10^5$	$4x10^5$	$2x10^6$	$8x10^5$	$4x10^6$	$>1x10^7$
Design Traffic DTN	5	20	20	5	20	200	100	500	
Minimum Seal Type	25mm Asphalt	25mm Asphalt	40mm Asphalt	Bitumen	Bitumen	40mm Asphalt	Asphalt	Asphalt	Asphalt

RURAL ROADS

Road Pavement Design Criteria ↓	Minor Roads					Major Roads	
	Formation only	5m Gravel Pavement on 7m Formation #	8m Gravel Pavement on 10m Formation #	Bitumen single Lane	Bitumen two Lane	Rural Collector	Rural Arterial
Road Class →	*7*	*6*	*5*	*4*	*3*	*2*	*1*
Pavement Type	-	-	-	B	B	C	E
Design Traffic (ESA)	N/a	N/a	N/a	$2x10^5$	$2x10^5$	$4x10^5$	$2x10^6$
Minimum Pavement thickness	-	100	150	150	150	200	250
Gravel Type	-	Selected local	Selected local	Reput Supply	Reput Supply	Reput Supply	Reput Supply

A “Reput Supply” is a reputable supplier with a Quality Assurance program in place.

Car parking should be provided with at least a Type A pavement with Type E used for roads service access and loading areas involving vehicles larger than a small rigid vehicle.

9.4.2 GRANULAR PAVEMENTS

Granular pavements comprise the majority of pavements in Council's road network. Council prefers this type of pavement as it provides the lowest whole of life costs, the best opportunities for rehabilitation and is the most cost effective to construct. The design of granular pavements are as per the table 9.4.2 following.

Table 9.4.2- Minimum Pavement Thickness Including Surface Wearing Course

Sub-grade CBR	Minimum Total Pavement Thickness					
	A	B	C	D	E	FG
CBR<3	Subgrade treatment required – then treat as CBR 3					The Developer's Engineer to design pavement in consultation with Council
3	420	480	520	500	540	
4	350	420	440			
5	300	290	370	410	440	
7	250	290	300	360	400	
9	200	245	260	320	360	
12	170	210	220	250	250	
15	150	170	180			
Minimum Pavement thickness	150mm	150mm	250mm	250mm	250mm	300mm
Minimum top course thickness	100mm	100mm	100mm	125mm	125mm	100mm
Minimum Asphalt Thickness	25mm	25mm	25mm	50mm	50mm	100mm

Source Reference:
Types ABCD: "A guide to the design of new pavements for lighter Traffic"
Types EFG: "Pavement Design – A Guide to the design of Road Pavements"

Notes:

The CBR value is the 4 day soaked CBR Value

Pavement is to be minimum 75mm thick under kerb and channel and extend 75mm beyond the kerb and channel for stability.

Where rock is encountered that can not be removed from the box with a rock pick on an average 20t excavator, a minimum depth of 100mm can be adopted provided subsoil drainage is satisfactory for the layer.

Pavement Material Strength

The Base and Sub-base pavement materials shall have the following soaked C.B.R. values in relation to the road classification:

Pavement Layer	Major Road	Minor Road
Base	C.B.R. 80	C.B.R. 60
Sub-base	C.B.R. 45	C.B.R. 35

The C.B.R. values of Base and Sub-base materials shall be determined on specimens prepared at 100% standard compaction at O.M.C. and soaked for 4 days (Main Roads Standard Test).

Pavement Material Specifications

Soil Aggregate Pavements for Base and Sub-base shall be in accordance with Main Roads Specification M.R.S. 11.05 as amended from time to time, and the following:-

Base Course = Class 2.2 Grading C or D

Sub-Base = Class 2.3 Grading B, C or D

Crushed Rock Pavements for Base and Sub-base shall be in accordance with Main Roads Specification M.R.S. 11.06 as amended from time-to-time.

9.4.3 CONCRETE PAVEMENTS

Full depth concrete roads are generally used only for heavily trafficked roads, however they can be designed for local streets. Concrete pavements should be designed in accordance with AUSTROADS' "Pavement Design - A Guide to the Design of Road Pavements"

Special attention must be paid to jointing details in regard to rideability and the provision for additional conduits for future services.

Subgrade CBR[1]	MINIMUM CONCRETE THICKNESS FOR PAVEMENT TYPE				
	A	B	C	D	E,F,G
1	Treat subgrade and place thickness of crushed rock Sub-base for a subgrade characteristic of CBR5, then use CBR 5 below.				Council to design pavement in consultation with developer's Engineer
5	170	180	190	200	
10	160	170	180	180	

1. The CBR value is the 4 day soaked CBR Value
2. Pavement is to be minimum 75mm thick under kerb and channel and extend 150mm beyond the kerb and channel for stability.
3. Where rock is encountered that can not be removed from the box with a rock pick on an average 20t excavator, a minimum depth of compacted sand 50mm under the concrete can be adopted provided subsoil drainage is satisfactory for the layer.

Surface treatments, coloured treatments and patterns will be considered by Council on a case by case basis. Oxide colouring for the full depth of the slab is allowed by Council. Surface coatings are not allowed. Oxide colours shall remain as standard manufacturers colours and shall not be mixed with other colours. Surface patterns using moulds may be considered, however the safety of pedestrians and cyclists is a consideration in the decision of Council.

Sealing coats over any concrete are not allowed as they make the surface slippery in wet weather and can peel and crack creating a maintenance problem.

Most concrete pavements are used in LATM schemes and as such detailing should be carefully carried out. Acute points should be avoided where possible.

Poor Detail

Good Detail

9.4.4 SUBGRADE CBR. DETERMINATION

The sub-grade California Bearing Ratio (CBR) may be determined by laboratory based CBR determination (Soaked) .

Sub-grade CBR should be carried out for each type of material encountered on the site with a limit of one per an average between 60 and 120 metres of road and at least one for each road. On rural roads this may be extended to no less than 1 test per 300 metres of road. A minimum of three (3) tests per site are required.

Samples of the in situ material are to be obtained from as near as possible to the sub-grade design level. C.B.R. shall be determined on specimens prepared at 100% standard compaction at O.M.C. and soaked for 4 days. The lowest of the two results at each location is to be taken as the design C.B.R. value for the subgrade.

Sample Intervals shall be a maximum of 500m, with a minimum of one (1) per length of road, and at any obvious change in the nature of the sub-grade material.

9.4.5 PAVEMENT MATERIAL QUALITY TESTING

The Engineer shall certify that the pavement material is of adequate quality and meets the material specification above.

Testing shall be carried out to ascertain the quality of the material such as a Particle Size Distribution (PSD), Plasticity Index (PI), Soaked CBR, and others as requested from time to time. Council requires 1 set of tests per 500m^3 of material. Test result to be submitted to Council before commencement of the maintenance period.

9.4.6 COMPACTION STANDARD AND TESTING REQUIREMENTS

The minimum standard of compaction for subgrade and pavement layers and testing intervals shall be as per Table 9.4.6 as follows:

Layer	**Compaction Standard Required**	**Testing Interval Not less than (Field Density)**
Trench Backfill under road	98% Standard Compaction @ OMC for top 300mm layer 95% Standard Compaction @ OMC for 300mm below subgrade	1 per trench or 1/40m 1 per trench or 1/40m
Top 150mm of Subgrade	100% Standard Compaction @ OMC	1 per 100m of road 1 per road 1 per 1000m^2 of pavement
Sub-Base Pavement	95% Modified Compaction @OMC	1 per 100m of road 1 per road 1 per 1000m^2 of pavement
Base Course Pavement	98% Modified Compaction @OMC	1 per 100m of road 1 per road 1 per 1000m^2 of pavement

Table 9.4.6 – Testing Requirements

9.4.7 FIELD PROOF TESTING

The theoretical design for a pavement is carried out based on a comparatively tiny sample of material. The variability of the natural materials of the subgrade should let the designer recognise that some of the subgrade material will not be suitable to the design. This may become evident in the proof rolling of the subgrade or pavement through movement of the surface under load. This moving material may be required by Council to be removed and replaced with specification pavement material. Hence it would be wise to allow a provisional item for removal of unsuitable material equal to 10% of the pavement amount to cater for this problem.

Maximum deflections of subgrade or pavement shall be as follows:

Design Traffic (ESAs)	Subgrade Deflection	Base Course Deflection
$1x10^5$	1.6mm	0.9mm
$1x10^6$	1.2mm	0.75mm
$1x10^7$	0.9mm	0.55mm

9.5 BITUMEN SEAL AND ASPHALT SURFACING

9.5.1 SPECIFICATION

Bitumen Seal and Asphalt Surfacing Works shall be in accordance with the following Specifications as amended from time-to-time:-

(a) Main Roads - M.R.S. 11.30 – Dense Graded Asphalt Pavements

(b) Main Roads - M.R.S. 11.11 – Sprayed Bitumen Surfacing

(c) Main Roads - M.R.S. 11.18 - Supply and Delivery of Bitumen

(d) Main Roads - M.R.S. 11.19 - Bitumen Cutter Oil and Flux Oil

(e) Main Roads - M.R.S. 11.22 - Supply of Cover Aggregate

(f) AAPA - *National Asphalt Specification* - April 2004

9.5.2 BITUMEN SEAL SURFACING

Bitumen surfacing shall comply with the following requirements:

(a) Bitumen shall be class 170.

(b) Cover Aggregate shall be Quality Category B (limestone will not be accepted for top coat cover aggregate).

(c) Aggregate Pre-coating shall be an adhesion agent approved by Council.

(d) Application Rates - all Bitumen Seal works shall comprise of the application of at least two coats of hot bitumen and associated cover aggregate.

The following application rates will act as a design guide, however the actual rates may be varied by the Supervising Engineer as required by different materials and the field conditions at the time of spraying.

	Bitumen Application Rate	Bitumen Cutter(Flux)	Aggregate Size	Aggregate Cover Rate	Aggregate Precoating
1st Coat	1.5 l/m^2	10%	16mm	75m^2/m^3	N/A
2nd Coat	1.1 l/m^2	5%	10mm	120m^2/m^3	Yes

(e) Bitumen Sealing shall overlap the kerb and channel by between 20 and 30mm.

9.5.3 ASPHALT SURFACING

Thin asphalt surfacing shall be between 25mm and 50mm, and considered to function as a wearing surface only. Asphalt thicknesses for particular road types are designated on Table 4.6.3.

Asphalt 40mm or thicker shall be a dense graded asphalt (DG14) in accordance with Main Roads "Standard Specifications Roadworks" MRS11.30.

Asphalt of a thinner layer shall be for low speed access streets only and shall be a dense graded asphalt (AC10) in accordance with the AAPA's (Australian Asphalt Pavement Association) *National Asphalt Specification* - April 2004.

A light prime shall be over the pavement material prior to the asphalt being laid.

Surfacing for arterial roads shall be designed in consultation with Council and may include consideration of other matters such as pavement drainage, noise attenuation etc.

9.5.4 PRIME

An AMC 0 or AMC 00 prime shall be applied to the granular pavement prior to the application of the asphalt. The primer design shall be submitted to Council for approval prior to application. The design shall ensure that the maximum residual bitumen remaining on the pavement surface shall not exceed 0.3 l/m^2. The prime shall have a minimum curing time of 48 hours prior to applying the asphalt. Asphalt shall only be applied once the primed surface is not sticky to touch.

In the event that the pavement is required to take traffic, a primer seal shall be submitted for Council approval.

9.6 SIGNS PAVEMENT MARKING AND GUIDE POSTS

All necessary warning signs, regulatory signs, directional signs and pavement marking as approved by Council, shall be provided.

9.6.1 STANDARDS

Signing and pavement markings shall be in accordance with the Main Roads (Qld) Manual of Uniform Traffic Control Devices, and Main Roads Specification 11.14 "Road Furniture", as amended from time to time.

Main Roads' Manuals such as and "Guide to Pavement Marking" , the "Traffic and Road Use Manual" may also be referenced from time to time.

9.6.2 REQUIREMENTS

Street name signs shall be provided at each intersection, in accordance with Council's Standard Drawings. Without limitation, the Major and Rural roads shall be provided with:-

(a) "Keep Left" signs at the approach end of the medians at all channelised intersections, and at all median openings.

(b) Warning signs at the approach to all hazards.

(c) Obstruction markers at all bridges, grids, or other restriction to the pavement width.

(d) Vertically striped barrier board shall be erected at the temporary termination of road construction such as a subdivisional or stage boundary.

9.6.3 PAVEMENT MARKING AND SIGNAGE REQUIREMENT TABLES

Tables 9.6.3a and 9.6.3b outline the requirement for the level of signage and pavement marking for each classification of road.

Refer also Section 4.6.1.1 Layout design for residential roads. This is provided as a guide only and may be over ridden by Council where warranted.

The key to the following tables are as follows:
Y = Yes, mandatory to use
N = Not Necessary to use
O = Optional to use where circumstances warrant

Table 9.6.3a - Sign Requirement Table

Road Classification **Road Sign Series**	Residential Access Rural Residential Access	Residential collector and Rural Residential Collectors	Industrial/Commercial Access	Rural Classes 4 to 7	Rural Class 3	All Arterials, & rural collector
R1 – Stop/give way etc	O	Y	Y	Y	Y	Y
R2-3 keep left,	N	O	O	N	Y	Y
R4 – Speed Series	Y	Y	Y	Y	Y	Y
R5 – Parking Series	N	N	Y	N	N	Y
W Series - Warning	O[1]	O[1]	Y	Y	Y	Y
G1 Adv. Direction	N	N	O	N	O	Y
G2 Intersection Dir.	N	N	O	N	N	Y
G3 to G11 Traffic Instruction and Guides[2]	O	O	Y	O	Y	Y
D4 Hazard boards	N	O	Y	Y	Y	Y
Other Requirements						
Minimum Sign Size	C	B	B	B	B	A
Retro-reflection Class	2A	1	1	2	2	1

[1] Particularly on some LATM devices
[2] With the exception of Road name and No Through Road signs G5 Series which must be provided

Table 9.6.3b - Pavement Marking Requirement Table

Road Classification-> **Pavement Marking Type**	Residential Access Rural Residential Access	Residential collector and Rural Residential Collectors	Industrial/Commercial Access	Rural Classes 4 to 7	Rural Class 3	All Arterials, & rural collector
Separation/Barrier Lines	N	O	O	O	Y	Y
Edge Lines	N	O	O	N	O	Y
Stop/Give Way hold lines	O	Y	Y	Y	Y	Y
Continuity/Give Way Lines Turn lines	O	O	O	N	N	Y
Outline/chevrons	O	Y	Y	Y	Y	Y
Intersection Arrows	N	O	O	O	Y	Y
Raised Pavement Markers (RRPMs)	O	O	O	O	O	Y
Pavement Messages	N	O	O	O	O	Y

Double barrier centre lines should be used in urban areas where there is inadequate stopping sight distance for people to access driveways or other conflicting manoeuvres.

Raised Pavement Markers shall be fixed to the road using a Urethane based adhesive such as RS 2000 or equivalent. Two applications are required for chip seal roads, the first sealing the voids in the road surface and the second to hold the marker. Epoxies such as "Megapoxy 36, Hilti 268, and Degadur 450" are also acceptable.

Pavement marking should be carried out in accordance with Main Roads' "*Guide To Pavement Markings"* (2000). In particular intersections should be designed and marked in accordance with the typical arrangements in Section 4.2 of the guide given the above requirement matrix.

9.6.4 GUIDE POSTS

Guide Posts shall be of powder coated steel and in accordance with Main Roads *Manual of Uniform Traffic Control Devices*, Specification M.R.S.11.14 "Road Furniture" and Main Roads Standard Drawings 1356 &1357as amended from time-to-time.

9.7 GUARD RAILS AND FENCES

Fences or rails provided shall not present a puncture hazard if hit by a vehicle or cyclist.

9.7.1 GUARD RAILS

Guard rails are to be corrugated steel beam type erected on galvanised steel posts and in accordance with Main Roads Specification 11.14 "Road Furniture" and Main Roads Standard Drawings as amended from time-to-time. To minimise maintenance and eliminate the hazard of the rail itself, preferably batters should be flattened or obstacles removed to obviate the need for a guard rail. Main Roads' Queensland guidelines should be used to identify areas to be protected by guard rail ("*Road Planning and Design Manual*" may be used).

9.7.2 PEDESTRIAN BALUSTRADES

Pedestrian fences should be constructed in urban and residential areas where the height of the drop exceeds 1.0m and the slope exceeds 1 in 2. The extent of the rails should be such to deflect pedestrians and cyclists away from the hazard by flaring the alignment of the end of the rails.

A welded galvanised mesh pool fence complying with the Building Act 1975 shall be provided. The structure is welded, powder coated (heritage green or as required by Council) and set in a concrete footing. Where large amounts of pedestrian traffic is expected or passes directly adjacent to the hazard, a balustrade may be required to be installed as per the Building Code of Australia and requirements which will satisfy Council legal duty of care.

9.7.3 BICYCLE RAILINGS AND BALUSTRADES

On bikeways or where bicycles are expected, rails shall be provided to comply with the requirements of Section 7.6.2 of AUSTROADS *Guide to Traffic Engineering Practice Part 14-Bicycles*.

SECTION 10. - PEDESTRIAN AND BICYCLE FACILITES

The principle requirements for pedestrian and cycle facilities are contained in SECTION 4. - URBAN ROADS AND TRANSPORT and the conditions of the Permit for the development.

10.1 VERGE PROFILE

Council's standard drawings stipulate the cross section of the footpath (i.e. that portion of the road reserve between the kerb and the property alignment) including service locations.

The standard cross-falls shown on the standard drawings must not be exceeded at any location where vehicular access to allotments may be required.

The grading of allotments where necessary to conform to design alignment levels, shall also be in accordance the standard drawings.

10.2 PEDESTRIAN FOOTPATH PAVING

Council may require the construction of concrete footpath paving as determined by Section 4.1 PEDESTRIAN FACILITIES or development permit conditions, and in accordance with the following:-

(a) The surface of the footpath paving shall be of a non-skid surface acceptable to Council.

(b) The concrete path should be flat and continuous in grade. Joints between sections of pavement shall be flush such that the difference in height between slabs is no greater than 5-10mm. The level of the ground adjacent to such pathways shall be not lower than 30mm below the edge of the path and not higher than the edge of path.

(c) Concentrated water such as from garden edges, air conditioners, roof water or carparks shall be collected and piped under concrete path to the kerb and channel. Constant wetness resulting slippery areas will need to have under path drainage installed.

(d) Where concrete paths are required around an intersection turnout, pram ramps shall be installed in accordance with the appropriate standard drawing and pathway connections made between the pram ramp and path.

Subject to the approval of Council, other paving materials such as asphalt or segmental pavers may be used.

10.3 BICYCLE PATHS

Bicycle Paths where constructed shall comply with the following and AUSTROADS' "Guide to Traffic Engineering Practice" Part 14. Generally the material used to construct Bikeways *through park land* is asphalt on gravel pavement. Bikeways through residential streets however shall be constructed of concrete.

Longitudinal surface drainage to both sides of the pathway plus nominal under ground cross drainage shall be provided to the requirements of the Council.

Turfing of 1.0m minimum width shall be provided to both sides of the pathway or width to stabilise the soil around the pathway. Grass should be established in 8 weeks by regular watering and mowing.

10.4 ASPHALT PATH SPECIFICATION

Where asphalt surfacing is applied , it shall be hot mix asphalt laid by machine, having a minimum thickness of 25mm and a constant cross fall of 2.5% (1:40).

Pavement thickness will depend on the subgrade conditions, however the minimum thickness shall be 100mm. Subgrade should be of a satisfactory strength, proof rolled in the presence of a Council officer before proceeding with placing pavement.

The gravel pavement on both sides of the asphalt surfacing shall be scarified to 50mm deep and top soil incorporated before the turf is laid.

10.5 CONCRETE BICYCLE PATH SPECIFICATION

The design of concrete bike and cycle ways should take into consideration the expected vehicle traffic, sub-grade type and external environment. Rider and walking comfort must be considered such that the bikeway has a smooth longitudinal profile. Edges should be rounded using an edging tool with a radius of no greater than 20mm.

Deleterious material such as grass and vegetation matter should be removed before construction of the path to reveal a firm sub-grade.

Where the ground is soft under foot when wet or of uneven strength, additional sub-base material may be needed to provide additional strength and provide even support for the pathway. Crushed rock or gravel should be used – not fine material such as sand which may enter a contraction joint.

Where the sub-grade or sub-base is highly permeable, plastic may be required to retain moisture for the hydration of the concrete.

Concrete bike paths shall be 100mm thick if constructed in existing residential areas with 80% of allotments with houses already constructed, or 125mm thick concrete path otherwise. The sub-grade under bikeways on road reserves shall be compacted and proof rolled in the presence of a Council officer to ensure adequate support for the path. Where the path is provided as a part of the reconfiguring of a lot, the developer shall extend water service conduits under the path and provide roof water lines to the kerb and channel where applicable.

Concrete shall be N25 in accordance with AS 1379 with a nominal aggregate size of 20mm. If colouring is used full depth colour should be used with white cement. Surface colouring is questionable in quality and suffers from short life.

Reinforcing steel to control shrinkage cracking shall be F72. Reinforcing must be laid on bars chairs and be located in top half of the slab but no less than 30mm from the surface. Every second bar shall be discontinuous across expansion joints.

Contraction joints shall be saw cut and provided at intervals no greater than 30 times the slab thickness or no greater than twice the width of the path. Saw cut contraction joints shall be cut not wider than 3mm to a depth of a quarter of the thickness of the slab. A diamond blade cutter shall be used to cut the joint.

Expansion joints shall be constructed at 12m centres using 10mm thick compressible filler such as foam to within 5mm of the surface. The top 5mm of the joint shall be filled with a sealant such as silicone or "Sikaflex" in a light colour that matches the path colour where possible.

Surface finishes should be non-skid type such as a light broom finish. No allowance should be made in the finishing for contraction joints so a continuous smooth surface is produced.

Concrete shall be cured with appropriate methods as approved by Council.

The level of the ground adjacent to such pathways shall be not lower than 30mm below the edge of the path and not higher than the edge of path.

10.6 PRAM RAMPS

Refer Section 9.1.4 Pram Ramps for details.

10.7 BOLLARDS AND POSTS

A legal case has been heard regarding the use of bollards or posts set into a bikeway to prevent vehicles from using a bikeway. A woman cyclist following a group of cyclists failed to avoid a short post located in the middle of the bikeway permanently damaging knee ligaments. She was awarded a significant damages payout for her injuries.

An answer to the keep vehicles out of bikeways and parks are rails as shown in Figure 6.38 on p100 of AUSTROADS Guide to Traffic Engineering Practice Part 14, as shown in the following photo.

SECTION 11. - STORMWATER AND SUBSOIL DRAINAGE

The detailed design of stormwater drainage shall be in accordance with Council's Planning Scheme documents and other parts of the *Engineering and Development Guidelines*.

Full calculations for all drainage design shall be submitted for checking together with a catchment plan, showing the total catchment, and the sub-areas used in the calculations.

11.1 ROAD DRAINAGE REQUIREMENTS

At locations where the level at the property alignment is below the kerb level, particular care must be taken that the maximum allowable depth of flow is not exceeded, to prevent flooding of properties.

Gullies should, preferably, be located at or about the midpoint of the frontage of allotments, to reduce the likelihood of conflict with future driveway locations and service crossings.

Where curves are super-elevated, it is necessary to ensure that any low points in the kerb and channel resulting from the application of super-elevation are adequately drained and the capacity of kerbing and channelling on the high side is not exceeded. Water shall also be picked up before crossing the road.

The depth of over land flow for a major storm should not exceed 0.3m in sags at the kerb line

11.1.1 DRAINAGE AT INTERSECTIONS

At intersections, particularly where traffic islands are provided, care must be taken to ensure that all low points are drained.

Concentrated flow across the pavement, e.g. from the end of a traffic island to the channel must be prevented by the provision of additional gullies as necessary.

Gullies at intersections should where possible, be located where they are unlikely to be run over by traffic, e.g., preferably at the tangent points of kerbs rather than on the radius, to prevent possible damage to the gully and danger to cyclists. Anti ponding pits are to be used if the low point can not be located out side of the turnout.

11.2 BRIDGES

Generally bridges and culverts shall be constructed from reinforced concrete using standard components where practical from manufacturers and Main Roads Standards.

11.2.1 LENGTH ALONG ROAD CENTRE LINE LESS THAN 6.0M

Bridges or Box Culverts with the top of the deck at road level, with a length measured along the centre line of the road of 6.0m or less, should extend the full width of the minimum road verges with the exception of rural areas.

11.2.2 LENGTH ALONG ROAD CENTRE LINE GREATER THAN 6.0M

Bridges or Box Culverts with the top of the deck at road level, with a length measured along the centreline of the road of greater than 6.0m, shall have a width between kerbs of not less than the following:-

(a)	Residential Access, Rural class 3 and Rural Residential Access	=	8.0m
(b)	All Collector Roads, Rural Arterial	=	8.6m
(c)	Industrial/Commercial Access	=	8.6m
(d)	Arterial/sub-arterial Road	=	2 x 8.6m

11.2.3 BRIDGE DESIGN STANDARDS

Bridges should be generally designed in accordance with the AUSTROADS' "Bridge Design Code" using concrete structures.

All documents are to be certified by a third party Registered Professional Engineer Queensland with relevant bridge design and construction experience.

11.2.4 PEDESTRIAN/CYCLE FOOTWAYS

Pedestrian foot ways shall be provided on bridges or box culverts with a clear width from the inside face of the handrail to the kerb line or guard railing, etc as per the following:-

(a)	Access or Collector Road - both sides	3.0m
(b)	Arterial Road - outer side of each bridge	2.0m
	- On one side of road	2.7m

Hand rails and other facilities shall be in accordance with the Austroads' "Guide To Traffic Engineering Practice" Parts 12 and 13. In particular the rails should be between 1.1 and 1.35m high either side and free of any protrusions or sharp edges. If a single footpath is provided on a bridge it should link up with paths on either side of the approach.

On arterial roads, the span of the bridge may be required to be extended to provide an under pass for pedestrian and bicycle traffic.

11.2.5 BRIDGE SURFACING

Bridges or box culverts with the deck at near road level shall be surfaced with asphalt of minimum thickness of 40mm.

11.3 SUB-SOIL DRAINAGE

For design and estimating purposes, it should be assumed that sub-soil drainage will be required at all locations where the bottom of the pavement is below the natural surface, in all subgrade materials.

Where the road centreline is approximately parallel to the contours, a side drain in general will be required on the high side of the road, while where the centreline is approximately at right angles to the contours, mitre drains may be required. Where the road finishes without a gully pit, the sub-soil drain shall be extended to a concrete outlet clear of the road such that water does not back up in the drain and effect the pavement.

Determination of sub-soil drainage will be made by the Council, at the sub-grade inspection stage, before the placing of any pavement or construction of any kerb and channel. Generally the slope of the sub-soil of the sub-soil drain will follow the slope of the kerb and channel, however the minimum slope shall not be less than 0.3%.

11.3.1 LOCATION

The location of the sub-soil drains will be centrally under the kerb and channel in accordance with Council's Standard Drawings, unless otherwise directed by the Council. Subsoil drains shall also be located:

* at the toe of cuttings greater than 2.0m high.
* Where springs are located on or adjacent to the road
* Across the end of a road at a stage boundary
* Under the invert of grassed swales
* Under kerb/kerb and channel in medians with landscaping or permeable surfacing such as grass or mulch. (refer also section 6.7MEDIANS AND TRAFFIC ISLANDS)
* A short section (600mm) of sub-soil drainage with a capped end shall be provided centrally under the kerb and channel on the inflow side(s) of all gully boxes and manholes where sub-soil drainage is not otherwise provided.

11.3.2 TYPE

Sub-soil drainage shall be in accordance with IPWEA standard Drawing R-0140. The types of subsoil drains used shall be as per the following table

Location	Calliope Shire Council	Gladstone City Council
Sub-surface Pavement Drain	Type B	Type A

In soils with a particle size no larger than 50mm, strip drains may be used similar to a Type 2 Standard Surface Drain on the above drawing.

Subsoil drain depths maybe reduced to 600mm below the invert of the kerb and channel to allow services to pass below, provided they protrude 300mm below the pavement layer.

11.3.3 MEDIANS AND TRAFFIC ISLANDS

Sub-soil drainage in medians/traffic islands are to terminate in a pit, which shall be drained into a gully box or stormwater manhole.

Medians and traffic islands with concrete infills however would not require sub-soil drainage providing the pavement and the bitumen seal is continuous under the joint in the concrete of the median and the kerb island.

SECTION 12. - SERVICES, UTILITIES AND LIGHTING

Provision for services should be made within the road cross section with the creation of the new road and reserve. Provision must be made in the construction of the road for a practical service corridor for the first 4m of the reserve from the property boundary on both sides of the road reserve. Additional widths may be required by Council. The service corridor shall be clear of table and cut-off drains and should have a maximum grade of 25% in any direction. Large trees shall not be left within the service corridor and as such they should be removed or the boundary relocated to retain the drip line of the tree outside of the corridor. Service installations generally end up killing trees left in the corridor by either loss of stability or cutting off sustenance.

12.1 UTILITY ALLOCATIONS

The standard allocations of the footpath cross-section for the various services and utilities is shown on Council's standard drawings. The services are always located with respect to the property alignment along the road frontage of the allotment but not the road. Generally local reticulation services are located between the property boundary and the first four metres of footpath. Trunk mains in some instances will be located outside of this area where space exists.

12.1.1 INDUSTRIAL SERVICES

In Major Industrial areas, Council may have specific utility allocation plans for specialised service corridors which service the industries in these areas. Contact Council for more details.

12.1.2 WATER RETICULATION

Refer the Water Reticulation Standard for further details.

12.1.3 SEWERAGE RETICULATION

Refer to the Sewerage Reticulation Standard for further details.

12.1.4 TELECOMMUNICATIONS

In **rural** areas where sewers are not expected, the standard alignment for the installation of telecommunication lines is 2.4m from the boundary. The telecommunication lines should be installed on the down hill side of the road where practical to avoid any clash with sewers at a later date. This alignment allows the cable to be ploughed in. **The alignment should not vary around trees or hard ground etc without written confirmation of Council.**

In new **urban** areas, joint trenching with underground electricity is preferred with the alignment for conduits being between 0.4 and 0.9m from the boundary. Large Pits are unacceptable in the footpath – refer general conditions below.

12.1.5 ELECTRICITY AND LIGHTING

In urban areas, electricity is required to be installed under ground. Under ground electricity is allocated the space of 0.4 to 0.9m from the property boundary in joint trench operation with telephone or a first in basis.

Over head reticulation and street lighting poles should be installed to the requirements of Appendix B of AS1158.1.3. Poles shall maintain clearances from roadways as required by the Australian Standard. Service poles may be located between 0.1m and 0.5m from the property boundary.

Where there is a table drain or culvert beside the road, the pole should be located clear of drainage paths. Poles should be drilled and excess material removed from the site. Trees cleared in the road reserve shall be removed from the road reserve and disposed of in a legal and proper manner approved by Council.

Where the developer is required to install under ground conduits for utility services, certification shall be provided from the service provider that the work comply with their standards and specifications.

12.1.6 GENERAL CONDITIONS FOR THE INSTALLATION OF UNDER GROUND SERVICE WITHIN ROADS

Council is reluctant to allow trenching across existing bitumen roads particularly now under ground boring is reasonably successful. Where proposed under ground lines cross bitumen roads, two methods of road restoration are acceptable to Council. The first method is boring under the road. The second, where the trench width is less than 125mm, an open trench is allowed provided it is back filled up to 20mm below the surface with cement stabilised sand (from a commercial supplier), and the top 20mm filled with asphalt mix compacted flush to the adjoining bitumen surface. Under ground cable shall ***cross roads at near perpendicular*** to the property alignment with a minimum cover of 900mm. Where pits are provided at each end of the straight run, angles of up to 45 degrees to the road boundary can be used.

Where proposed under ground line crosses gravel roads, an open trench is acceptable, provided the trench is back filled with base course gravel (or stabilised sand) from a commercial supplier which is compacted to 95% compaction at OMC.

Where under ground services cross Council's services, the service provider shall install their services underneath Council's services.

Where lines are installed through creeks, or across road table drains, or within 1.2m of a table drain, under ground cables shall have a minimum cover of 900mm below the lowest water run, invert of table drain, or the outlet of a culvert, which ever is deepest. Where the designated cable alignment is within the table drain of the road, the contractor shall contact Council for an alternative alignment. Failure to comply with these conditions may lead to your line being accidentally removed by routine grading or maintenance, for which Council will take no responsibility.

Attaching to or supporting plant on a Council structure such as a pipe, causeway or bridge is prohibited unless written approval is obtained from Council. Plant attached to Council structures maybe removed by Council at cost to the service provider at any time with service reinstallation at no cost to Council.

All traffic control and signage during construction shall be carried out in accordance with the Manual of Uniform Traffic Control Devices. A copy of Main Roads' "Manual of Uniform Traffic Control Devices" or "Roadworks Signage Guide" shall be immediately available on request on site. Council may order a stop work on projects with inappropriate roadworks signage. Roadworks signage shall be applicable for the immediate site and only displayed during on-site working hours unless a hazard exists within 4m of the travel lane. Pedestrian traffic shall also be protected by signage lighting and barricading in accordance with the Manual of Uniform Traffic Control Devices.

Where lines are installed which are not detectable from the surface such as fibre optic, the constructor shall install the line in a conduit or install a trace wire 200mm directly above the line which is able to be readily utilised by field location staff for surface detection.

Pits larger than 1200mm long, wider than 600mm, or deeper than 750mm must be identified on the plans and located as directed by Council on site to minimise nuisance to other services and adjacent owners.

Telecommunications, electricity and other service conduits shall be installed in accordance with the requirements of the particular authority and specifically to the requirements of the Council.

In general, services shall cross the footpath on a level grade and at a minimum depth of 150mm below any water mains in the footpath. All services crossing the kerb shall have indicators located in the face of the kerb and channel.

Council requires that the surface of the excavation be reinstated in a like for like condition. ie if the existing footpath had 100mm of topsoil and grass cover before excavation, the footpath should be reinstated to the same. Excavated material from excavations in urban areas should also be controlled to prevent sediments from entering kerb and channel and stormwater systems. Surface stabilisation of turf (including establishment) should prevent this from finished excavations.

It is advised to locate existing services in the field prior to excavation or construction. Council offers free water and sewer locations which should be utilised prior to commencing construction.

12.2 STREET LIGHTING

Street lighting shall be installed on Council roads where specified below in accordance with AS1158 unless otherwise specified in this standard. Street lighting layouts shall be submitted with the Operational Works application for roadworks.

12.2.1 LIGHTING CATEGORIES FOR ROAD CLASSIFICATION

Table 12.2.1depicts the minimum category of lighting required for each type of road unless specified otherwise in development approval conditions. Refer Also to Table 1.1 AS1158.3.1 1999.

Type Of Development	Classification	Lighting Category
Residential	Access Street	P4/P5[1]
	Collector	P4
Rural	Access	Intersection[3]
	Collector	Intersection[3]
Industrial/ Commercial	Access	P4/P5[1]
	Collector	P4
Rural Residential	Access	P4/P5 [1]
	Collector	P4
Arterial [2] .	Sub-Arterial	P4, V4 or V5
	Minor Arterial	V3, V4 or V5
	Major Arterial	V1, V2, or V3
	Rural Arterial	Intersections [3]
	Without adjoining urban development	Intersections and potential hazards

1. Category P5 is the absolute minimum standard and can only be used if there are existing reticulation poles. Otherwise P4 to be used.
2. Lighting categories for arterial roads will determined by Council according to pedestrian cyclist and vehicle traffic, and surrounding land uses
3. Intersection flag lighting maybe required by Council where power is available.

Table 12.2.1 - Minimum Categories Of Lighting

Lights should be provided in accordance with AS 1158 unless otherwise noted in this Standard.

12.2.2 INTERSECTIONS AND OBSTACLE LIGHTING

In accordance with AS 1158, lighting shall be provided at intersections, bends, traffic islands, slow points , road terminations, or any other location where the driving task is generally more complex than elsewhere along the route.

Council may allow small fully mountable traffic islands in residential areas which may have a reduced level of lighting to avoid having an too many lights in one area.

12.2.3 PARKS, PATHS AND BIKEWAYS

Parks and Bikeways may be requested to have lighting installed under certain circumstances. Lights provided in parks shall be vandal resistant such that the luminaire is at least 6m from the ground or foot hold. Under ground power reticulation is required to the lights in parks within open spaces.

Lighting on paths in parks in commercial areas shall comply with AS1158.4. Feature lighting in commercial parks shall be of high quality fitting of common origin installed in a low maintenance method to the satisfaction of Council. All lighting in park adjoining commercial or industrial uses shall be installed with timer switches to control the hours of lighting from a convenient secure location.

12.2.4 LIGHTING POLES AND LUMINAIRS

Generally the light poles shall be located in accordance with Council's standard drawings and Section 12.1.5 Electricity of this standard.

Frangible poles shall be used where the traffic speed environment is over 70km/h with underground conduiting connecting the electricity. The electricity authorities generally do not install this type of equipment, therefore the developer shall provide the design and construct the lighting system. However, the luminaires shall use lighting lamps which are able to be maintained by the local electricity authority or agents thereof. A statement from the electricity authority confirming this shall be submitted to Council before accepting the lights.

Where solid poles are installed, the centre of the pole shall be no less that 700mm from the invert of the kerb and channel.

Nostalgia type light poles may be approved on application to Council. These fittings are extremely expensive and vulnerable to vehicles and vandalism. History has shown that they are prone to being damaged during the building phase of the development. Nostalgia lights are not to be used in park lands.

In residential and commercial areas, Council prefers to use mercury vapour type lamps because of their colour rendition. All other areas may use high pressure sodium.

Where lights are above P4 category or emit more light than a 80w Mercury vapour lamp are installed within 40m of residential houses or 20m of new residential allotments, luminaires minimising glare to adjoining residences shall be used such as an “aero -screen” luminaire.

12.2.5 DEVELOPER'S RESPONSIBILITIES

For lighting in new subdivisions, installations shall comply with the requirements of the electricity authority such that they are accepted by the electricity authority for the "Rating 2" category charges of the Electricity Authority. "Rating 2" category is where the developer pays the capital cost of the light and installation and the Council pays for the energy and maintenance of the light. Nostalgia type lights are acceptable under the above premise, provided Council has no responsibility to replace the light pole if damaged.

Where frangible poles are used, the type of lamps and luminaires shall be such that the electricity authority will accept to carry out maintenance of the lamp (Council pays for the maintenance and replacement separate to the energy under the electricity authority's "Rate 3" charges).

Light fittings used in the development of public land shall be supplied by a known reputable supplier with a reliable spare parts backup service. Suppliers such as GE, Thorn, and Sylvania are generally acceptable.

12.3 SERVICE CONDUITS

Service conduits shall be provided in the sub-grade of all subdivisional roads before pavement construction. Installation after the placing of pavement material will not be allowed, except by under-road boring. The locations of conduits will be specified by Council, but generally, the conduits for particular services will be located opposite alternate property boundaries, having regard for the location of other underground services.

12.3.1 BACKFILL

Backfill material shall be compacted to 100% Standard compaction at O.M.C. in 100mm (maximum) layers for the total depth of the trench up to the sub-grade finished level. Where conduits are installed after the construction and compaction of the sub-grade to finished level, the Council may require the backfill to be full depth cement stabilised sand.

12.3.2 WATER SERVICE CONDUITS

Water Service Conduits shall be 100mm diameter uPVC Class 6 (minimum) pressure pipe, or other materials approved by the Council, laid at 90^{o} to the road centre line. The location of each conduit shall be marked on both sides of the road by the installation of a brass indicator disc in the face of and 50mm from the top of the kerb. Details for conduit locations for urban and rural developments are contained in Council's Standard Drawings.

12.3.3 PARKS/MEDIANS

All parks, open spaces, etc. shall be provided with a water service conduit in situations where a water main is not adjacent to a park boundary. All grassed medians and traffic islands shall also be provided with a water service conduit.

The location of these conduits shall have regard for the economical installation of future irrigation watering systems, e.g. conduits to be located near to middle of medians, not at either end. Long medians may require the provision of two (2) or more water service conduits.

SECTION 13. - DESIGN AND CONSTRUCTION REQUIREMENTS

The following guidelines are provide for the procedures for design and construction of works associated with development.

13.1 ROAD DESIGN DOCUMENTATION REQUIREMENTS

Documentation for submission to Council for approval should in general contain the following:-

(a) Title Page

(b) Locality Plan

(c) Layout and Stage Plan

(d) Engineering Drawings containing

(i) Plan of each road

(ii) Longitudinal Section of each road

(iii) Intersection Detail Plan of each intersection

(iv) All existing services in or adjacent to the works.

(iv) Standard Cross-sections

(v) Cross-sections of each road

(vi) Longitudinal sections of each drain line

(vii) Traffic Management Plans setting out pavement marking and signage

(Viii) Stormwater Management Plan – see stormwater standards.

(e) Specifications of Works

(f) Copies of Standard Drawings appropriate to the construction.

(g) Roadworks Signing plans appropriate to the construction

(h) Schedules of Quantities from proposed contract.

(I) Pavement Design

(J) Stormwater Drainage Design

13.1.1 LOCALITY PLAN

Locality Plan to show the location of the subdivision in relation to adjacent towns, main roads, major streets, etc.

13.1.2 LAYOUT AND STAGE PLAN

For large subdivisions, the layout plan should show the relationship of all new roads to each other, and to existing roads adjoining the subdivision.

Where development is to be carried out by stages, the boundaries of proposed stages should be shown on this plan and the stages identified by numbering.

For small subdivisions, where all new roads can be shown on one detail plan, the layout plan may be omitted.

13.1.3 ENGINEERING DRAWING REQUIREMENTS

Engineering Drawings shall be in accordance with the following:-

(a) Plan - the Plan of each road shall include:-

(i) Road reserve boundaries.

(ii) Allotment boundaries, both existing and proposed.

(iii) Centreline or other construction line.

(iv) Chainages, on centre line or construction line.

(v) Bearings of the centreline or construction line.

(vi) Offsets, if the construction line is not the centreline.

(vii) Tangent point chainages of each curve.

(viii) Radius, arc length, tangent length and secant distance of each curve.

(ix) Road reserve boundaries, centreline and bearing of each intersecting road.

(x) Chainage of the intersection point of road centrelines.

(xi) Kerb lines, kerb radii, and chainage of all tangent points of the kerb line.

(xii) Edge of pavement, where no kerb is to be constructed.

(xiii) Dimensioned road reserve, footpath and pavement widths, where these differ from the standard cross section.

(xiv) Location and details of signs and road markings to be provided.

(xv) Drainline locations, diameters, and class of pipe.

(xvi) Manhole locations, and inlet and outlet invert levels.

(xvii) Gully locations, and invert and kerb levels.

(xviii) Location and levels of existing utilities or other existing works within the site.

(xix) Limits and levels of allotment filling or grading.

(xx) Location and levels of Bench Marks and Reference Pegs.

(xxi) North Point.

(b) Longitudinal Sections - The longitudinal section of each road shall include:-

(i) Chainages.

(ii) Existing surface or peg levels.

(iii) Design road centreline levels.

(iv) Cut or fill depths.

(v) Design grades.

(vi) Chainage and levels of grade intersection points.

(vii) Chainage of tangent points and radius of vertical curves.

(viii) Lengths of vertical curves.

(ix) Sections on control lines on superelevated curves (i.e., pavement edges, kerb or lane edges).

(x) Curve data and super elevation diagrams on bottom of long section.

(xi) Pipe locations of existing and proposed services and stormwater lines.

(xii) Sight distance diagram, for each direction of travel.

For subdivisions on reclaimed land, where road grades do not exceed 0.5% the longitudinal section of the road may be omitted, provided centreline and kerb levels at all pegged chainages and at all crest and sag points, are shown on the Plan.

(c) Intersection Detail Plans - Intersection detail plans shall include all the relevant information required for Plans, as listed in (a) above, together with additional details such as kerb levels on all kerb returns, pavement contours, and channelisation works.

(d) Standard Cross Sections - A standard cross section shall be shown for each road, including:-

(i) Road reserve width.

(ii) Pavement width.

(iii) Footpath widths.

(iv) Cross falls of pavement and footpaths.

(v) Pavement depth.

(vi) Type of kerb and channel.

(vii) Type of pavement surfacing.

(e) Road Cross Sections - A cross section shall be shown for each pegged chainage on each road except in flat country where all cross sections conform to the standard cross section.

Cross sections shall show:-

(i) Road reserve boundaries.

(ii) Pavement centre line (or other construction lines).

(iii) Natural surface.

(iv) Design cross section

(v) Cross fall of pavement and footpath, pavement and footpath widths, and pavement depths, wherever these differ from the standard cross section. ie on a flank widening.

(vi) Existing services where relevant to the construction process.

(f) Longitudinal Sections of Drain lines - A longitudinal section of each drain line shall be shown, including:-

(i) Chainages.

(ii) Existing and finished surface levels.

(iii) Design invert levels and hydraulic grade line for Minor Flows.

(iv) Manhole chainages, and inlet and outlet invert levels.

(v) Distances between manholes.

(vi) Grade of each pipe.

(vii) Diameter of each pipe length.

(viii) Class of each pipe length.

13.2 COORDINATION OF SERVICES

In subdivisional works or complex building work, the consulting Engineer designing the project is expected to coordinate the location of services expected within the development. The supervising Engineer is expected to show all services on plans and long sections so as to minimise service clashes. Where trunk lines are expected within the development, the Engineer may have to widen the road reserve or shuffle the road or services about the reserve cross section. Where this occurs, the Engineer shall indicate the proposed services cross section in the Engineer drawings for approval of Council.

13.3 SPECIFICATIONS OF WORKS

Full specifications, covering all aspects of the proposed works, shall be submitted for approval.

Generally, specifications in accordance with Main Roads' *Standard Specification for Roads* shall apply, and have been "called up" throughout this Design Standard where applicable. Where a Main Roads standard is not available or not considered applicable, sufficient information has been included throughout the text and on standard drawings in this regard.

Manufactured products shall be in accordance with the relevant Australian Standards or the manufacturers recommendations.

Where a Council Standard Specification is available it shall be included in the Specifications for the work, but in the interim, Consultants may continue to use their own standard specifications, subject to these being approved by Council.

13.4 SCHEDULES OF QUANTITIES

Schedules of Quantities shall be submitted, including all roadworks and associated works such as drainage and allotment clearing or grading, which are proposed to be carried out.

All Schedules of Quantities shall be in metric units. Usual units shall be:-

Length	metre	(m)
Area	square metre	(m^2)
Volume	cubic metre	(m^3)
Weight	tonne	(t)
	kilogram	(kg)

13.5 PAVEMENT DESIGN

Pavement design calculations including details of sub-grade sample locations and copies of the test results, etc. in accordance with 9.4 PAVEMENT DESIGN , shall be submitted with the documentation for checking and approval by Council.

Pavement Material test results shall be submitted for approval by Council, prior to the placing of any pavement material.

13.6 STORMWATER DRAINAGE DESIGN

Details including Catchment Plan showing total catchment and sub-areas used in the calculations and full calculations for all stormwater drainage in accordance with Council's Stormwater Drainage Standard shall be submitted with the documentation for checking and approval by Council.

13.7 INSPECTION AND TESTING REQUIREMENTS

At various stages of works during the construction period, a representative of Council shall be invited to carry out audit inspections.

Without limitation, inspections shall be at the “hold points” detailed below, and construction shall not proceed beyond a "hold point" without approval.

Inspections will only be carried with the Supervising Engineer during normal office working hours with a minimum of 24 business hours notice.

13.7.1 INSPECTIONS

Inspections for road works are required in accordance with the following requirements. Hold point forms outline the minimum works to be completed before the inspection is to take place.

Hold point forms will generally be issued by each Council after the works are approved by Council. Hold point forms outline the pre-requisites to be completed before a particular inspection takes place. When the Supervising Consulting Engineers have inspected the work and is satisfied that the works are ready for the next stage to commence, they shall sign and fax the completed hold point form to Council and arrange an inspection.

The Supervising Consulting Engineers will bring two copies of the original hold point form to the inspection with any test results required, whereupon the Engineer will certify the work by signing both copies of the forms. The Council officer if satisfied with the work will also sign both copies if the work can proceed and retain one copy for Council records.

Inspections shall be carried out at the stages as outlined in the following paragraphs.

13.7.1.1 Pre-start meeting

A meeting shall be carried out before works commence to familiarise contractors, engineers and Council representatives with the procedures for carrying out the works and to sort out any administrative matters necessary such as construction water, site safety, inspection procedures etc.

13.7.1.2 Sub-soil drainage determination

An onsite meeting shall be carried out when the bulk earthworks are reaching the final levels for road and allotments to determine the extent of the subsoil drainage. The extent of subsoil drainage will be determined on-site and indicated on additional copies of the road works plans.

13.7.1.3 Sub-grade audit inspection

A sub-grade audit inspection shall be carried out before the placement of any pavement materials or kerb and channel. Works subject to this inspection would generally include:-

* Confirmation of extent of sub-soil drainage constructed
* Service conduits and back filling
* Stormwater drainage and back filling
* Sub-grade profile and compaction
* Load testing of pavement

Sub-grade compaction test results shall be available at the time of inspection. Tests shall be carried out at 150m (maximum) intervals with a minimum of two tests per length of road.

Load testing will usually be carried out at this inspection and therefore a full water truck with a legal axle loading shall be available for the inspection. All other vehicles are to be removed from the road. Soft areas shall be removed and replaced with selected material.

13.7.1.4 Pavement (pre-seal) audit inspection

A pavement audit inspection shall be carried out after the pavement has been swept, but prior to bitumen sealing or primer. It is advised that a preliminary pavement inspection be arranged before the sealing works are programmed to allow for any remedial works, however this inspection does not limit in any way the subsequent inspection.

It should be noted that sealing works will not be approved unless final approvals (pressure tests, etc.) have been obtained for all water mains and sewerage works that are located under the road to be sealed.

Works subject to this inspection would generally include:-

* Pavement profile and compaction
* Pavement surface
* Kerb and channel water test
* Gully boxes and maintenance holes are to be completed and backfilled
* Conduit markers in kerb and channel

Pavement material and compaction test results shall be available at the time of this inspection. Tests shall be carried out in accordance with *Sections 9.4.5 Pavement Material Quality Testing* and *9.4.6 Compaction Standard and Testing Requirements*.

13.7.1.5 "On-Maintenance" audit inspection

The on-maintenance audit inspection shall be carried out before the works are approved for commencing the on-maintenance period. The inspection should include all works involved in the development.

Works subject to this inspection would generally include:-

* Signs, guideposts, guardrails and line marking
* Allotment survey pegs and PSM's
* Allotment earthworks
* Stormwater drainage outlets works
* Final trim to the area

Test results for allotment fill earthworks shall be available at the time of this inspection.

The Supervising Engineer's "Certificate of Supervision and Compliance" together with the "As Constructed Plans" shall be submitted for Council approval at this time.

13.7.1.6 "Off-Maintenance" audit inspection

The off-maintenance audit inspection will include all works constructed as a part of the development and shall be carried out before they are taken over by Council.

It should be noted any outstanding requirements shall be satisfied (e.g. "As Constructed" plans, re-vegetation, etc.) before the works are released off maintenance.

13.7.2 "AS CONSTRUCTED" INFORMATION

The "as constructed" plans signed by the Supervising Engineer, shall be submitted to Council after the works are completed.

"As Constructed" drawings must be submitted and approved prior to the subdivision being placed on maintenance by Council. Refer to the "as constructed" standards for the appropriate Council for details of the required information.

13.8 MAINTENANCE PERIODS

The maintenance period should be treated as a defects liability period. Where an allotment has been sold and building works commenced, the developer shall not be responsible for the reinstatement of the footpath.

To avoid trespass the developer shall ensure that the stabilisation of the areas disturbed by earthworks on the allotments is effective at the time the development is place on maintenance. In urban areas, a silt fence shall be installed into the ground along the road boundary of the allotments on the uphill side of the road.

During the maintenance period, removal of silt from footpaths kerb and channels table drains stormwater pipes and pits, and restoration of the surfaces covered by the deposited sediments and scoured by runoff shall be carried out by the developer.

Roads and the associated furniture are expected to be maintained in a similar condition to when the it went on maintenance.

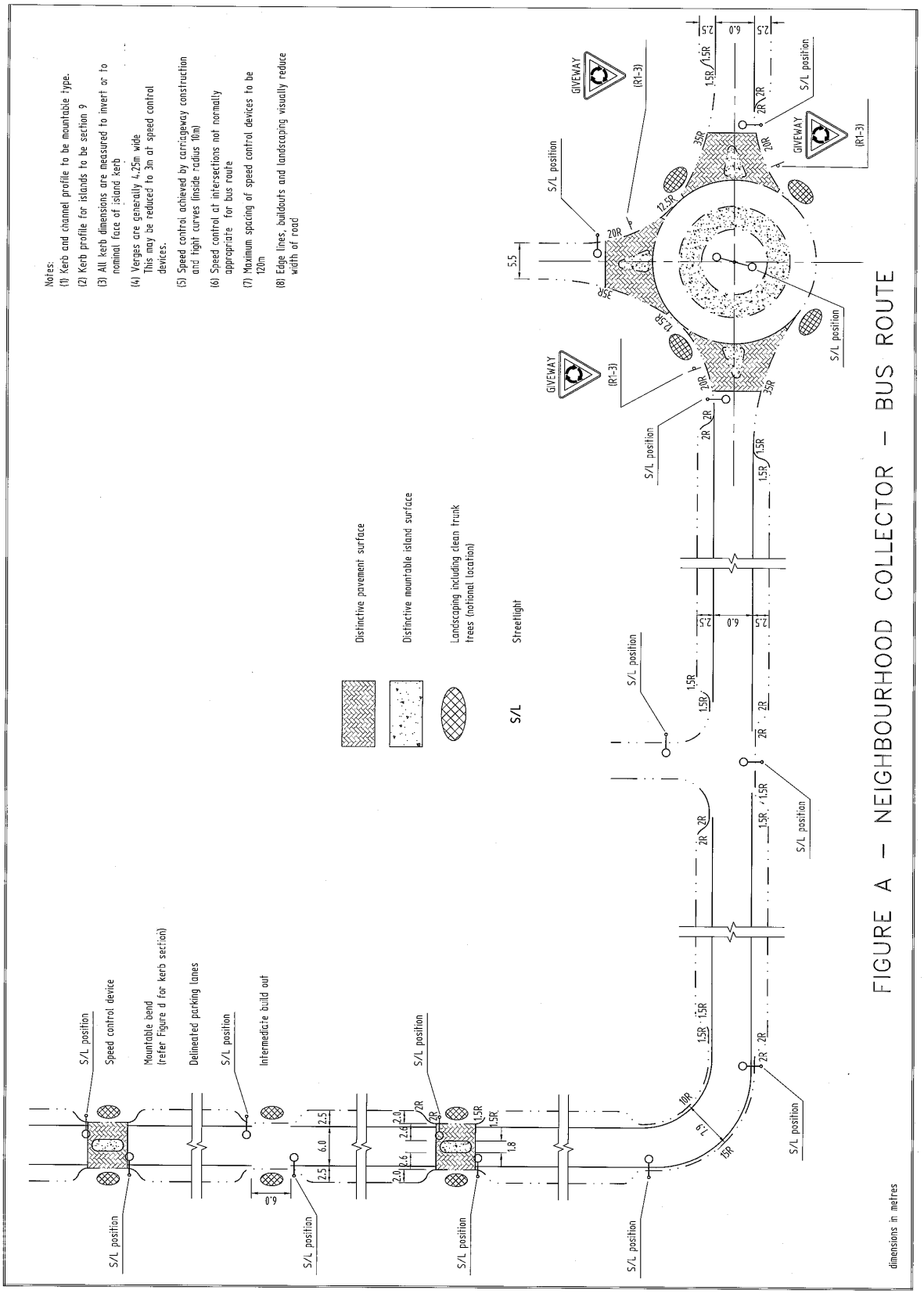
Loose stones shall be swept from the roadway and kerb and channel. Where allotments have not been subject to building works during the maintenance period , footpaths shall be of a profile in accordance with the standard drawing with any subsidence or deposits rectified and the surface restored. Profile of service boxes must be maintained at the correct height above the surrounding ground. All stormwater pipes pits and outlets shall be kept clean and clear of debris and sediment.

Where builders and owners have purposely modified the verge or kerb and channel, the contractor may be exempt for rectifying damage that can be unequivocally blamed on the builder or owner.

Failure to comply with these requirements will result in Council using the maintenance bond to rectify these matters.

SECTION 14. - APPENDIX A (TYPICAL SLOW POINTS)

Contents –


Notes:
(1) Kerb and channel profile to be mountable type.
(2) Kerb profile for islands to be section 9
(3) All kerb dimensions are measured to invert or to nominal face of island kerb
(4) Verges are generally 4.25m wide This may be reduced to 3m at speed control devices.
(5) Speed control achieved by carriageway construction and tight curves (inside radius 10m)
(6) Speed control at intersections not normally appropriate for bus route
(7) Maximum spacing of speed control devices to be 120m
(8) Edge lines, buildouts and landscaping visually reduce width of road
Distinctive pavement surface
Distinctive mountable island surface
Landscaping including clean trunk trees (national location)
S/L Streetlight
S/L position
Speed control device
Mountable bend (refer Figure d for kerb section)
Delineated parking lanes
Intermediate build out
GIVEWAY
(R1-3)
dimensions in metres
FIGURE A – NEIGHBOURHOOD COLLECTOR – BUS ROUTE

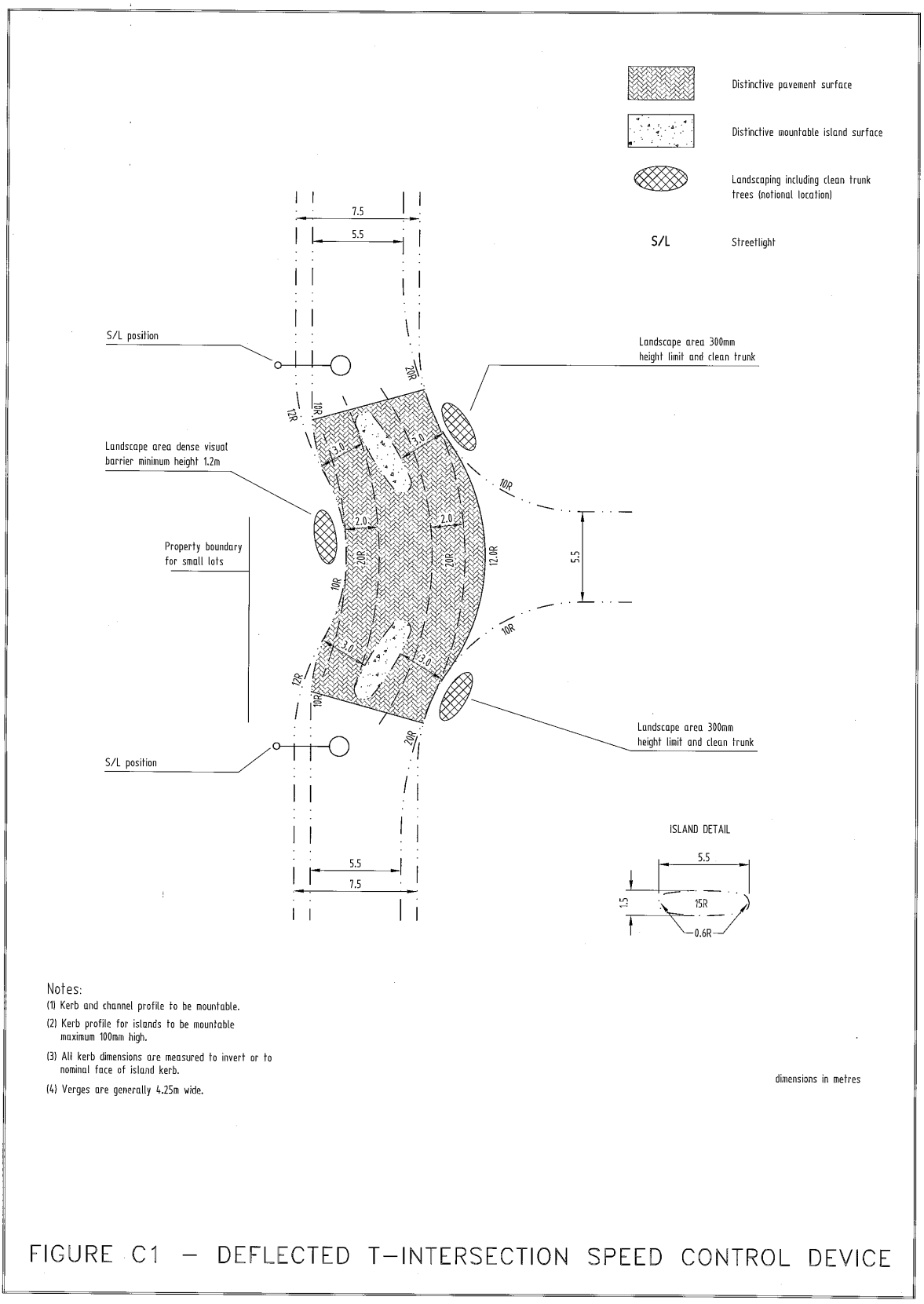
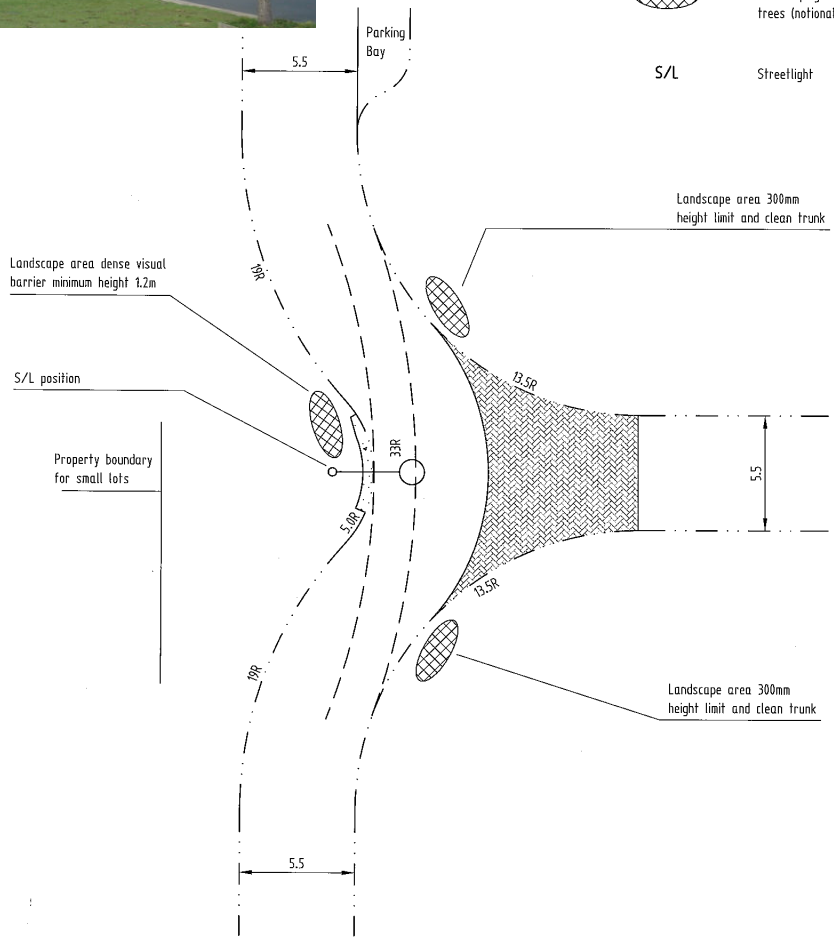


FIGURE C1 – DEFLECTED T–INTERSECTION SPEED CONTROL DEVICE



Notes:

(1) Kerb and channel profile to be mountable.

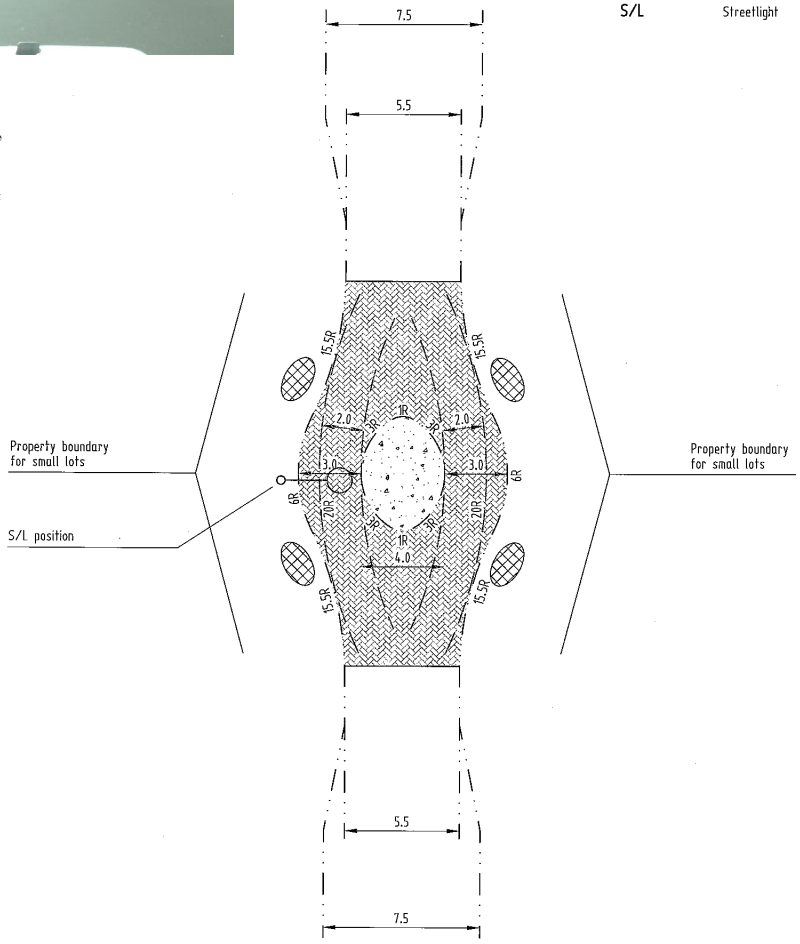
(2) Kerb profile for islands to be mountable maximum 100mm high.

(3) All kerb dimensions are measured to invert or to nominal face of island kerb.

(4) Verges are generally 4.25m wide.

dimensions in metres

FIGURE C2 – DEFLECTED T–INTERSECTION SPEED CONTROL DEVICE



Notes:

(1) Kerb and channel profile to be mountable type.

(2) Kerb profile for islands to be mountable type maximum 100mm high.

(3) All kerb dimensions are measured to invert or to toe of island kerb.

(4) Verges are generally 4.25m wide.

dimensions in metres

FIGURE D – TRAFFIC ISLAND SPEED CONTROL DEVICE

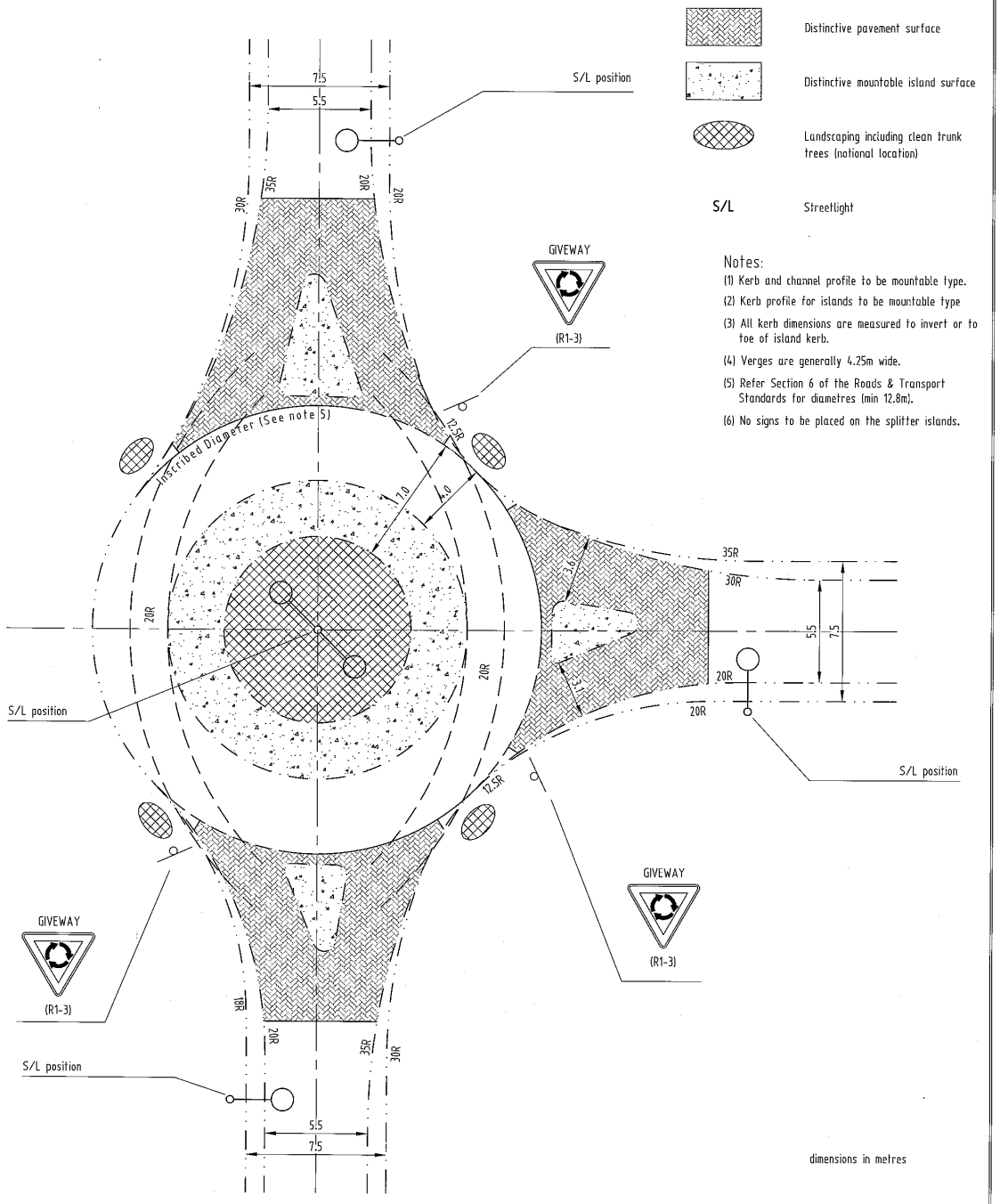
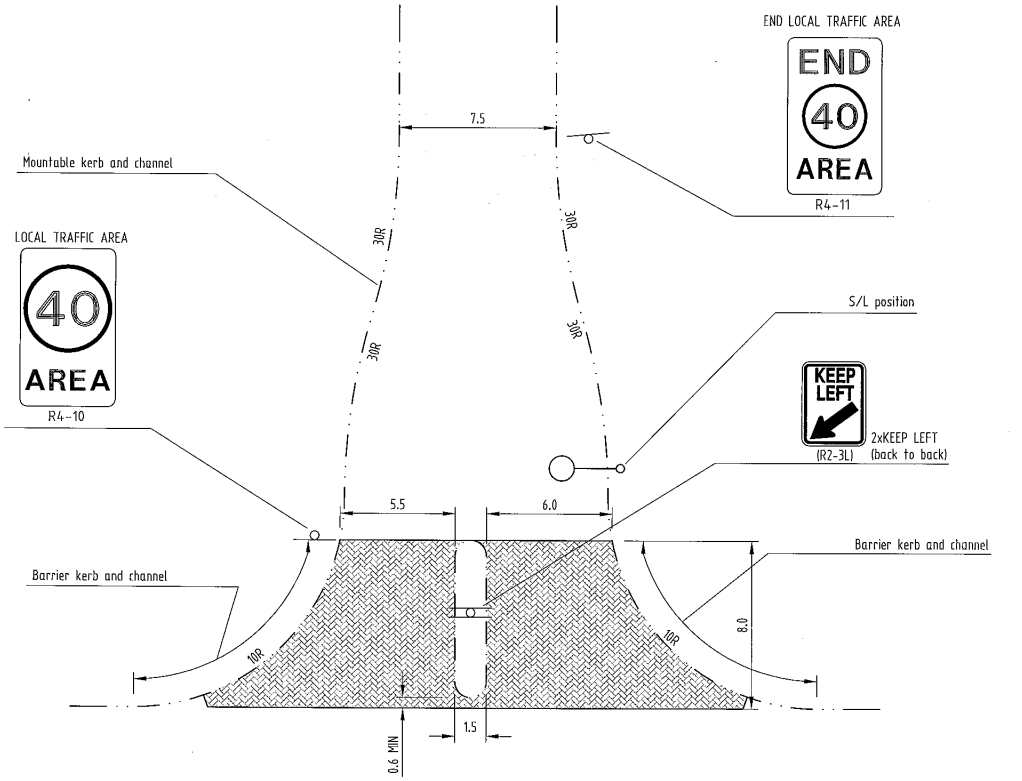
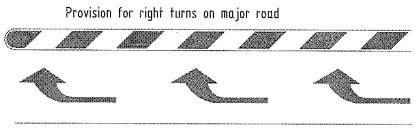


FIGURE E – MINOR ROAD ROUNDABOUT





Distinctive pavement surface

S/L Streetlight

Notes:

(1) Kerb and channel profile to be mountable type expect where shown.

(2) Kerb profile for islands to be mountable type.

(3) All kerb dimensions are measured to invert or to nominal face of island kerb.

(4) Verges are generally 4.25m wide.

(5) The design of these treatments should allow for safe turns from the arterial road. This may require locating the splitter island further away from the intersection, or relocation of sign R2-3, or both.

dimensions in metres

FIGURE G –
NEIGHBOURHOOD ACCESS/MAJOR ROAD INTERSECTION TREATMENT

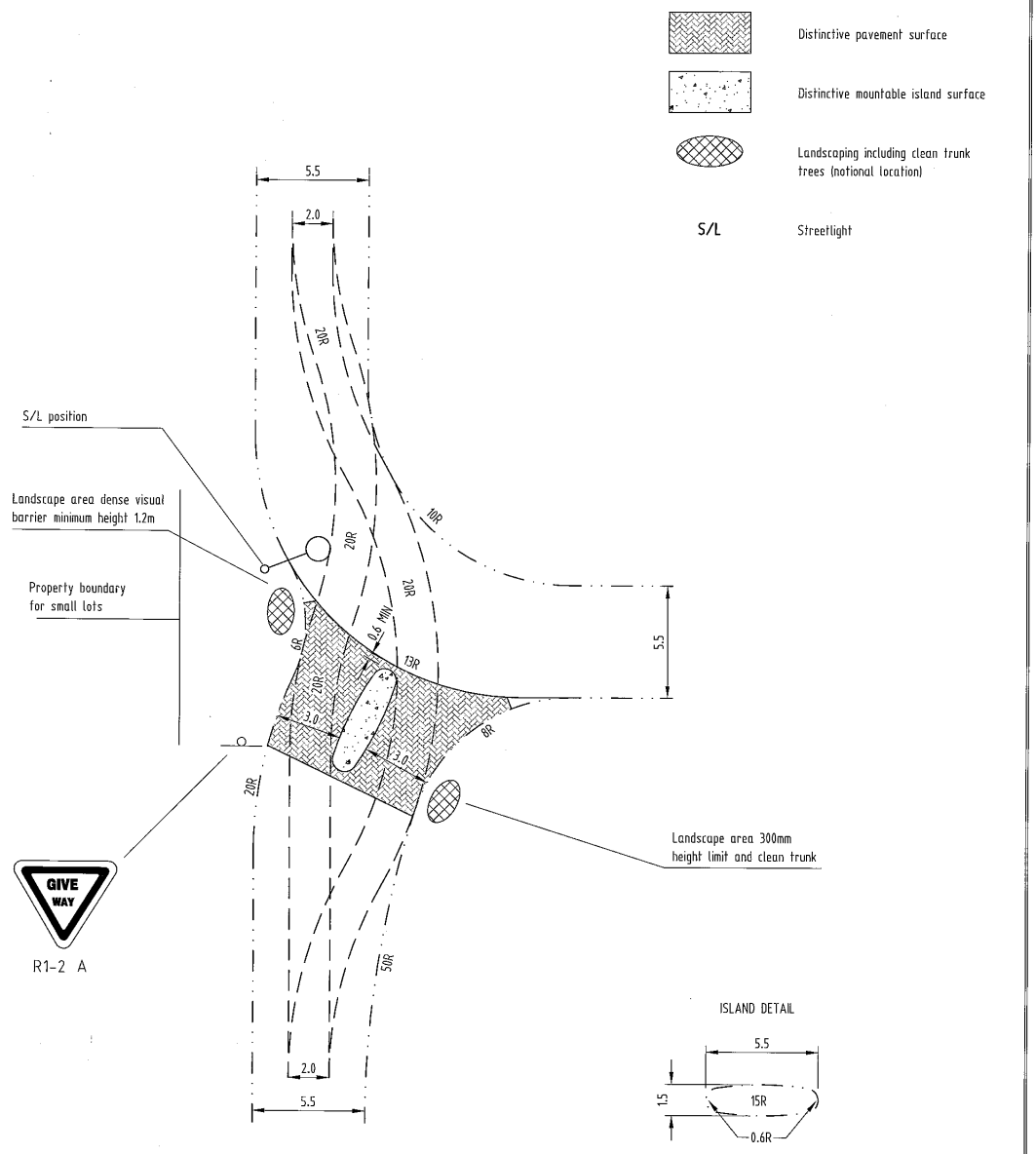


FIGURE H –
PRIORITY ALTERED T–INTERSECTION SPEED CONTROL DEVICE

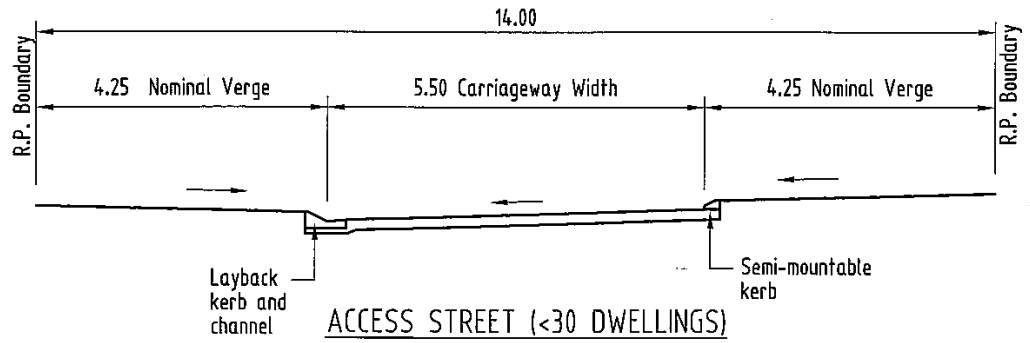
SECTION 15. - APPENDIX B (STANDARD DRAWINGS)

Not all Standard Drawings are contained in this standard. Some have been referenced from other sources. Some standards are referenced from other locations. IPWEA standards may be altered by the text of this standard. RATS= Road and Transport Standard. IPWEA drawings are under review currently by the IPWEA.

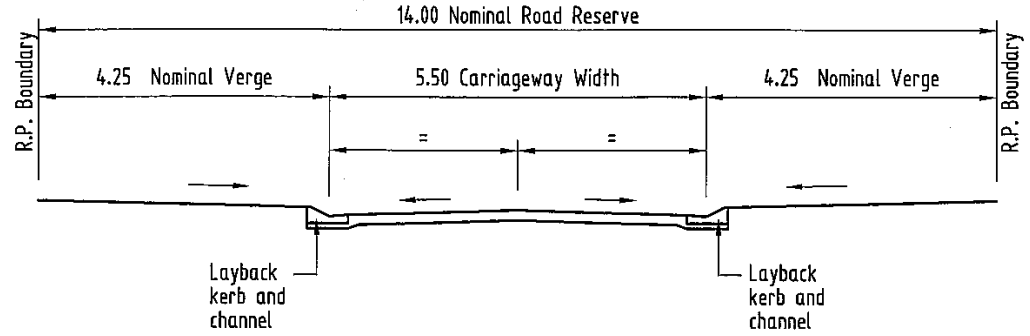
DRAWING TITLE OR SUBJECT	GLADSTONE CITY COUNCIL	CALLIOPE SHIRE COUNCIL
Cross Sections		
Urban road cross sections	RT- 0010	RT- 0010
Rural road sections are in the text of standard	In Standard text	In Standard text
Service Allocations		
Footpath Allocations For Public Utilities –	RT-0111	RT-0110
Standard Allocation of Services Joint trench layout	RT- 0112 Ex GCC – R-005	Not applicable
Water service Conduit Details - Urban	IPWEA R-0160	IPWEA R-0160
Rural Water Service Conduit Detail	RT-0165	RT-0165
Road Details		
Standard Type Kerbs and Channel (refer text for adopted profiles	IPWEA R-0080	IPWEA R-0080
Kerb Ramps	IPWEA R-0084	IPWEA R-0084
Kerb ramps for commercial or industrial areas Types 1, 2 and 3 (reference only – not included)	IPWEA R-0085 R-0086 R-0087	IPWEA R-0085 R-0086 R-0087
Kerb Adaptor Location Detail	RT-0083	RT-0083
Kerb and channel , drainage connections	IPWEA R-0081	IPWEA R-0081
Sub-Surface Drainage Details	IPWEA R-0140	IPWEA R-0140
Details at Median Islands	IPWEA R-0141	IPWEA R-0141
Street Name Sign Detail	RT-0129	RT-0129
Traffic Control Devices	RT-0130	RT-0130
Footpaths and Bikeways		
Concrete footpath details	IPWEA R-0065	IPWEA R-0065
Pathway joint details	IPWEA P-0012	IPWEA P-0012
Bikepath Slow Down Reverse Curve (reference?)	IPWEA P-0013	IPWEA P-0013

DRAWING TITLE OR SUBJECT	GLADSTONE CITY COUNCIL	CALLIOPE SHIRE COUNCIL
Bikepath Entrance to Road Reserve(reference?)	IPWEA P-0010	IPWEA P-0010
Street Tree Clearances	RT-0170	RT-0170
Driveway Access		
Refer 8.3 INDUSTRIAL AND COMMERCIAL ACCESS	Refer text	Refer text
Residential Cut Down Driveway - Mountable kerb and channel	RT-0055	RT-0055
Rural Property Access	RT-0056	RT-0056
Motor Grid	MR 1351	MR 1351
Fences and gates	MR1600 - 1602	MR1600 - 1602
Guard Rails and Barriers Refer Queensland Transport and Department of Main Roads Standard Drawings and specifications.	Department of Main Roads website	Department of Main Roads website
Road Edge Guide Posts	MR1356 and MR1357	MR1356 and MR1357

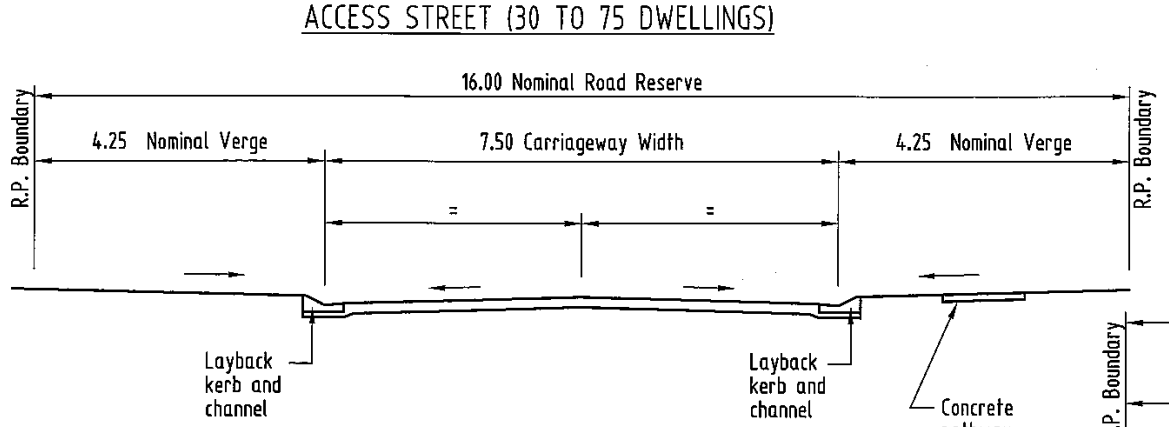
Most Department of Main Roads standard drawings are contained on their web site.



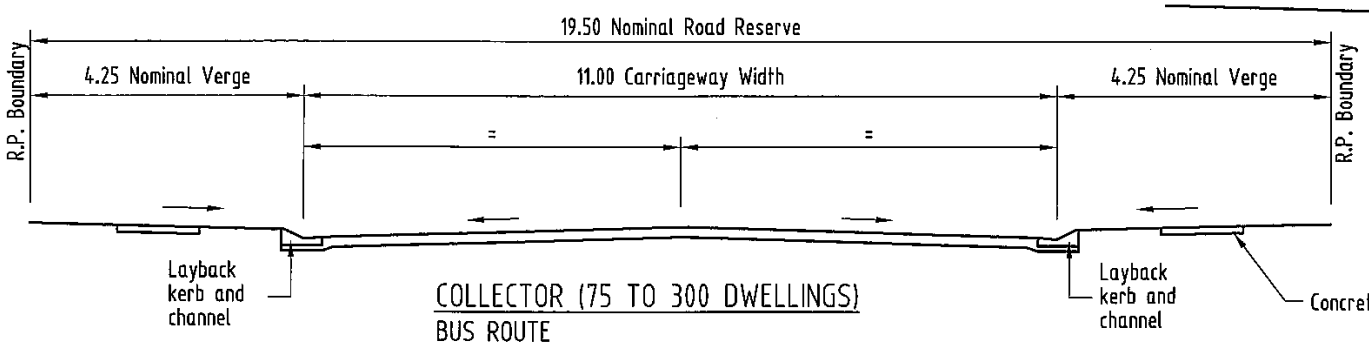
ACCESS STREET (<30 DWELLINGS)



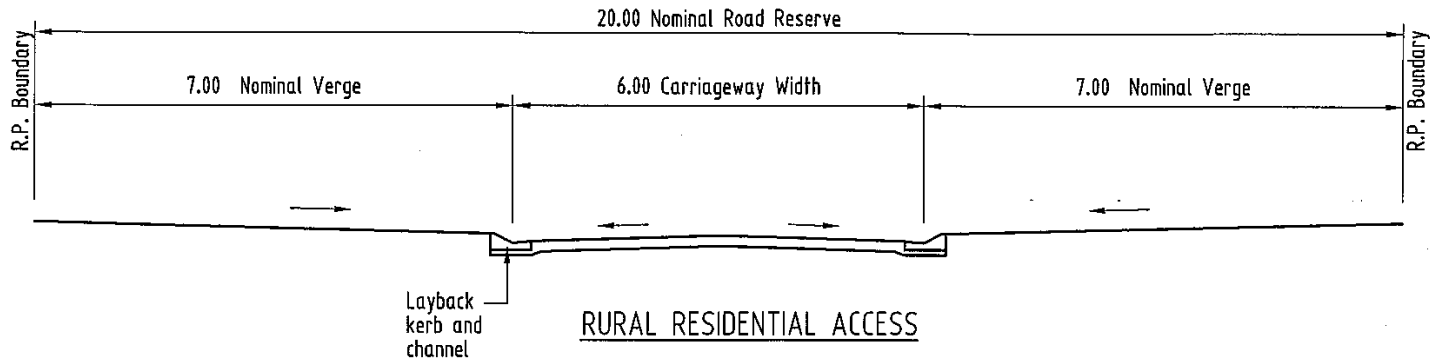
ACCESS STREET (30 TO 75 DWELLINGS)



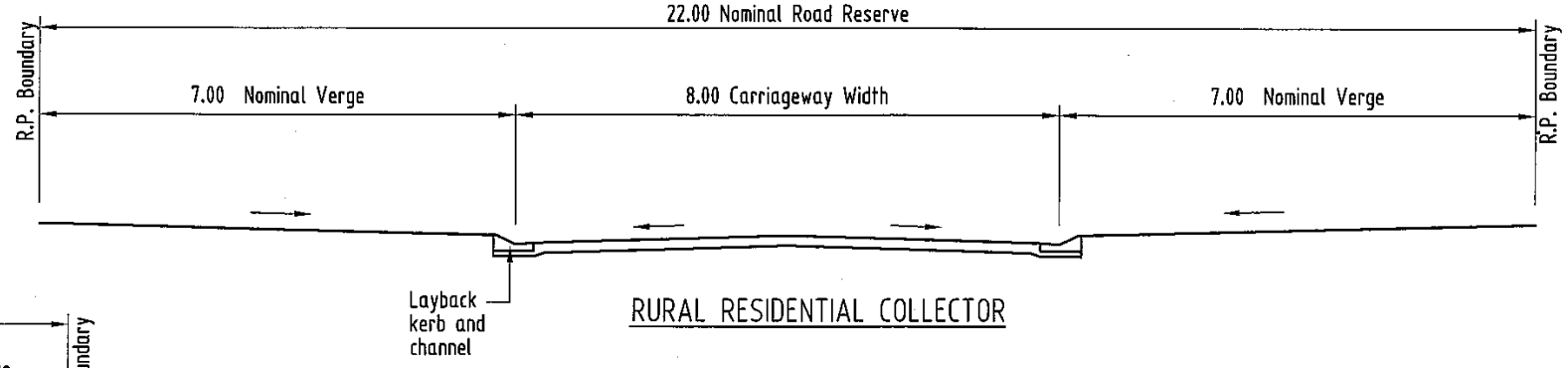
COLLECTOR (75 TO 300 DWELLINGS)
NON BUS ROUTE



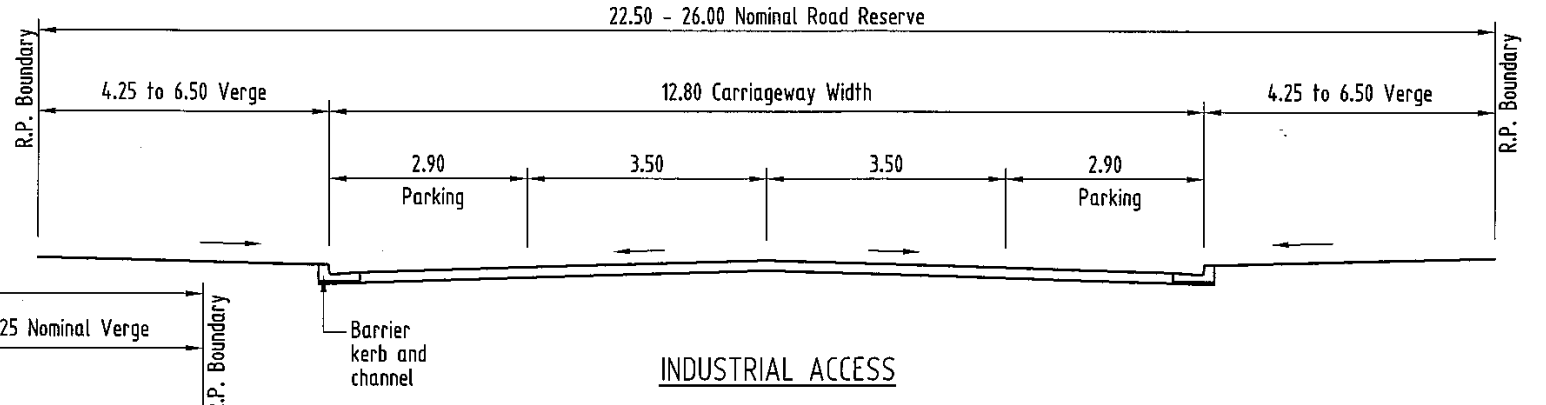
COLLECTOR (75 TO 300 DWELLINGS)
BUS ROUTE



RURAL RESIDENTIAL ACCESS



RURAL RESIDENTIAL COLLECTOR



INDUSTRIAL ACCESS

LEGEND

→ Cross Fall direction

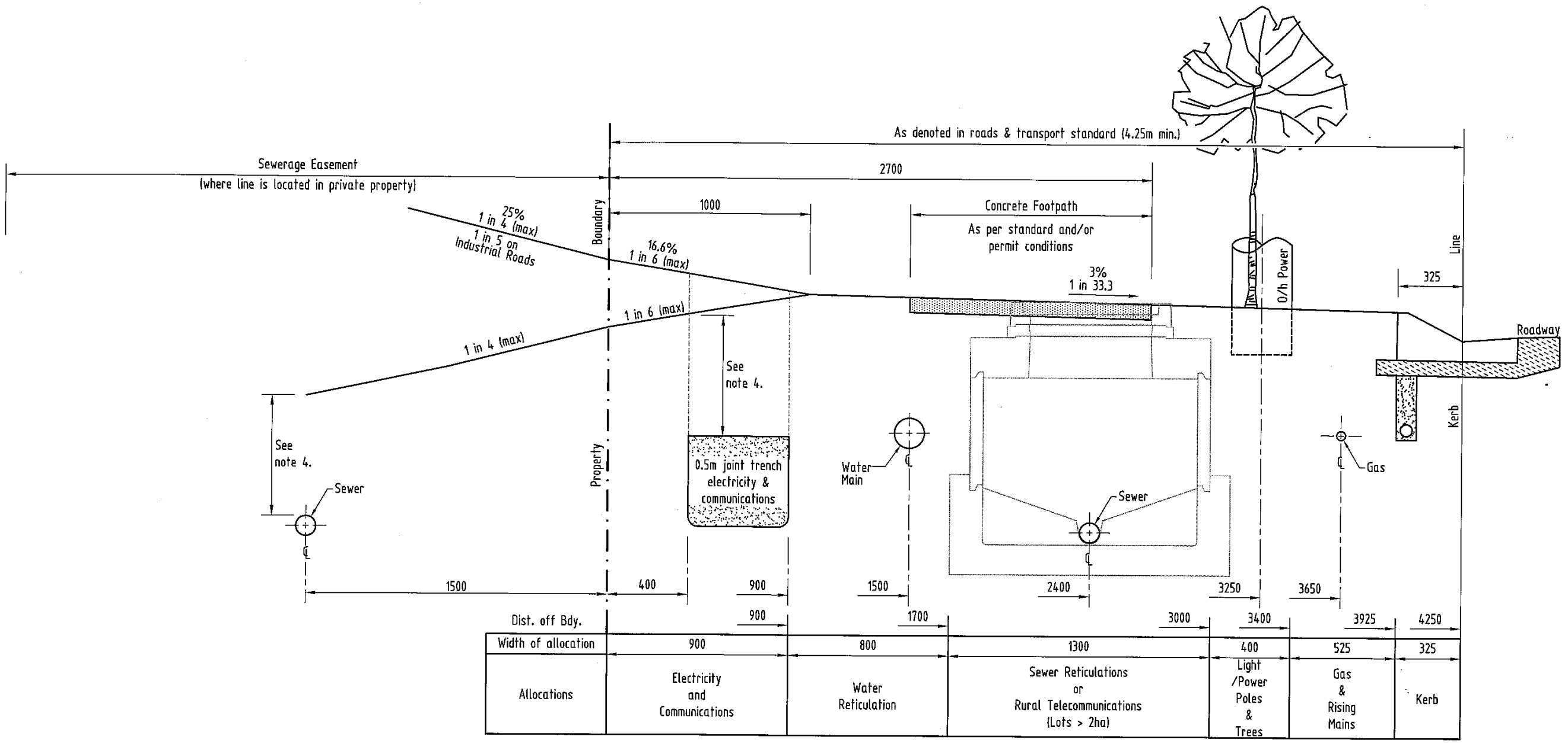
NOTE

1. Verge and reserve widths may vary with the requirements for reserves, bikeways, parking and earthworks.
2. Refer body of standard to confirm details of cross section.

SCALE	NOT TO SCALE	AMENDMENTS			
DRAWN	S.G.MCDONALD	ITEM	DESCRIPTION	DATE	INTL
FILE	RT-0010.DWG				
DATE	JAN.05				
DESIGNED	G.J.PENHALIGON				

TYPICAL ROAD CROSS SECTION
RESIDENTIAL, RURAL RES, INDUSTRIAL

STD. DRAWING NO.
RT-0010
REVISION CODE **A**

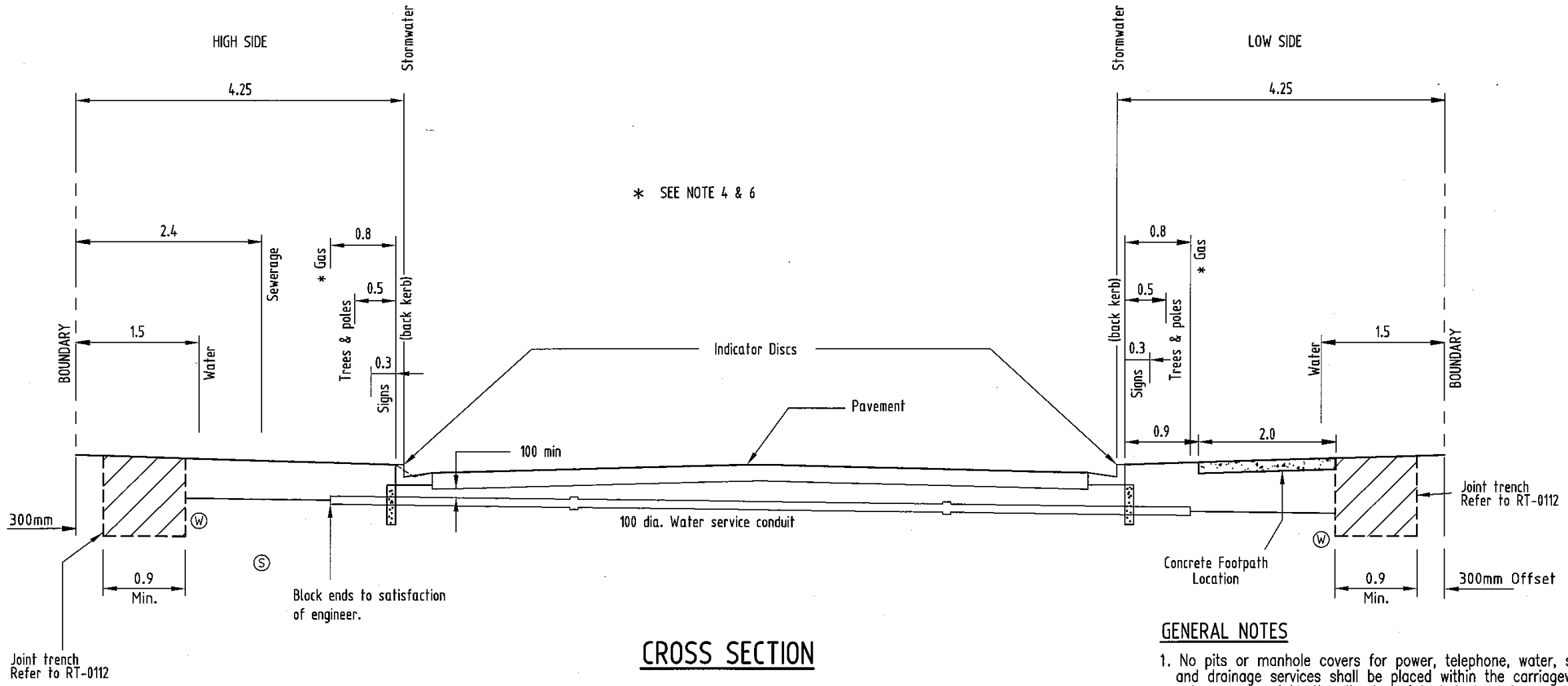


NOTE:

1. Electricity, telephone and water mains to be located in the same footpath to allow suitable servicers to alternate block boundaries on the opposite side of the street.
2. Electricity and telephone are to service the same boundary and water to service the other boundary of a block.
3. All service conduits to be marked on the face of kerb with brass discs. PSMs also to be cast into top of kerb and channel.
4. Maintain cover to services as required by service authority – generally 600mm min.

SCALE **NOT TO SCALE**	AMENDMENTS				
DRAWN S.G.MCDONALD	ITEM	DESCRIPTION	DATE	INTL	**CALLIOPE SHIRE COUNCIL FOOTPATH ALLOCATIONS FOR PUBLIC UTILITIES**
FILE RT–0110.DWG					STD. DRAWING NO. **RT-0110**
DATE JAN.05					REVISION CODE **A**
DESIGNED G.J.PENHALIGON					

CITY OF GLADSTONE
CALLIOPE SHIRE COUNCIL



CROSS SECTION

SEPERATED SERVICE LOCATIONS

GENERAL NOTES

1. No pits or manhole covers for power, telephone, water, sewerage and drainage services shall be placed within the carriageway unless approved by the director of technical services.
2. Trimming and compaction of the subgrade is to be completed and approved before excavation for the service conduits is commenced. excavation material shall be thrown on the footpath and not on the subgrade.
3. Service conduit alternatives:–100 ø Concrete/FR pipes (S.F.) Class C or S (R.R.J.) 100ø uPVC, Class 12
4. On wider footpaths, positions of services except stormwater, and signs are to be fixed by measurement from the property alignment.
5. Where practical, stormwater drainage is to be located between lip of channel and space allocated for poles. Sub–soil drainage is to be located under kerb & channel when required.
6. Location and width of concrete footpath where ordered shall be determined by the director of technical services.
7. For service conduits other than water, similar construction is to be utilised but with minimum depths of 750mm or as specified by relevant authorities.

CITY OF GLADSTONE

CALLIOPE SHIRE COUNCIL

SCALE	NOT TO SCALE
DRAWN	S.G.MCDONALD
FILE	RT–0111.DWG
DATE	MARCH.05
DESIGNED	G.J.PENHALIGON

AMENDMENTS

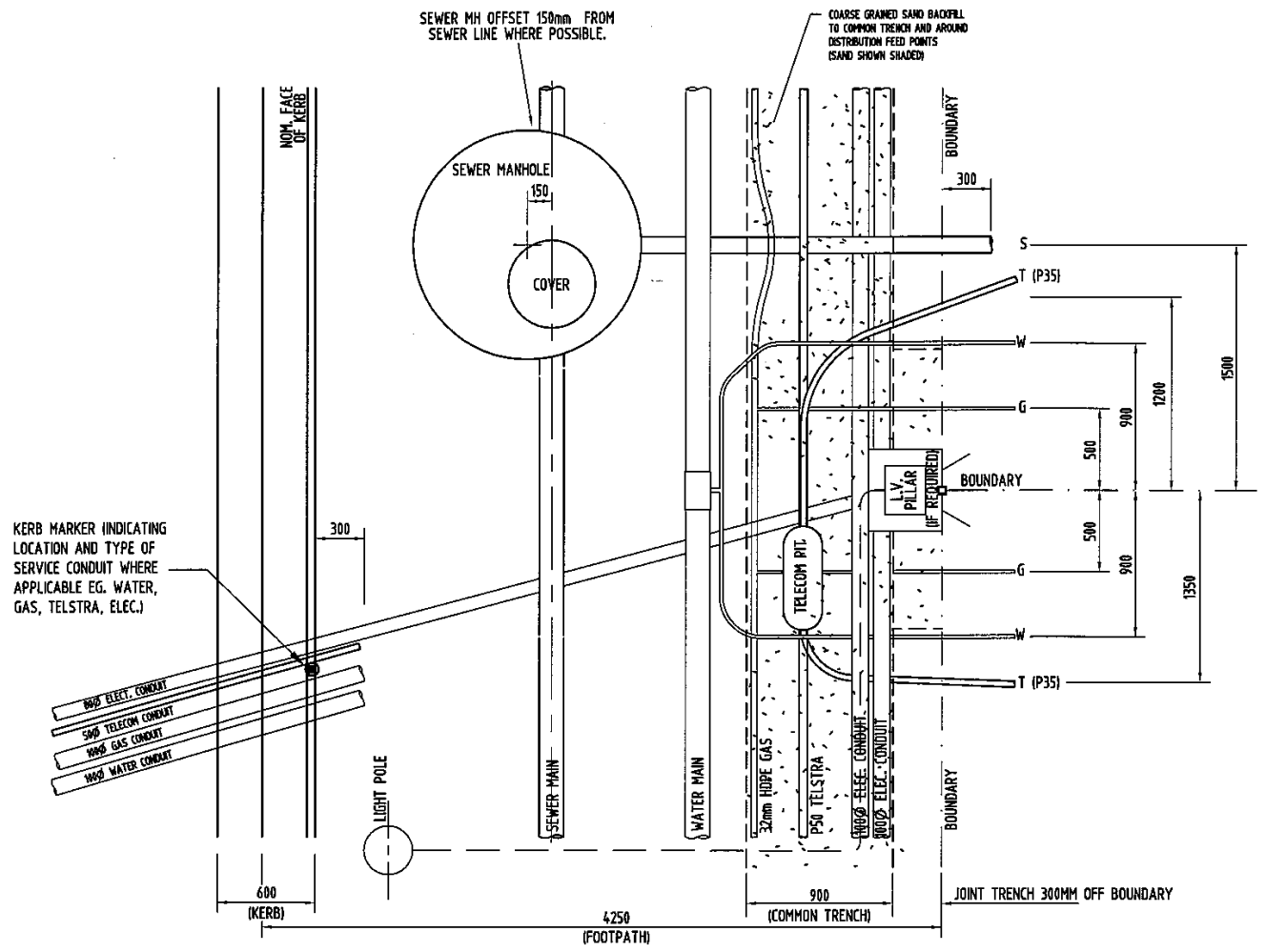
ITEM	DESCRIPTION	DATE	INTL

STANDARD LOCATION OF SERVICES FOR GLADSTONE CITY COUNCIL

STD. DRAWING NO.

RT-0111

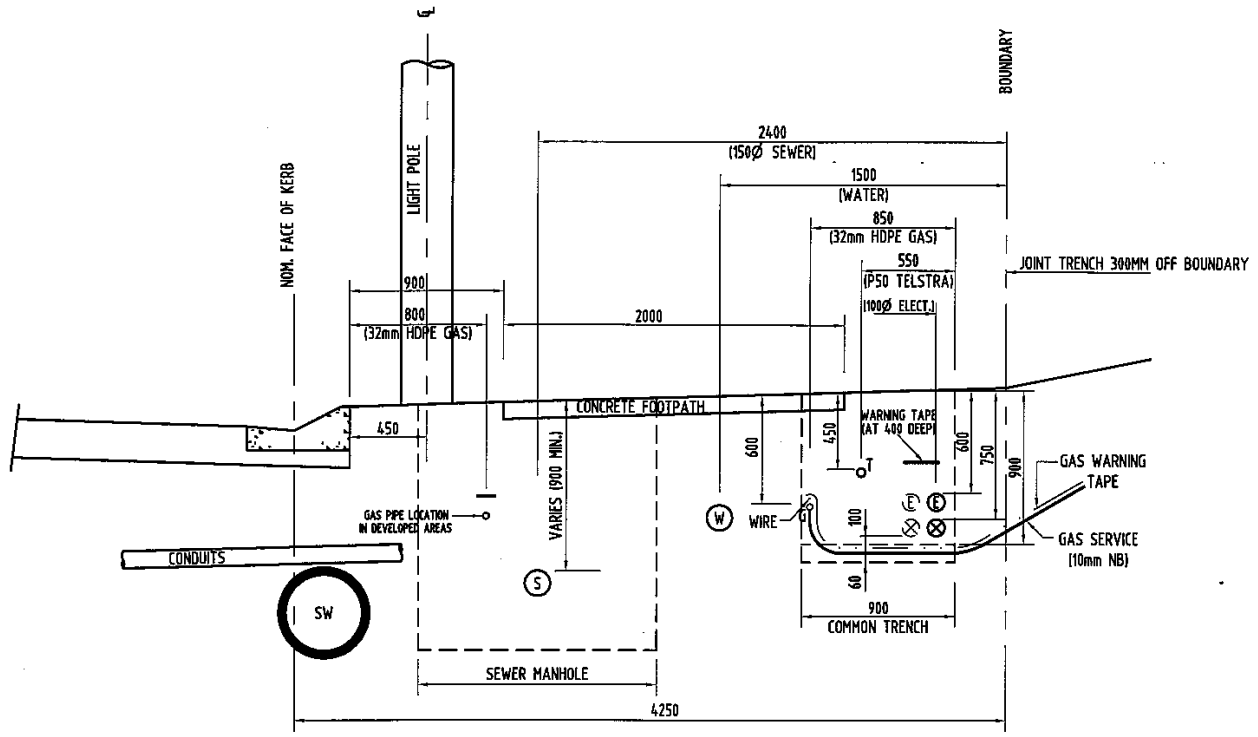
REVISION CODE **B**



COMMON TRENCH (PLAN)

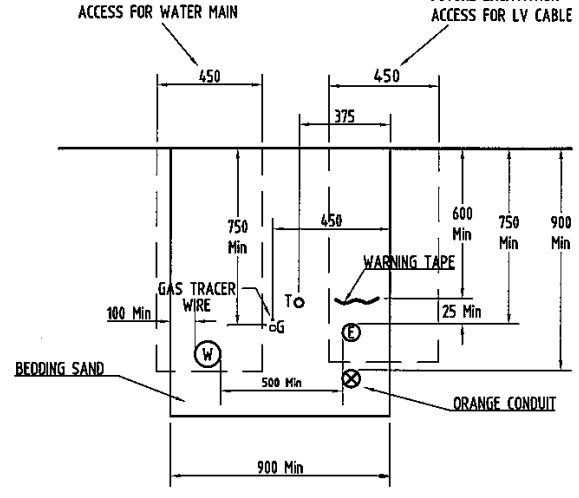
Scale 1:20

SERVICE ENTRY TO ADJOINING PROPERTIES



COMMON TRENCH (SECTION)

Scale 1:20



ROADWAY COMMON TRENCH (SECTION)

JOINT TRENCHING NOTES:

GENERAL

1. TRENCH WIDTH OF 900mm IS A MINIMUM. THE TRENCH WIDTH SHALL BE WIDENED FOR CUL-DE-SAC SITUATIONS. LARGER DIAMETER WATER MAINS AND ANY OTHER SITUATIONS WHERE MINIMUM CLEARANCES CANNOT BE MAINTAINED.
2. SERVICES ENTRY MAY BE SPLIT BETWEEN EITHER BOUNDRY PEG TO SATISFACTION OF CITY ENGINEER
3. FUTURE EXCAVATION AREAS MUST BE CLEAR OF ALL OTHER SERVICES.
4. DIMENSIONS INDICATE CLEAN TRENCH WIDTHS.
5. EXCAVATIONS ACROSS ROADWAYS TO BE FILLED AND COMPACTED TO COUNCIL REQUIREMENTS.

POWER CABLE - CAPELEC REQUIREMENTS

6. CONDUITS: - CLASS 6 ORANGE IS SUITABLE FOR UNDERGROUND RESIDENTIAL SUBDIVISIONS
   - HEAVY DUTY CONDUIT IN ACCORDANCE WITH A.S. 2053-1984 SHALL BE USED UNDER ALL MAIN ROADS.

GAS MAIN - GAS CORP. QLD LTD REQUIREMENTS

7. MARKER TAPE OVER SERVICE
8. KERB MARKER Ⓖ CROSSING TO INDICATE SERVICE LOCATION.
9. WHERE GAS SERVICE COINCIDES WITH WATER SERVICE, GAS MUST BE LOCATED UNDER WATER MAIN.

WATER - COUNCIL REQUIREMENTS

10. WHERE THRUST BLOCKS ARE REQUIRED ON THE WATER MAIN, THE ELECTRICITY CABLE SHALL BE LOWERED TO GIVE 150mm MIN. VERTICAL CLEARANCE TO WATER MAIN.
11. MINIMUM 100mm SAND BEDDING SHALL SURROUND WATER MAIN.

TELSTRA REQUIREMENTS

12. TELSTRA CONDUIT (MAXIMUM DIAMETER 50mm) TO BE LAID TO TELECOM REQUIREMENTS.
13. P4 TELSTRA PITS ARE NOT TO BE USED EVEN FOR ROAD CROSSINGS. THE TELSTRA CONDUIT IS TO BE LOWERED OVER THE DISTANCE FROM THE END OF THE PIT TO THE KERB MAINTAINING THE ABOVE STATED MINIMUM SEPARATIONS FROM POWER.
14. CRUSHER DUST OR SAND IS TO BE SPREAD OVER THE TELSTRA CONDUIT TO A DEPTH OF 100mm IF THE EXCAVATED SOIL HAS A HIGH ROCK CONTENT.
15. IN SOME CASES, PARTICULARLY WHERE BLASTING IS REQUIRED TO OPEN A TRENCH, IT MAY BE NECESSARY TO ALTER THE ABOVE TRENCH DESIGNS TO INCLUDE TELSTRA MAIN CONDUIT. THIS IS TO AVOID DAMAGE TO EXISTING SERVICES DUE TO TRENCH EXCAVATIONS ON TELSTRA'S MAIN CONDUIT ALIGNMENT.

LEGEND

SW	STORMWATER
W	WATER MAIN
S	SEWER MAIN
E	100ø L.V. ELECT. CONDUIT
⊗	100ø H.V. ELECT. CONDUIT
Gọ	32mm HDPE GAS MAIN & TRACER WIRE
To	P50mm TELSTRA CONDUIT

CITY OF GLADSTONE

CALLIOPE SHIRE COUNCIL

SCALE **NOT TO SCALE**

DRAWN	S.G.MCDONALD
FILE	RT-0112.DWG
DATE	JAN.05
DESIGNED	G.J.PENHALIGON

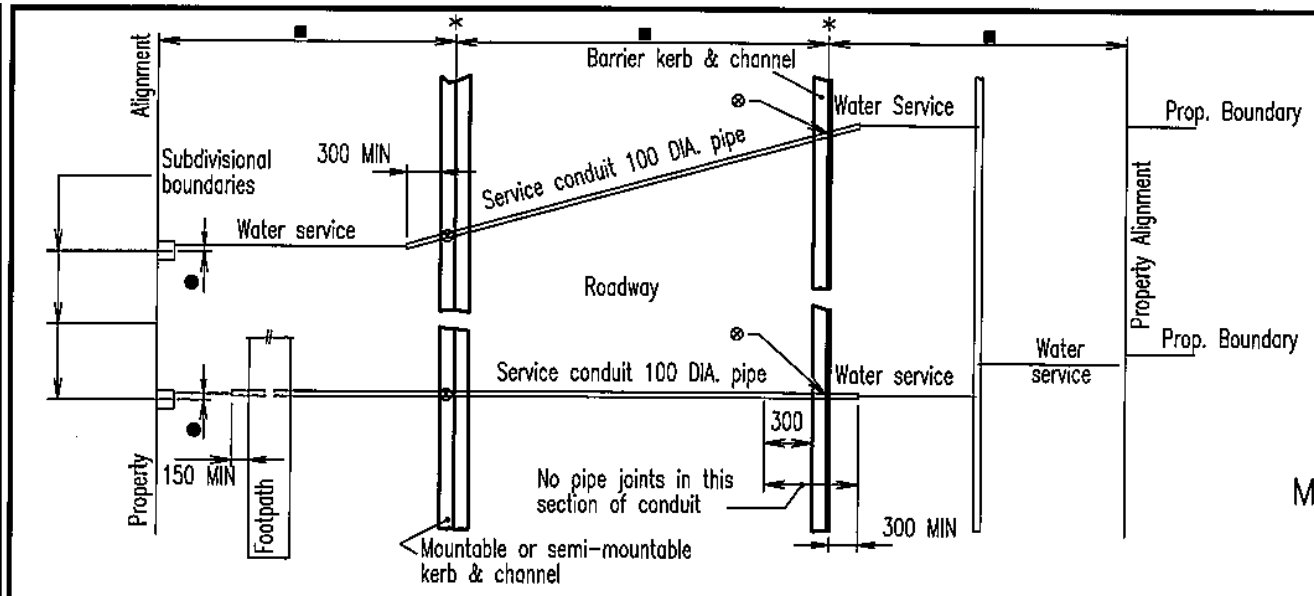
AMENDMENTS

ITEM	DESCRIPTION	DATE	INTL

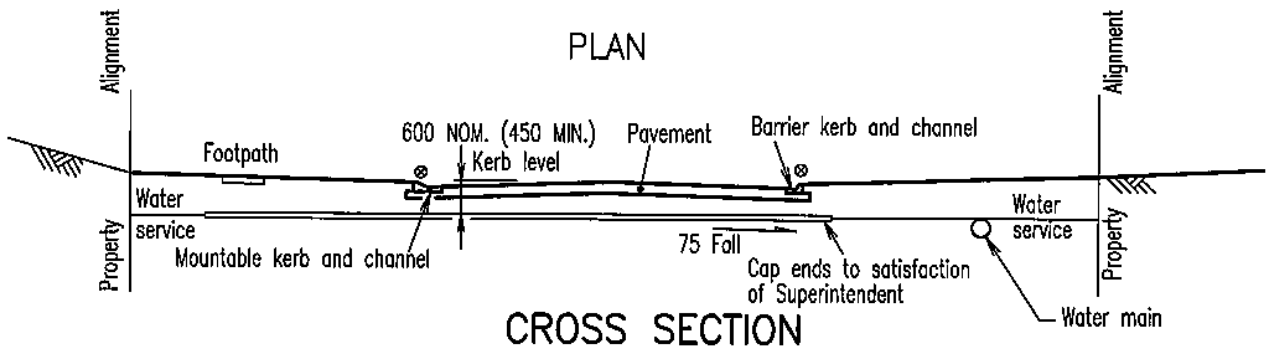
GLADSTONE CITY COUNCIL STANDARD LOCATION OF SERVICES

STD. DRAWING NO. **RT-0112**

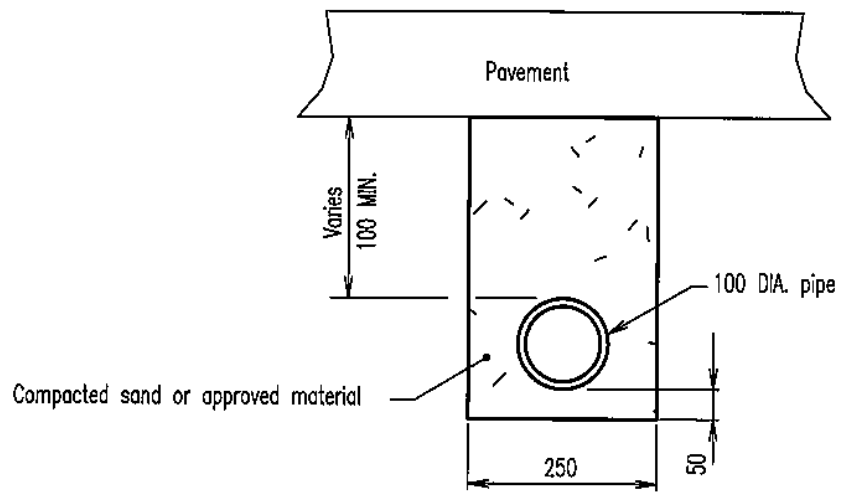
REVISION CODE **A**



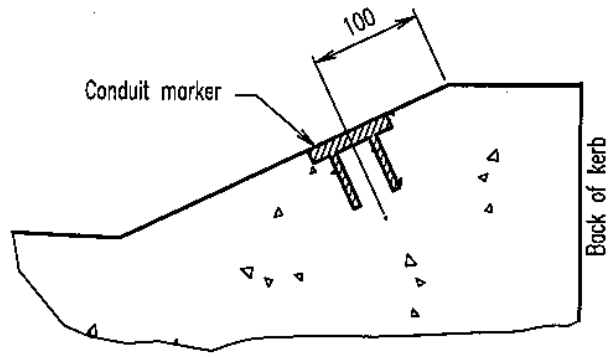
PLAN



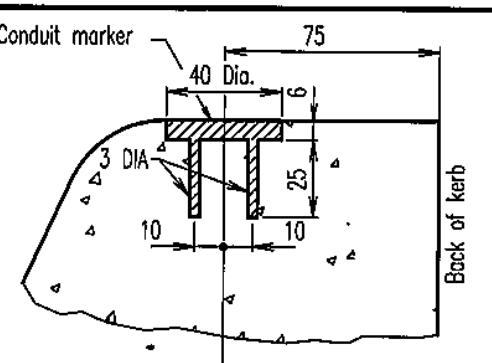
CROSS SECTION



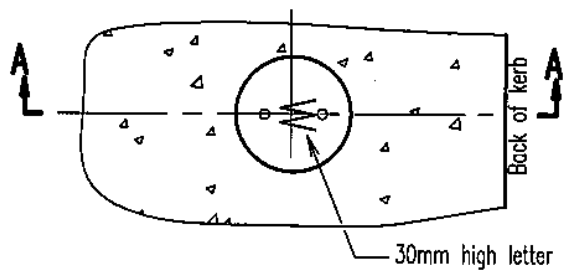
TYPICAL SECTION
SERVICE CONDUIT



SECTION A–A
MOUNTABLE OR SEMI–MOUNTABLE KERB



SECTION A–A
BARRIER KERB



PLAN

BRASS SERVICE CONDUIT MARKER

LEGEND

- ∗ NOM kerb line
- ⊗ Service conduit marker
- ■ Refer project drawings.
- ● Service conduit to be offset 0.8 metre on low side from subdivisional boundary.
- —SC— —— Service conduits (on project drawings).

NOTES:

1. Trimming and compaction of the subgrade to be completed and approved before excavation for service conduits is commenced. Excavated material shall be thrown on the footpath and not on the subgrade.
2. Service conduits alternatives :– 100 DIA FR pipes (S.F.) Class 1 or 2 (R.R.J.) 100 DIA uPVC, Class 12.
3. Positions of the service conduits shown are typical only. Conduits to be located as shown on project drawings.
4. Where concrete footpaths/cyclepaths exist or are planned, the service conduit is to extend past the far side of the path.
5. Marker details may be varied if approved.
6. All dimensions in millimetres.

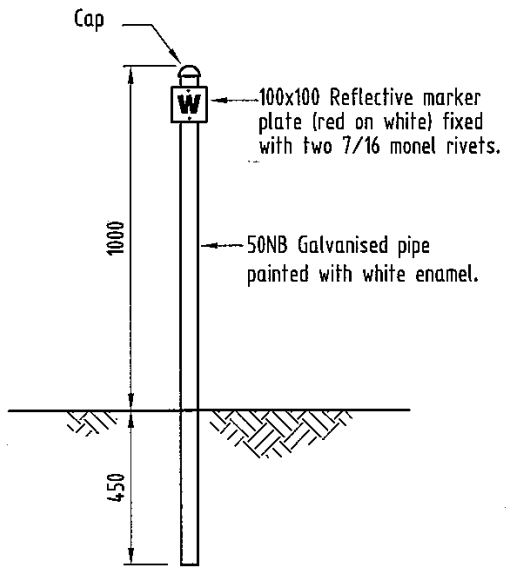
C	Note 2 amended. Dimension to Conduit	6/1/00
	behind K & C.	
B	Dim. to end of conduit and text size	16/1/97
	on marker	
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

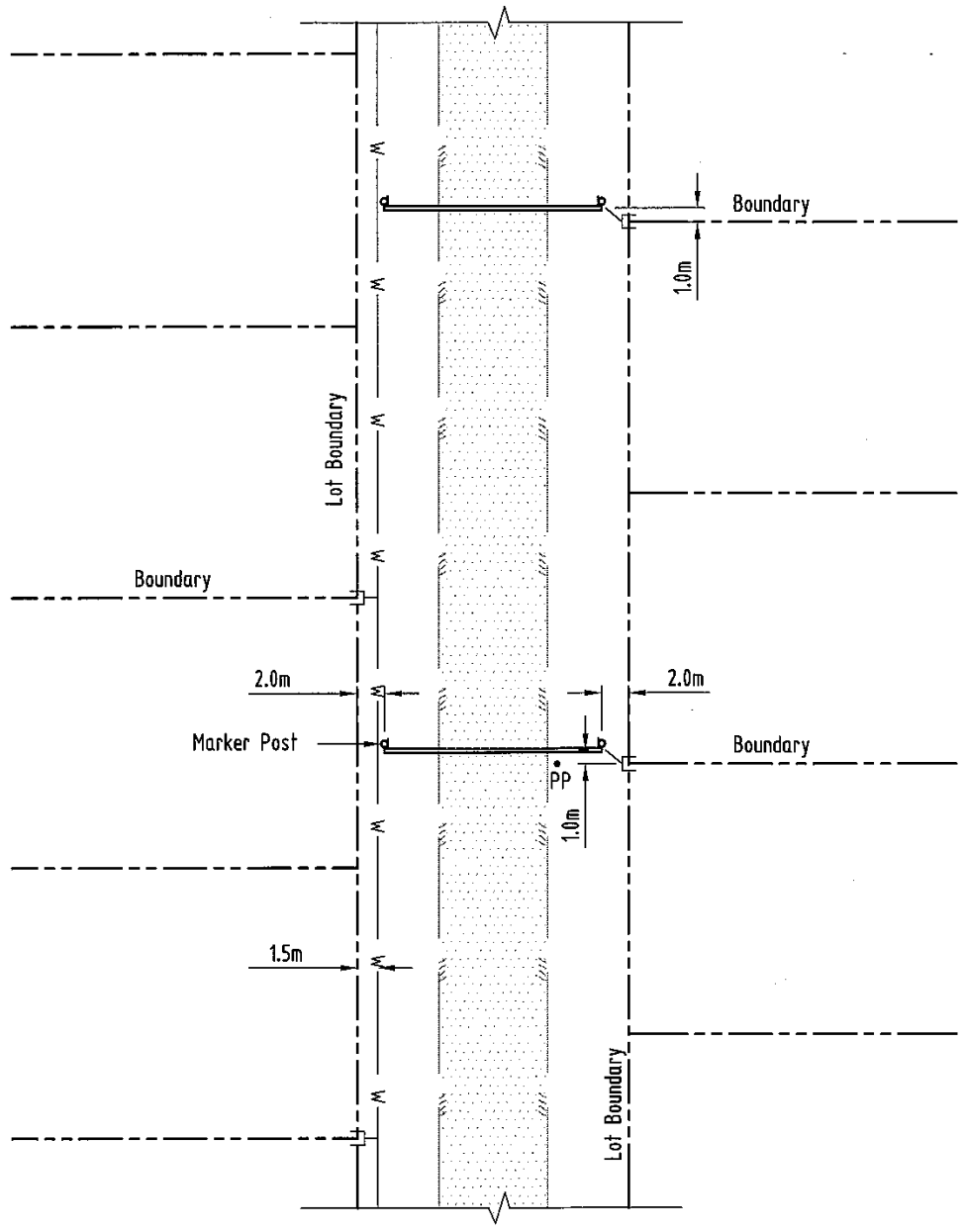
WATER SERVICE CONDUITS

ROAD/STREET
Standard Drawing
R–0160

A | B | C



MARKER POST DETAIL



CONDUIT LOCATIONS
RURAL SUBDIVISIONS

NOTES:

1. Use 100mm DIA. UPVC Class SEH solvent joint or Class 12 UPVC water pipe. Use removable close fitting UPVC caps on each end of conduit.

2. Pipe shall have MIN> 50mm bedding sand surround on sides and bottom and 200mm over conduit.

3. MIN/MAX cover – Table drain 600mm/1000mm
Verge 500mm/700mm
Road Pavement 750mm/1000mm

CITY OF GLADSTONE

CALLIOPE SHIRE COUNCIL

SCALE	NOT TO SCALE
DRAWN	S.G.MCDONALD
FILE	RT–0165.DWG
DATE	JAN.05
DESIGNED	G.J.PENHALIGON

AMENDMENTS

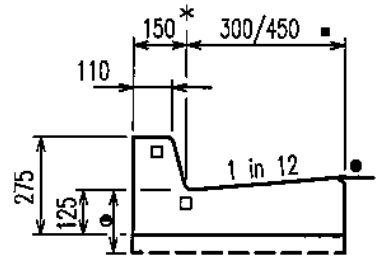
ITEM	DESCRIPTION	DATE	INTL

WATER SERVICE CONDUIT
DETAIL - RURAL ROADS

STD. DRAWING NO.

RT-0165

REVISION CODE **A**



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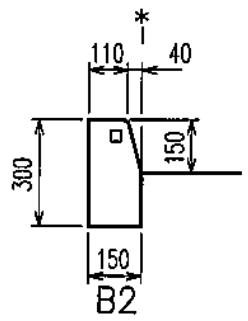

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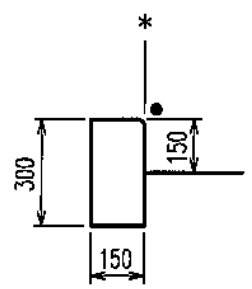

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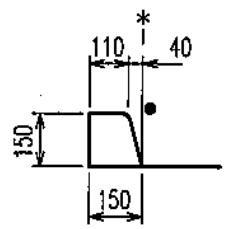

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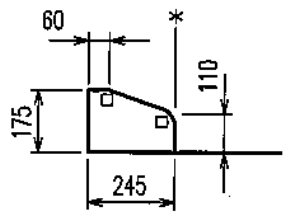
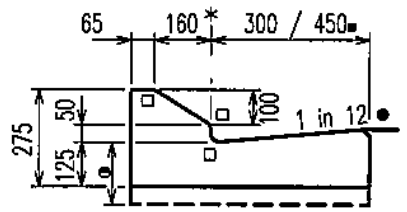
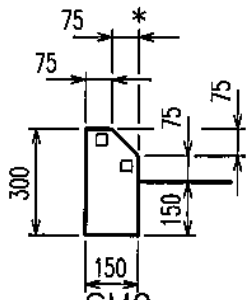


B5

BARRIER TYPE



SM1



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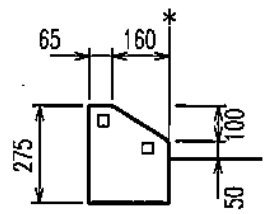

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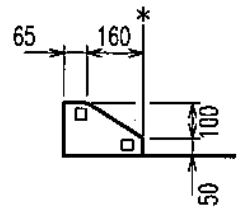

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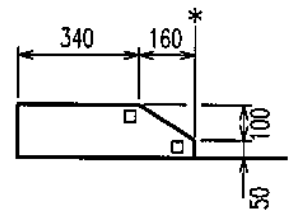
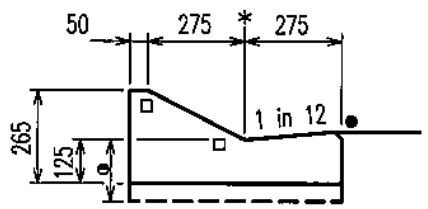


SM5

SEMI – MOUNTABLE TYPE



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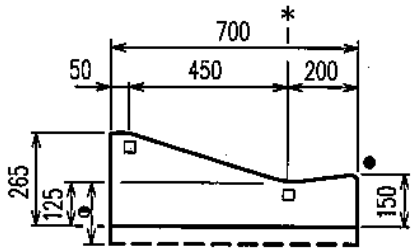

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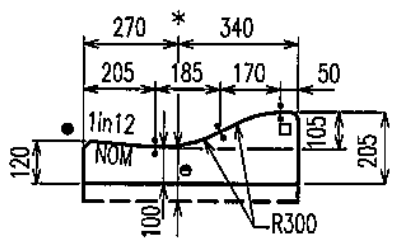

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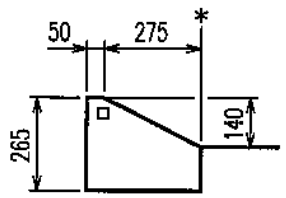

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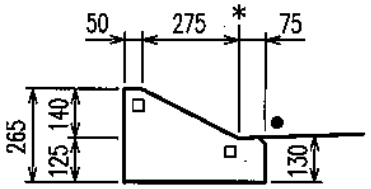

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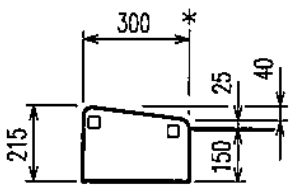
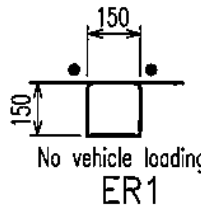
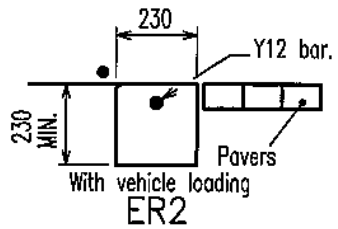


M6

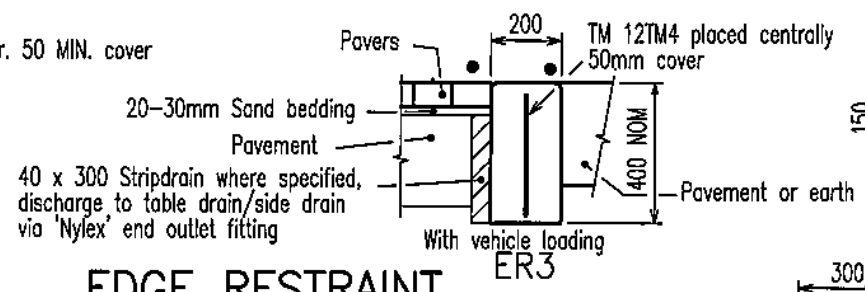
MOUNTABLE TYPE



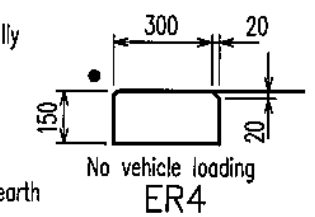
ER1



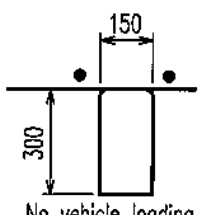
ER2



ER3

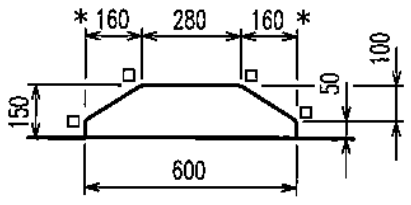


ER4

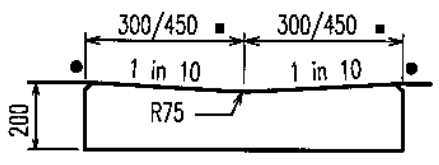


ER5

EDGE RESTRAINT



MEDIAN



INVERT

NOTES:

1. All materials and construction shall comply with AS 2876 except for dimensions on this drawing.
2. All concrete S25 MIN (refer project documentation) in accordance with AS1379 and AS 3600.
3. Reinforcement bars to AS 1302, trench fabric to AS 1304.
4. All dimensions in millimetres.

LEGEND

- * Nominal kerb line for setting out.
- ▪ Channel, invert width – refer project drawings.
- ● 10mm Radius.
- □ R20 Radius.
- ⊖ 175 where specified for commercial and industrial applications, refer project drawings.

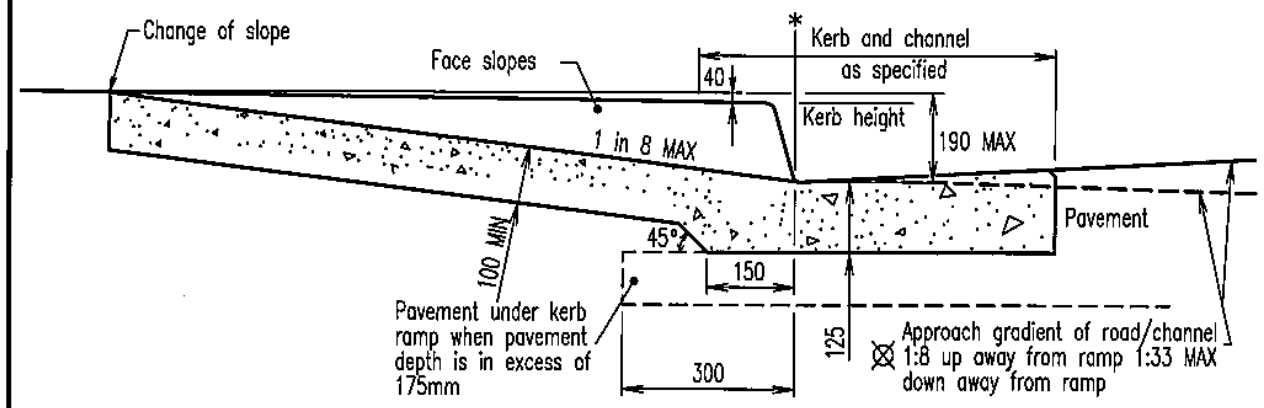
B	Channel thickened at commercial and	6/1/97
	industrial sites	
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

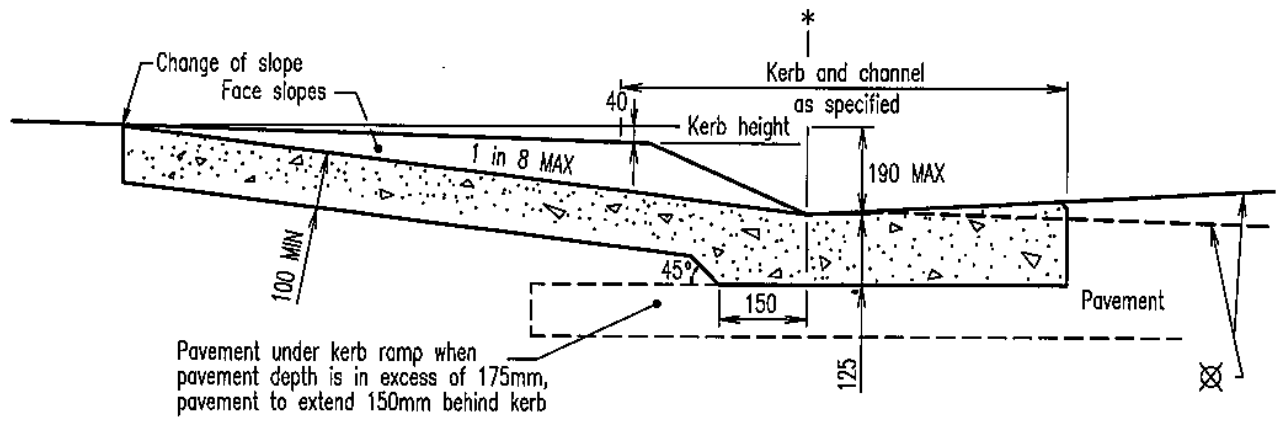
KERBS AND CHANNELS
PROFILES AND DIMENSIONS
INCL. EDGE RESTRAINTS, MEDIAN & INVERT

ROAD/STREET
Standard Drawing
R–0080

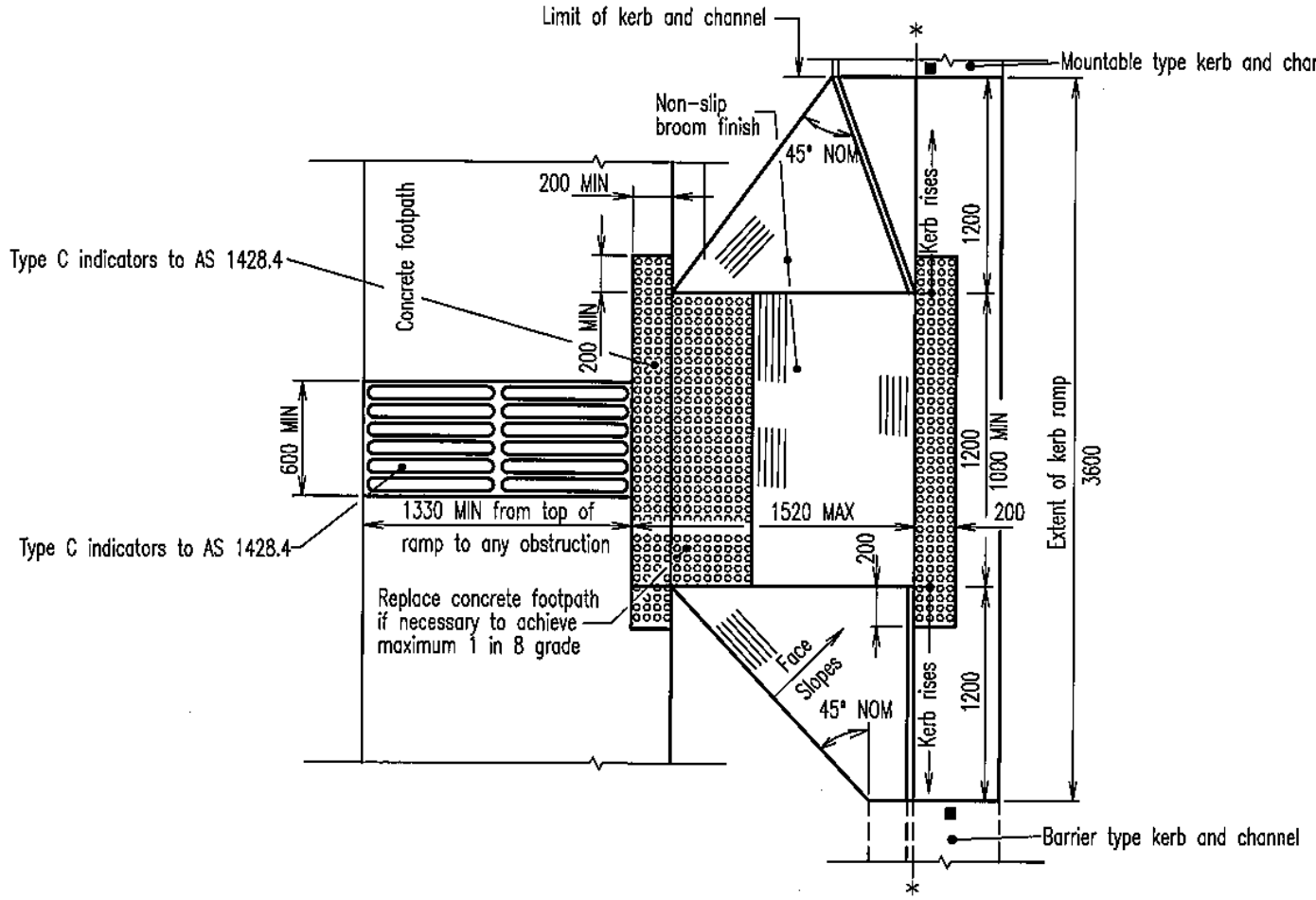
A | B



SECTION AT BARRIER KERB



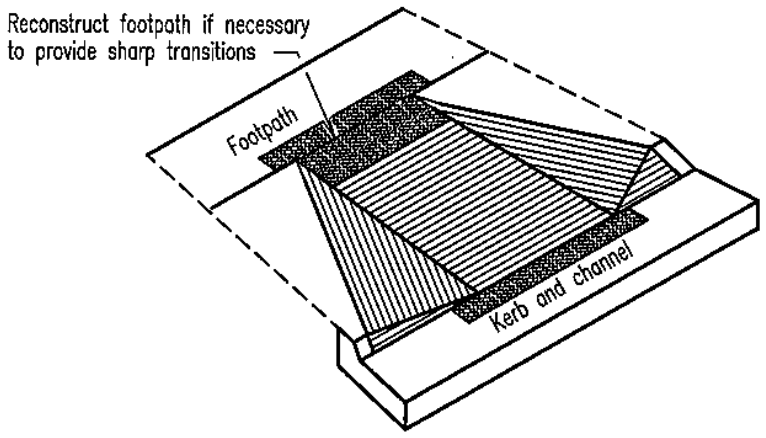
SECTION AT MOUNTABLE KERB



MUNICIPAL PUBLIC WORKS

PLAN

KERB RAMP



PERSPECTIVE VIEW

NOTES

1. Ramps to face direction of travel. For kerb ramp location, refer project drawings.
2. Concrete N25 in accordance with AS 1379 and AS 3600.
3. One layer of F62 reinforcing fabric to AS 1304 shall be placed centrally.
4. Kerb ramp to be cast monolithically, no construction joints will be allowed.
5. Designed to AS 1428.1 and 4. Ramp colour to contrast with adjoining surfaces.
6. Kerb ramps abutting a crossings not square to kerb line. For variation to Type C indicators refer AS 1424.4 – 1992.
7. All dimensions in millimetres.
8. Refer also to R–0085, R–0086, R–0087 for alternative kerb ramp details where approved by Local Authority.

LEGEND

* NOM Kerb Line

■ Saw cut if kerb and channel exists.

Direction of rough broom finish in 'PLAN'.

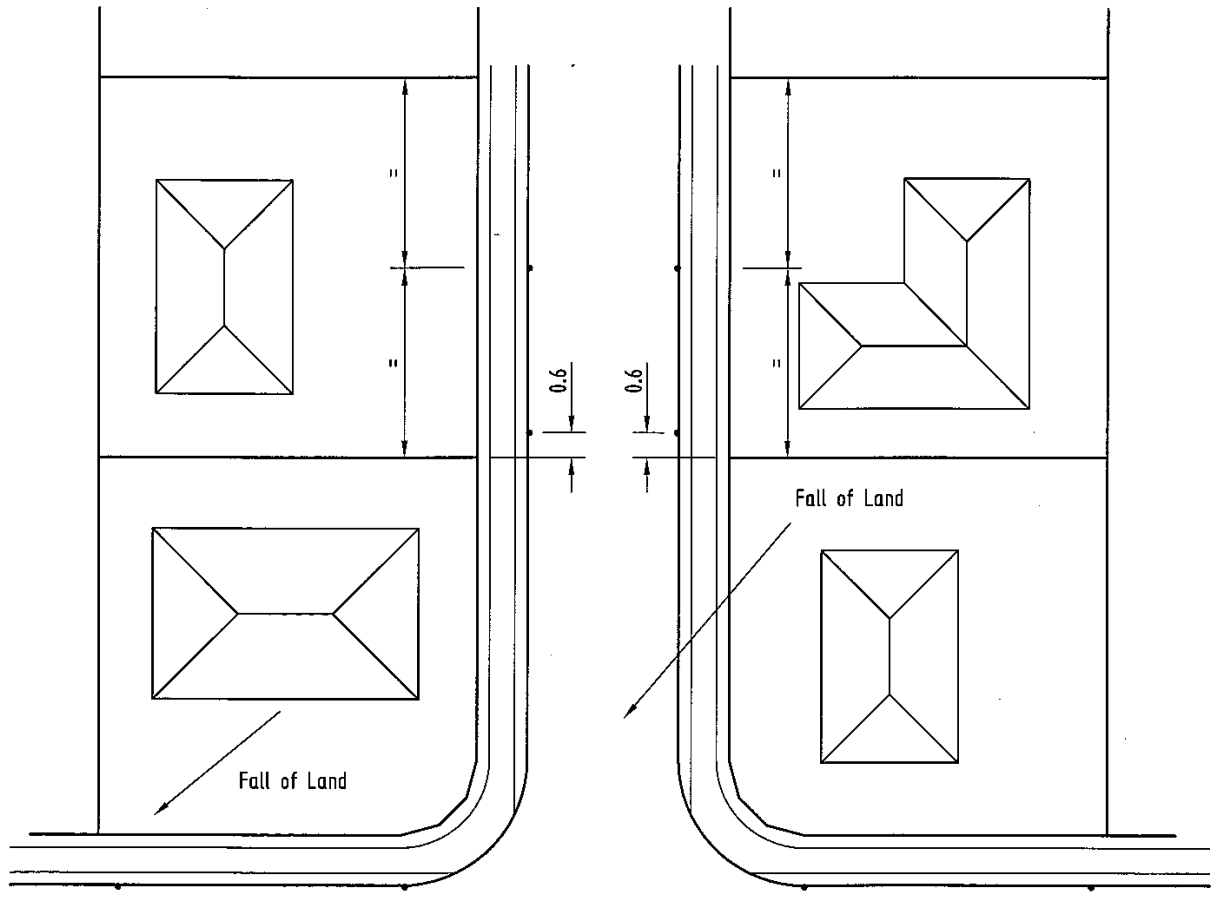
REVISIONS		DATE
C	Note 8 added	6/1/00
B	Tactile indicators added, dimensions altered and added	16/1/97
A	ORIGINAL ISSUE	8/12/95

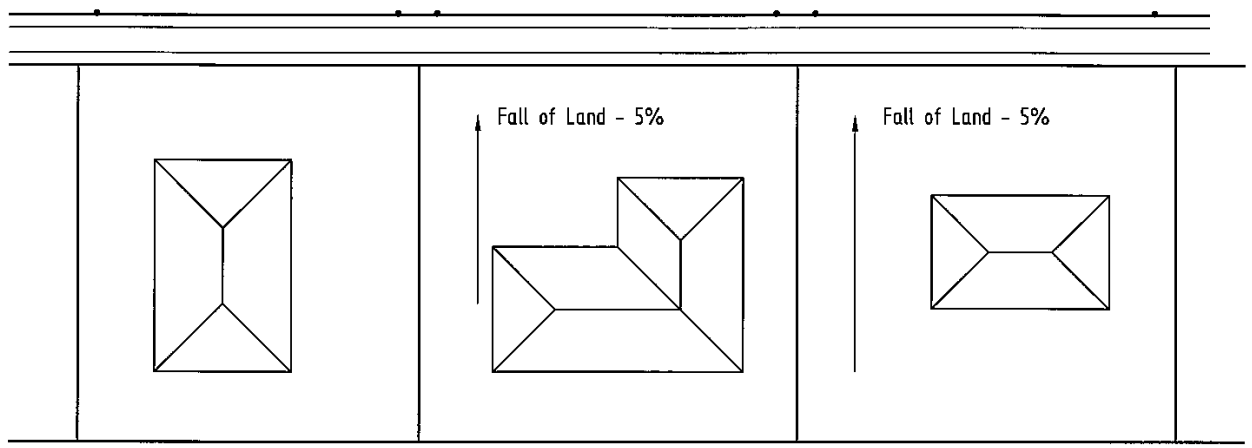
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

KERB RAMP

ROAD/STREET
Standard Drawing
R–0084

A | B | C





NOTE:

1. Kerb adaptors to be manufactured and installed in accordance with AS 3500.
2. Two kerb adaptors per lot shall be installed at the subdivision stage of the development. Adaptors shall be installed while the kerb and channel is being laid by neatly removing the section of kerb, installing the adaptor and backfilling with kerb mix and slurry – Adaptors shall have close fitting removeable back caps to prevent soil loss in footpath.
3. Where concrete paths are provided with the subdivision, roof water pipes shall be installed across the footpath to the property boundary. A construction joint shall be provided in the pathway over the roof water line.

CITY OF GLADSTONE

CALLIOPE SHIRE COUNCIL

SCALE	NOT TO SCALE
DRAWN	S.G.MCDONALD
FILE	RT–0083.DWG
DATE	JAN.05
DESIGNED	G.J.PENHALIGON

AMENDMENTS

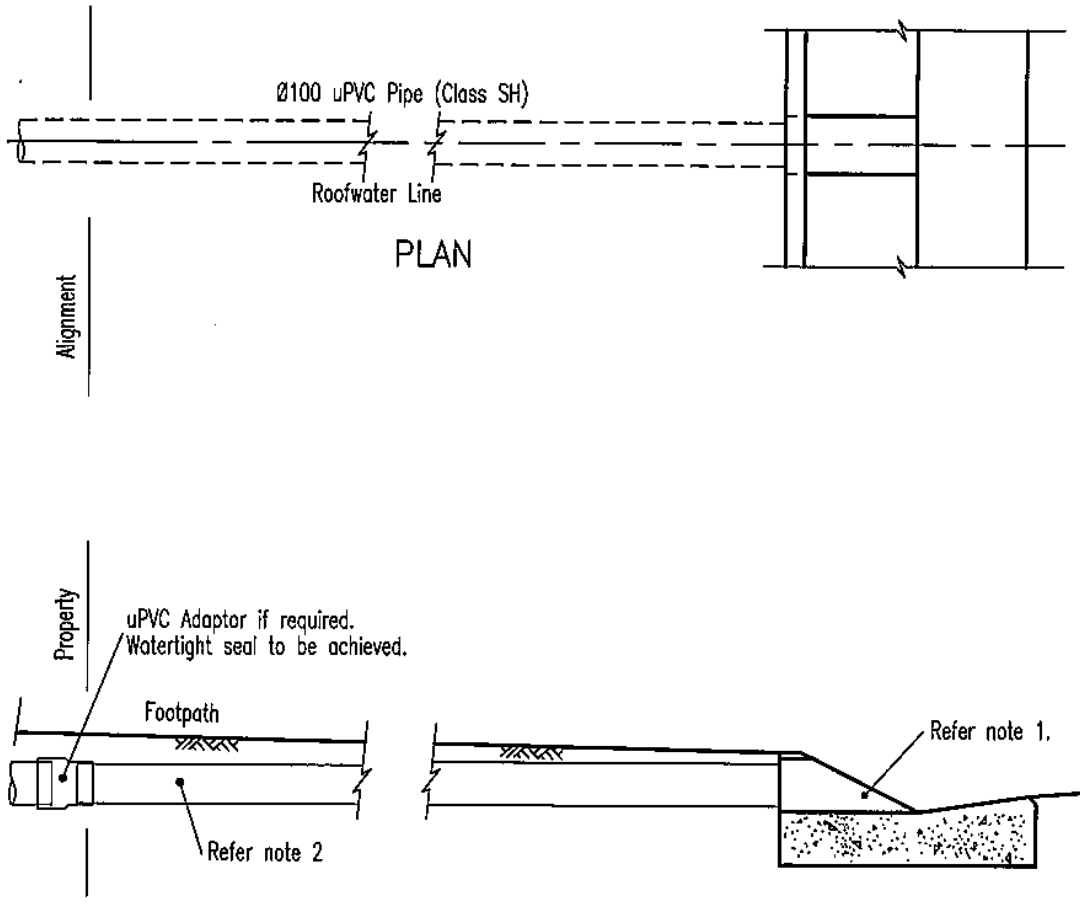
ITEM	DESCRIPTION	DATE	INTL

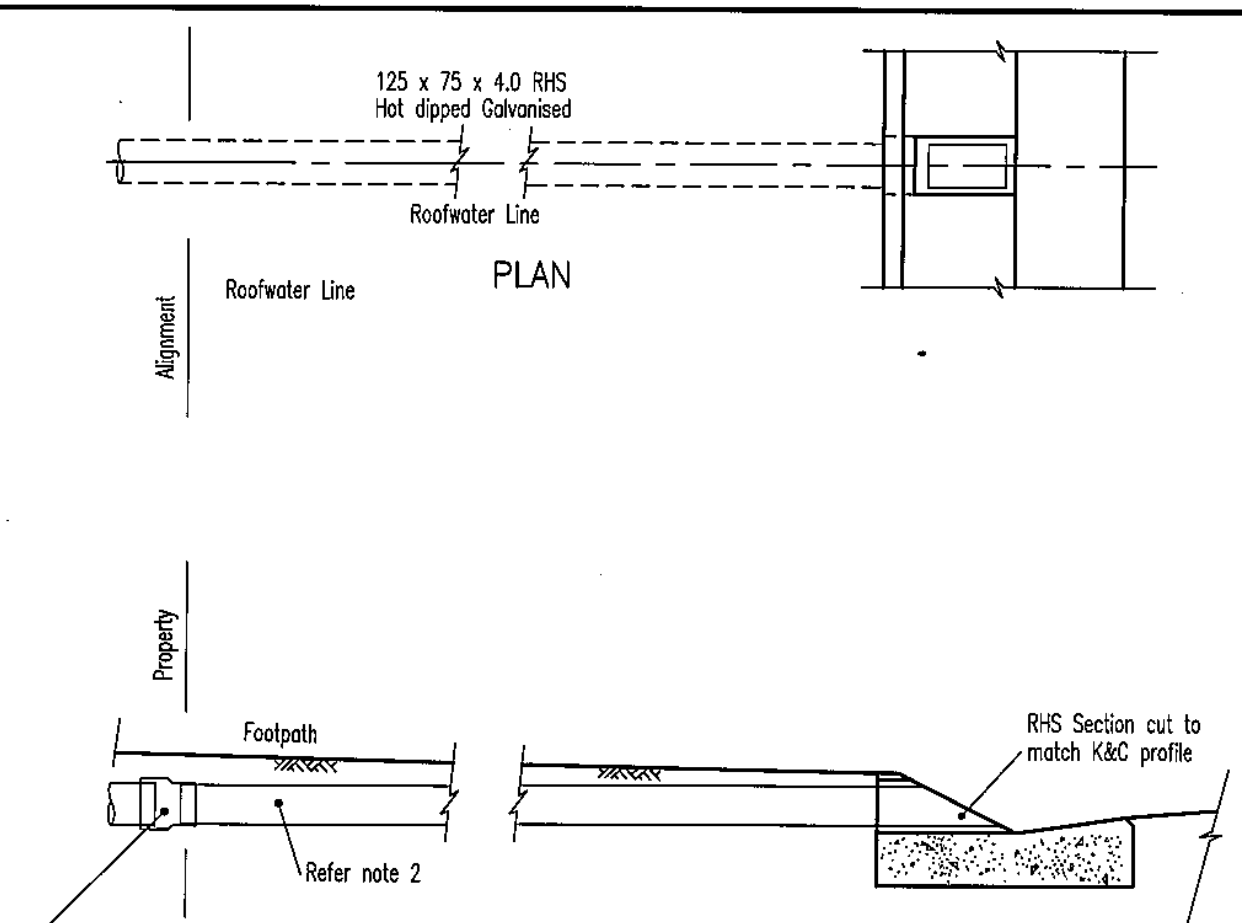
RESIDENTIAL KERB ADAPTOR LOCATION DEATIL

STD. DRAWING NO.

RT-0083

REVISION CODE **A**





ALTERNATIVE 1
KERB AND CHANNEL WITH
KERB ADAPTOR

ALTERNATIVE 2
KERB AND CHANNEL WITH
RHS VERGE ADAPTOR

NOTES

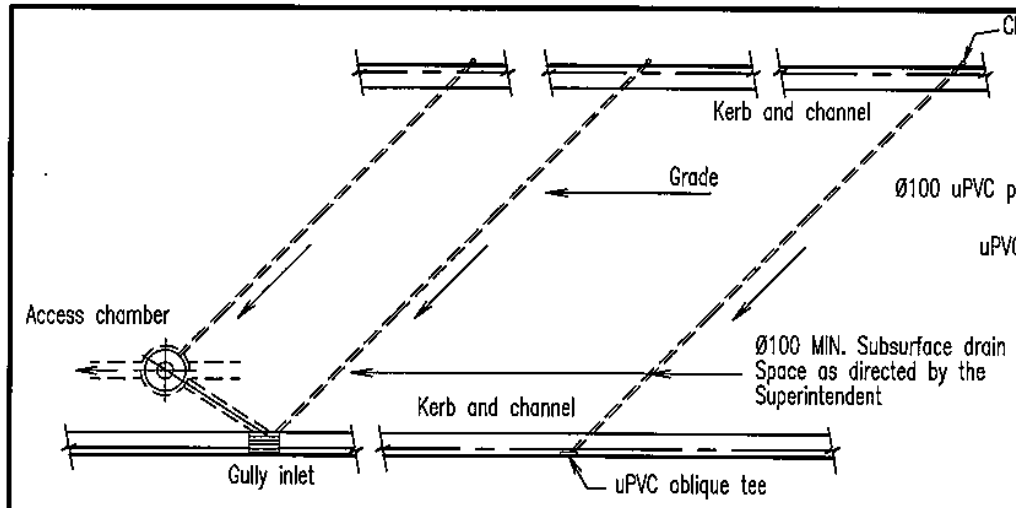
1. Proprietry Kerb Adaptor to suit K& C profile installed in accordance with manufacturers requirements.
2. Pipe across footpath to be laid with the maximum available cover, and with a minimum grade of 1 in 100.
3. Refer project drawings/specifications for option to be adopted.
4. At new developments seal inlet to adaptor.
5. All dimensions in millimetres.

B	Kerb Adaptor Details deleted, RHS Alternative added	6/1/00
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

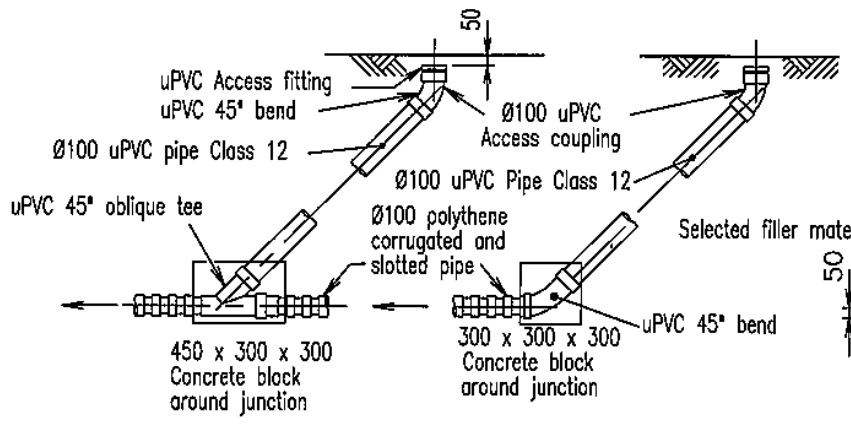
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

KERB AND CHANNEL
DRAINAGE CONNECTIONS

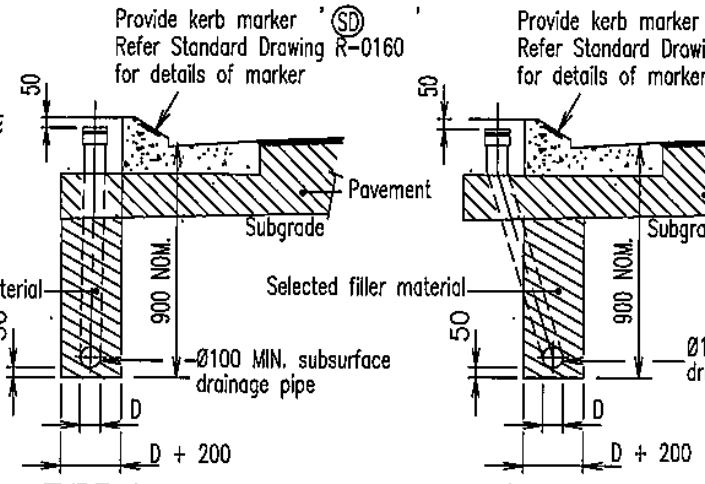
ROAD/STREET
Standard Drawing
R-0081
A | B



TYPICAL MITRE DRAIN LOCATIONS

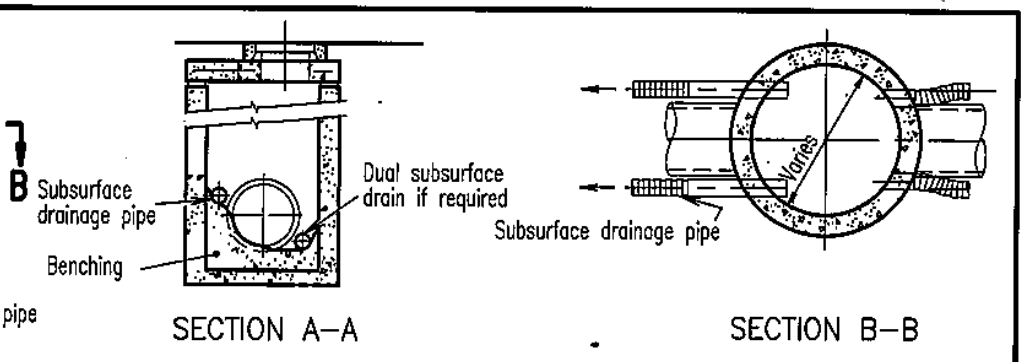


SUBSURFACE DRAIN CLEANING POINTS

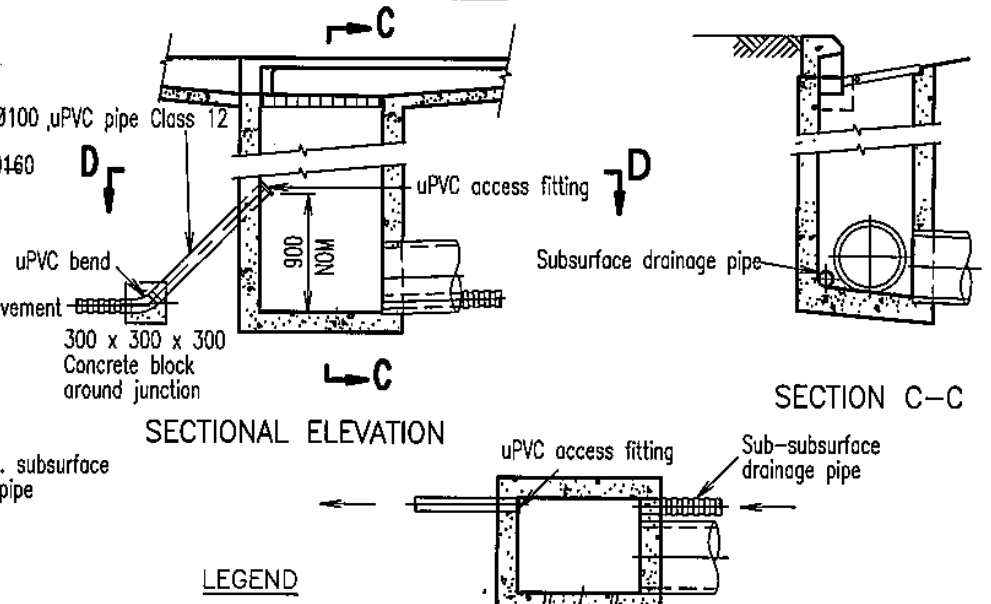


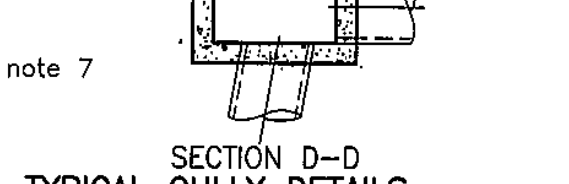
Refer project drawings or specification for location to be adopted

SUBSURFACE PAVEMENT DRAIN



TYPICAL ACCESS CHAMBER DETAILS





LEGEND

⊗ Refer note 7

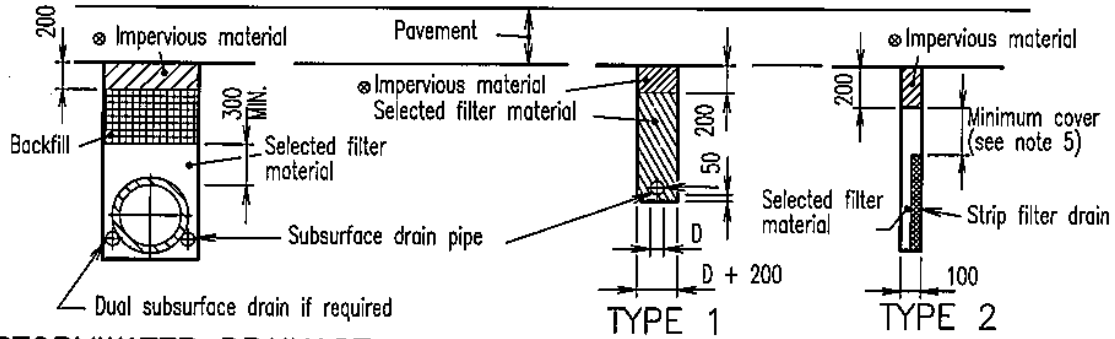
TYPICAL GULLY DETAILS

FILTER ON SLOTTED PIPE

A.S. SIEVE SIZE	% BY WT. PASS 'G
9.50 mm	100
4.75 mm	90 – 100
1.18 mm	45 – 80
300 µm	10 – 30
150 µm	0 – 10
75 µm	0 – 1

FILTER MATERIAL GRADING

Unless otherwise specified



STORMWATER DRAINAGE TRENCHES WITH SUBSURFACE DRAINAGE

STANDARD SUBSURFACE DRAIN

NOTES:

1. All Subsurface drains, polyethylene corrugated slotted pipe to AS 2439.1, discharge at inlet pipe invert level unless detailed otherwise. 0.5% MIN grade.
2. Filter materials not complying with the specified grading requirements may be used when approved by the Superintendent. A geofabric may be used to line trenches where approved by the Superintendent.
3. Concrete anchors N20 in accordance with AS1379 and AS 3600.
4. At 'oblique tee' on subsurface drain cleaning points, the contractor may install Vinidex vertical fittings if approved by the Superintendent.
5. Minimum cover over subsurface drain pipe for various compactors unless approved otherwise:
   Hand held units – 100, Units < 15 tonnes – 200, Units > 15 tonnes – 300
6. 'D' = 100 NOM. unless otherwise specified.
7. Impervious material to be provided where subsurface drainage is not under a pavement. When impervious material is omitted the backfill / selected filter material shall extend to underside of pavement.
8. All dimensions in millimetres.

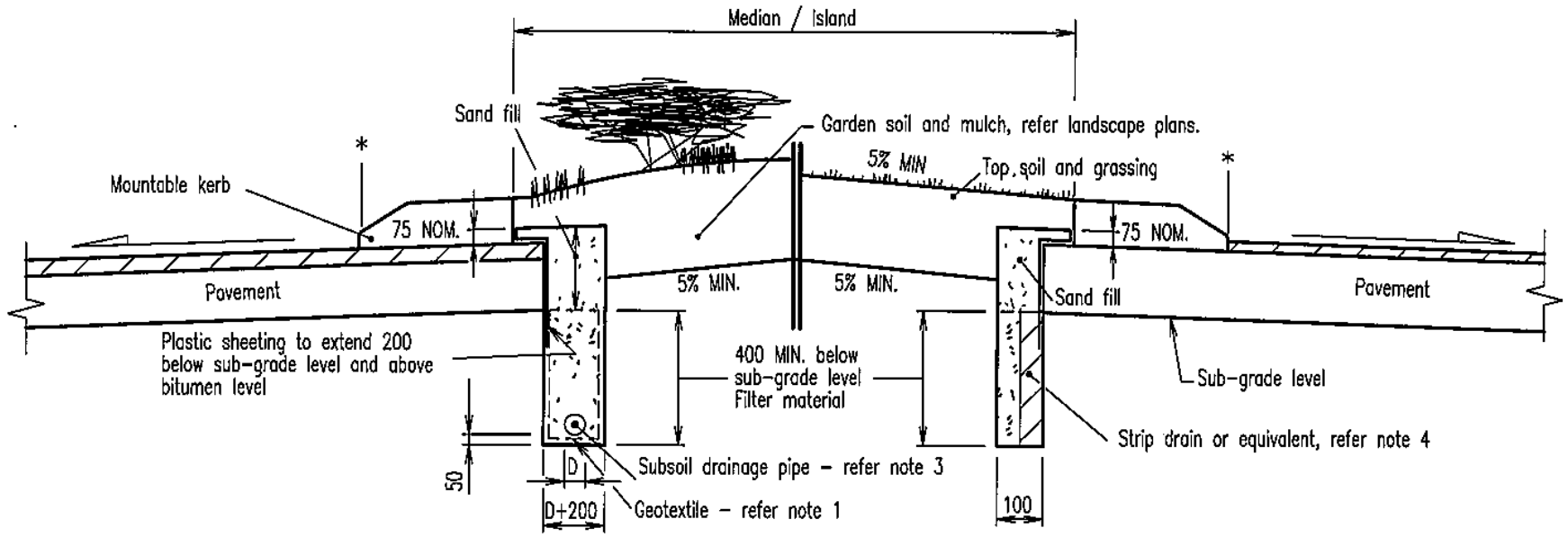
B	Alternative subsurface drain location	16/1/97
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

SUBSURFACE DRAINAGE

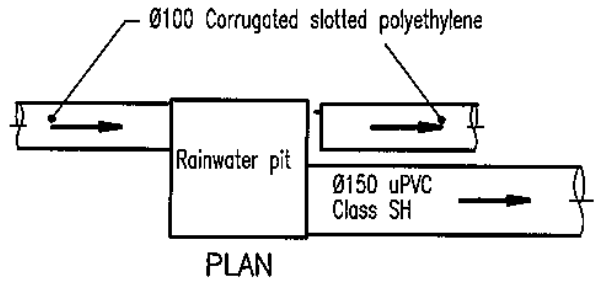
ROAD/STREET
Standard
Drawing
R–0140

A | B



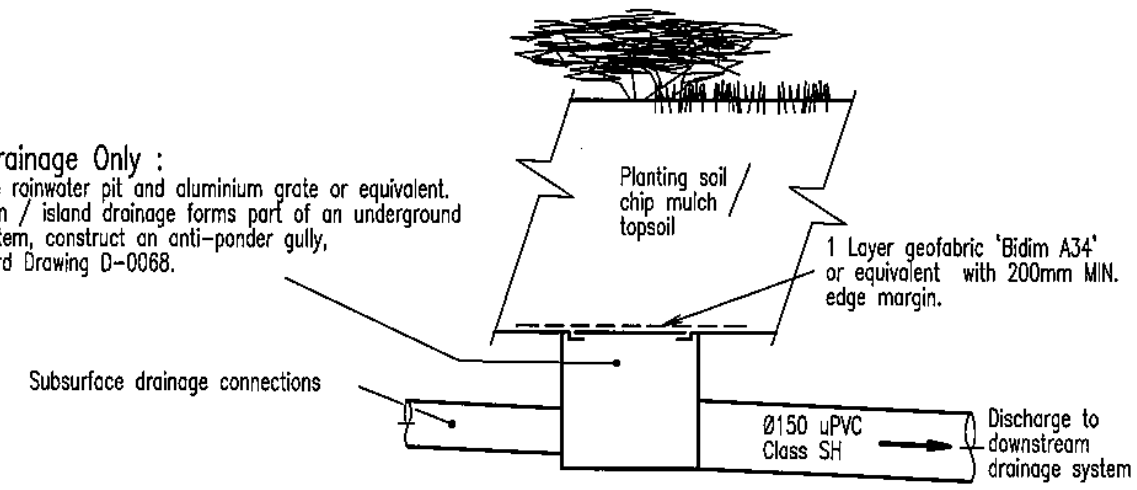
ALTERNATIVE 1

ALTERNATIVE 2

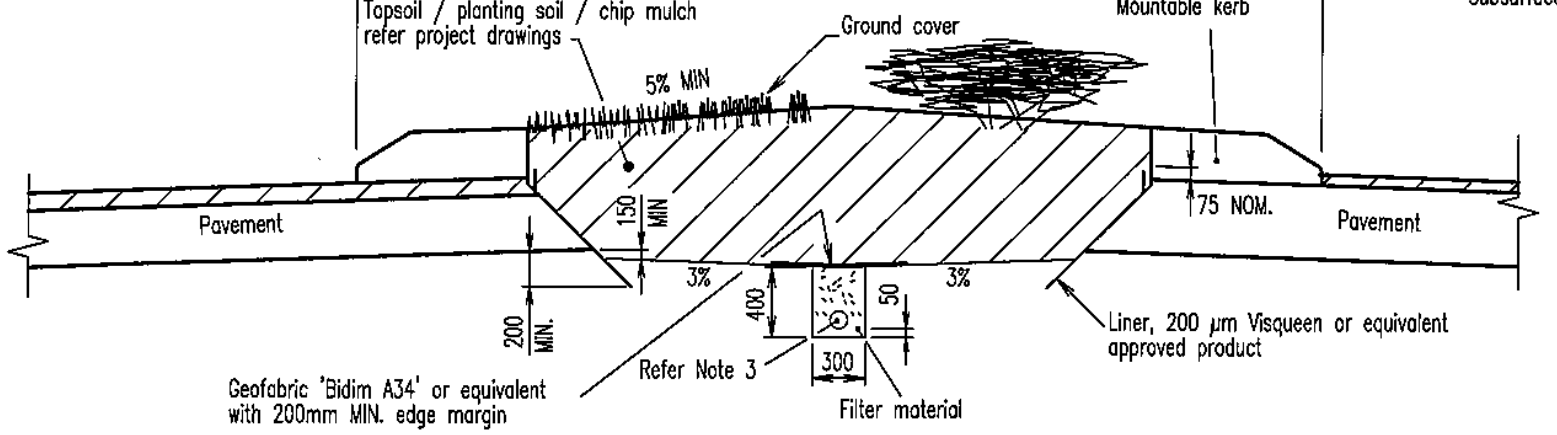


PLAN

Median Drainage Only :
Polypropylene rainwater pit and aluminium grate or equivalent. Where median / island drainage forms part of an underground drainage system, construct an anti-ponder gully, refer Standard Drawing D-0068.



SECTION
DRAINAGE FROM ALTERNATIVE 3



ALTERNATIVE 3

LEGEND

* NOMINAL kerb line

NOTES:

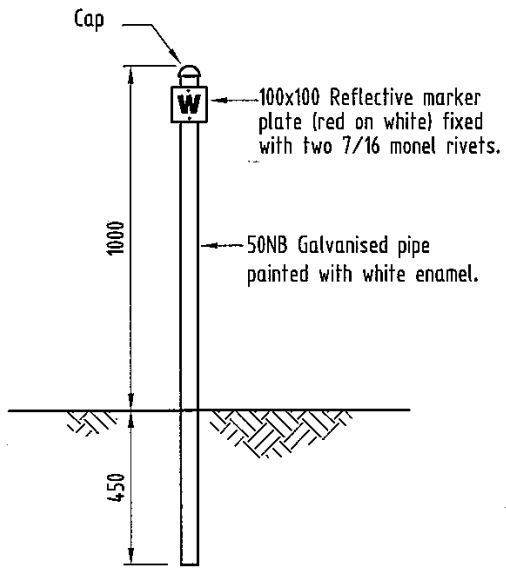
1. Geotextile surround, propriety product, U.V. stabilised, non-woven type, flow rate > 50 l/m²/sec, G > 1300 and E.O.S. < 200 µm.
2. Filter material – 75 µm – 9.5 mm. Refer grading requirements on Standard Drawing R-0140
3. Ø100 Subsoil drainage pipe – corrugated slotted polyethylene, connect to drainage system. 0.5% MIN. grade.
4. Strip drain – propriety product, deep-fin plastic core, 120 KPa MIN. crush strength, 40mm MIN. thickness , fully enclosed by a non-woven geotextile. 0.5% MIN. grade.
5. All dimensions in millimetres.

B	ø150 uPVC to class SH	16/1/97
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

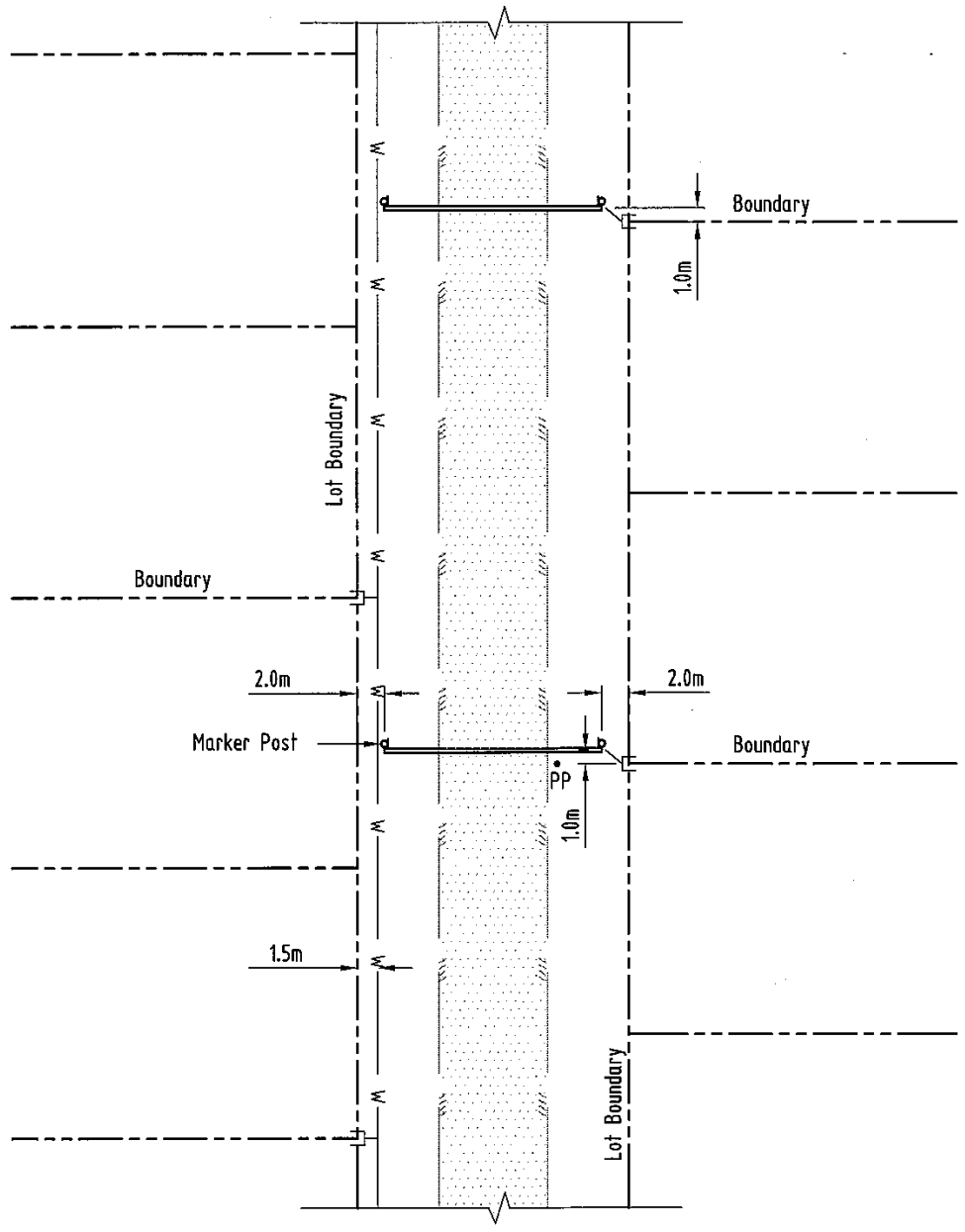
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

SUBSOIL DRAINAGE DETAILS AT MEDIANS / ISLANDS

ROAD/STREET
Standard Drawing
R-0141
A | B



MARKER POST DETAIL



CONDUIT LOCATIONS
RURAL SUBDIVISIONS

NOTES:

1. Use 100mm DIA. UPVC Class SEH solvent joint or Class 12 UPVC water pipe. Use removable close fitting UPVC caps on each end of conduit.

2. Pipe shall have MIN> 50mm bedding sand surround on sides and bottom and 200mm over conduit.

3. MIN/MAX cover – Table drain 600mm/1000mm
Verge 500mm/700mm
Road Pavement 750mm/1000mm

CITY OF GLADSTONE

CALLIOPE SHIRE COUNCIL

SCALE	NOT TO SCALE
DRAWN	S.G.MCDONALD
FILE	RT–0165.DWG
DATE	JAN.05
DESIGNED	G.J.PENHALIGON

AMENDMENTS

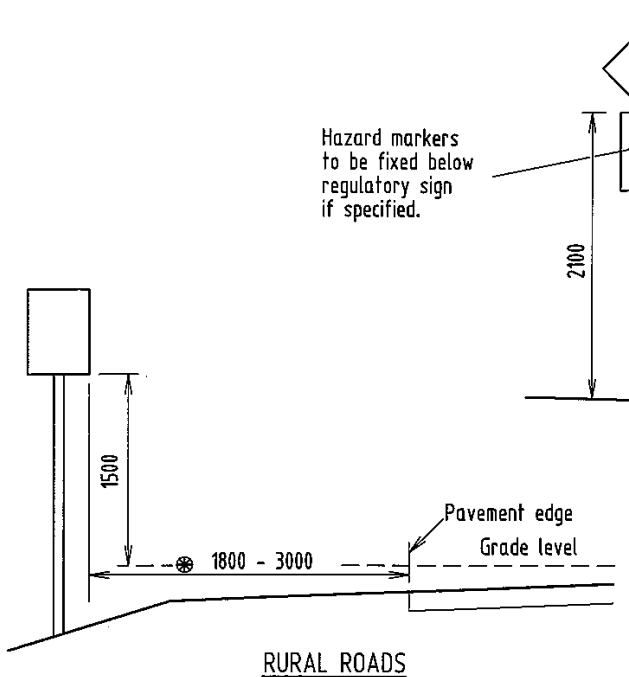
ITEM	DESCRIPTION	DATE	INTL

WATER SERVICE CONDUIT
DETAIL - RURAL ROADS

STD. DRAWING NO.

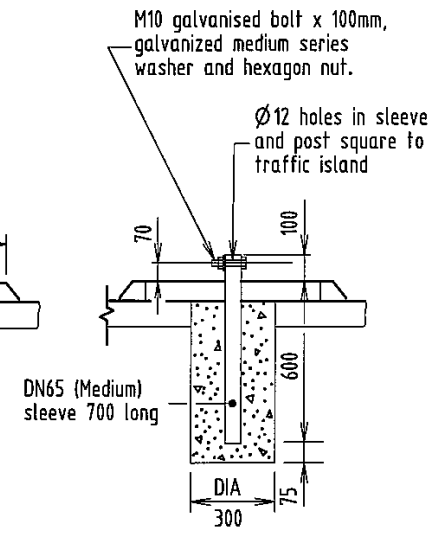
RT-0165

REVISION CODE **A**



RURAL ROADS

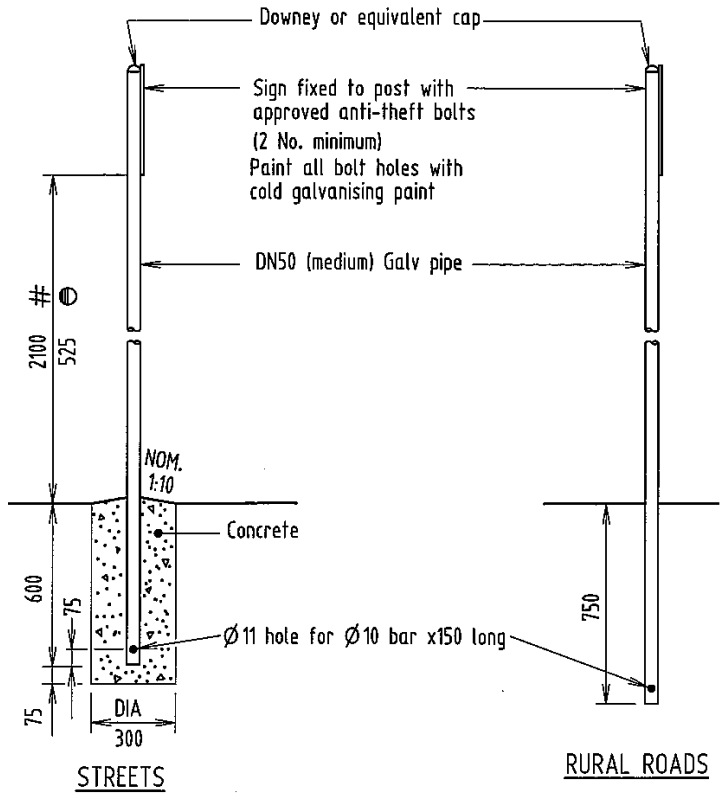
TYPE 1 MEDIAN



TYPE 2 MEDIAN

LOCATION OF SIGNS

STREETS



STREETS

RURAL ROADS

NOTES

1. All signs to be reflectorised Class 1 to AS1743 unless noted otherwise.
2. Size & sign type has been included in the schedule and/or in the project drawings.
   Special standards are to be provided at large signs when indicated in the project drawings.
3. All signs are to be approved by the Council prior to erection.
4. Where signs are to be erected in streets where footpaths are not constructed to permanent levels the Rural Roads type base shall be adopted.
5. Signs shall be out of aluminium or aluminium alloy not less than 2mm thick to AS 2848.
6. The DN65 sleeve and spike shall only be used on medians.
7. Text for Bus Stop Series A to AS1744 and shall be placed centrally on sign.
8. Bus Stop text, borders and icons are to be Green Print, Class 2 to AS1743. The sign background shall be Gold Print, Class 2 to AS1743.
9. All pipes to be galvanised. Steel pipe to AS 1074. Galvanising to AS 1650.
10. Concrete N20 in accordance with AS 1379 and AS 3600.
11. Hexagonal head bolts to AS 1111
    Nuts to AS 1112
    Washers to AS 1237
    Galvanizing to AS 1214
12. Bar ø10, Grade 250 to AS 1302.
13. All dimensions in millimetres.

KEEP LEFT SIGN

LEGEND

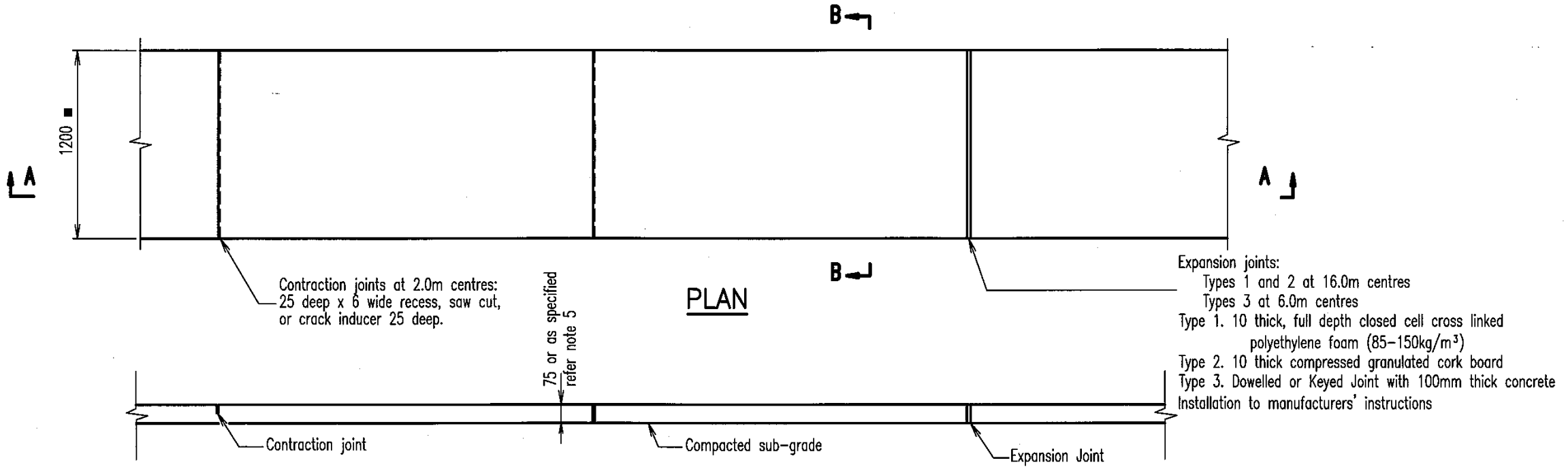
- ⊛ As directed by the D.T.S.
- ⊖ on medians
- # on footpaths

SCALE	NOT TO SCALE	AMENDMENTS			
DRAWN	S.G.MCDONALD	ITEM	DESCRIPTION	DATE	INTL
FILE	RT-0130.DWG				
DATE	JAN.05				
DESIGNED	G.J.PENHALIGON				

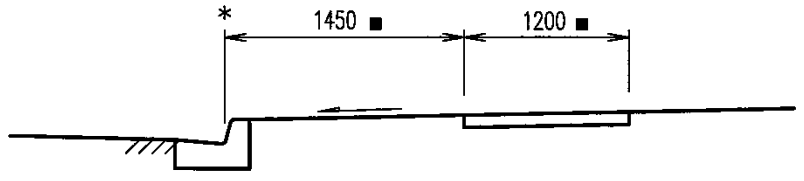
TRAFFIC CONTROL DEVICES

STD. DRAWING NO. **RT-0130**

REVISION CODE **A**

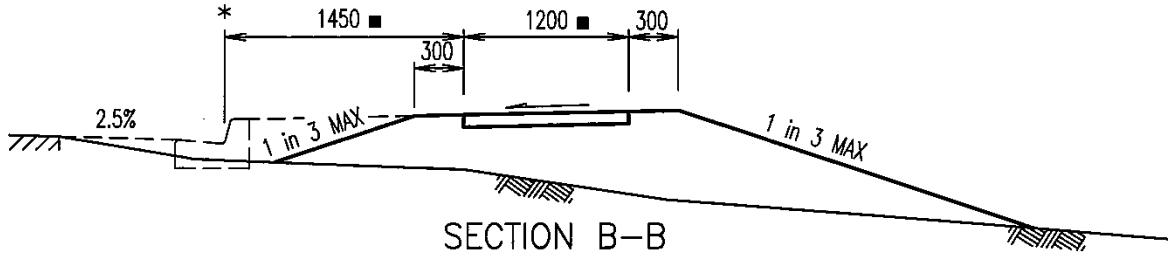


SECTION A – A



SECTION B–B

(Where kerb & channel exists)



SECTION B–B

(Where no kerb & channel exists)

LEGEND

* NOM kerb line.

■ Unless otherwise specified.

NOTES

1. Concrete N25 in accordance with AS 1379 and AS 3600.
2. All concrete to be broom finished.
3. Contraction/expansion joints, 2m MAX spacing.
4. Finished surface tolerance to be maximum $^{+6mm}_{-0mm}$ relative to kerb level and crossfall specified.
5. Thickness to be increased to 125mm at residential vehicular crossings. Reinforce with F62 MIN fabric, 50mm top and edge cover. Provide a contraction or expansion joint at both ends of thickened section.
6. Concrete footpaths, adjoining existing driveways are to be transitioned over a minimum 5.0m length.
7. A street opening permit must be obtained from Council, seek approval of location and levels prior to excavation.
8. Dowelled or keyed joints to be used as required by Local Authority. Refer to Specification.
9. Reinforcing to be used as required by Local Authority. Refer to Specification.
10. All dimensions in millimetres.

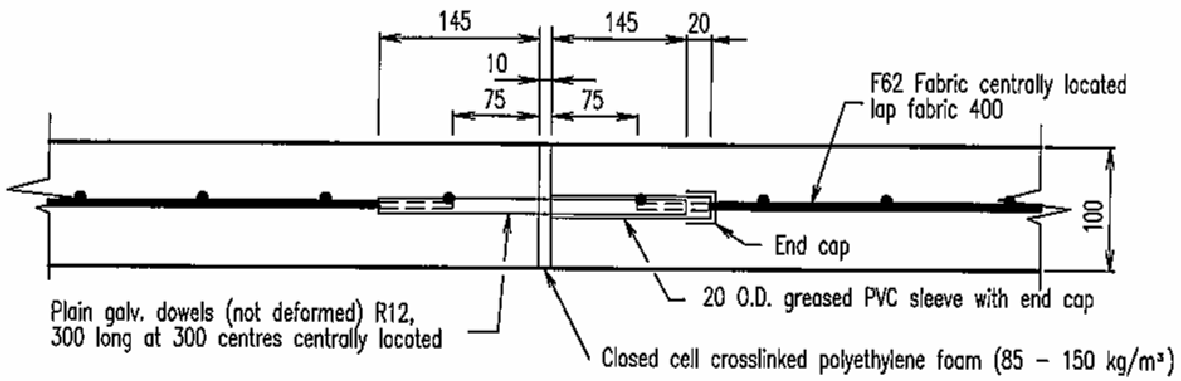
C	Notes 8 & 9 added, Type 3 Joint amended.	6/1/00
B	Pattern lines omitted, thickness 75 MIN and	16/1/97
	Connolly key joints included	
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

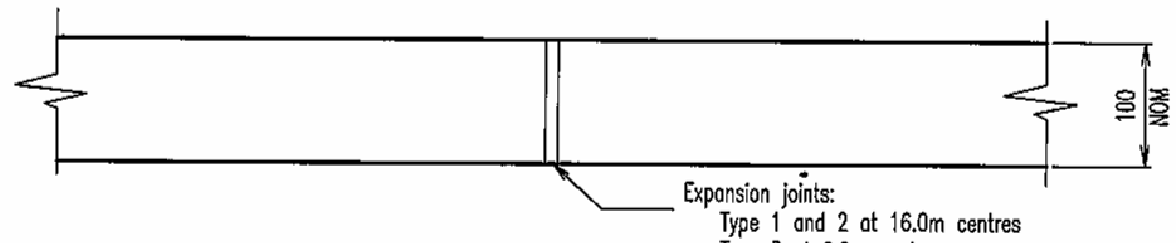
CONCRETE STRIP FOOTPATHS

ROAD/STREET
Standard Drawing
R–0065

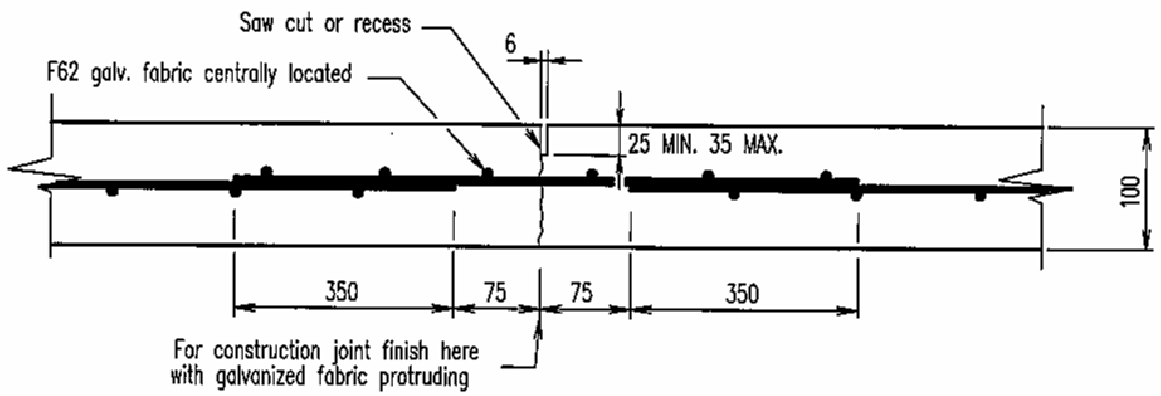
A | B | C



EXPANSION JOINT
Spacing 16m

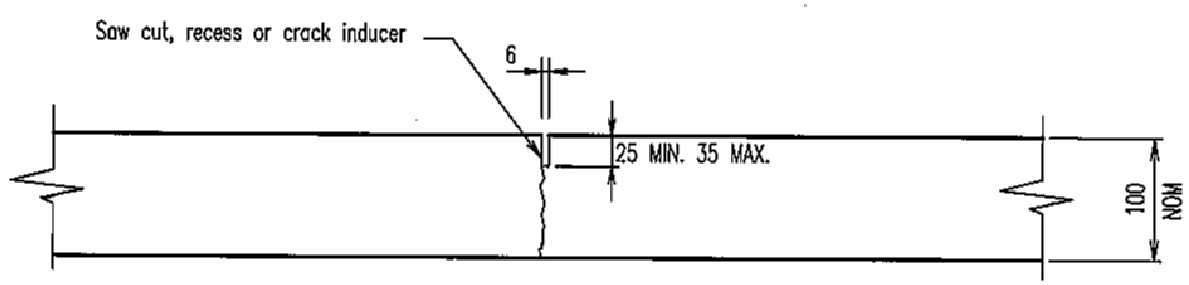


EXPANSION JOINT



CONTRACTION JOINT
Spacing 4m

REINFORCED



CONTRACTION JOINT
Spacing 2m

NON REINFORCED

NOTES:

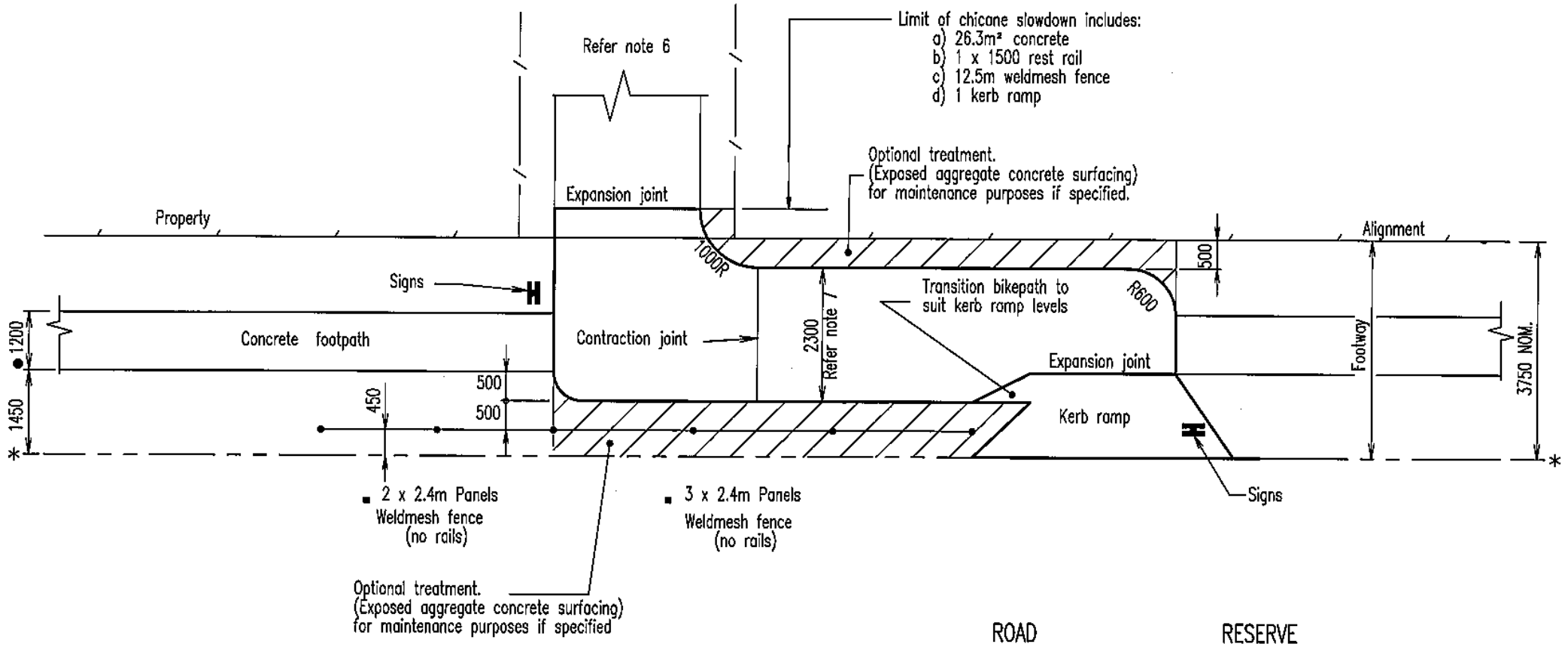
1. Concrete N25 in accordance with AS 1379 and AS 3600.
2. Reinforcement and dowels to be used, if specified, when bikepath is placed on fill or on poor subgrade.
3. Bikepath thickness may be reduced to 75mm in good ground conditions.
4. Dowels Grade 250 steel to AS 1302. Fabric to AS 1304.
5. Galvanizing to AS 1650.
6. All dimensions in millimetres.

B	Expansion joint, alternatives added	16/1/97
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

BIKEPATH
PAVEMENT JOINTS

PARKS
Standard Drawing
P–0012
A | B



OFFSET CHICANE

- For use where reverse curve is not practical
- Recommended for areas with high primary school traffic

LEGEND

* NOM. kerb line
▪ Each section may be reduced by 1 panel, refer project drawings
● Unless otherwise specified

NOTES

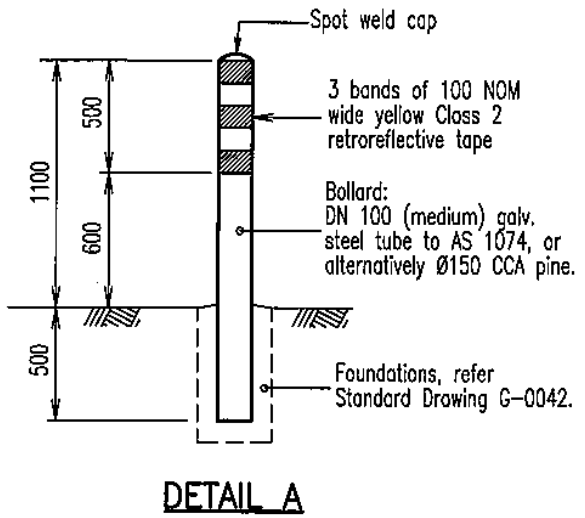
1. Concrete N25 in accordance with AS 1379 and AS 3600.
2. Concrete slab to be 100mm thick, refer Standard Drawing P–0012.
3. Weldmesh fence details as per Standard Drawing G–0045.
4. Kerb ramp details as per Standard Drawing R–0084. Provide Tactile ground surface indicators when specified in project documents.
5. Rest rails, refer project drawing and Standard Drawing P–0010.
6. The NOMINAL 2500 bikepath width may need to be increased for high use areas.
7. Bikepath width may need to be reduced to suit available footway. The preferred width is 2500; the absolute minimum width is 2000.
8. All dimensions in millimetres, unless shown otherwise.

	REVISIONS	DATE
B	Rest rail on verge omitted, Sign relocated	16/1/97
A	ORIGINAL ISSUE	8/12/95

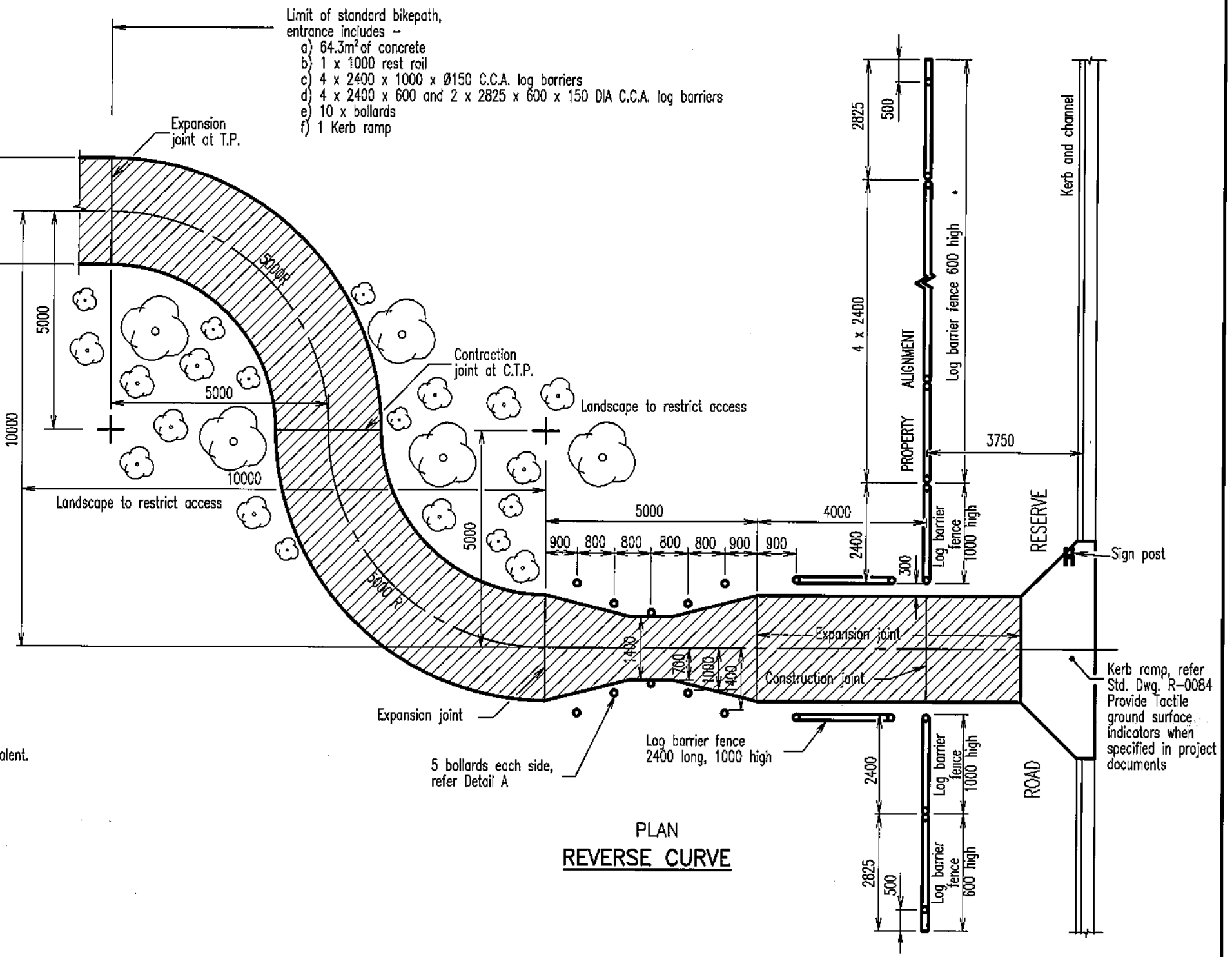
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

BIKEPATH
SLOWDOWN CONTROL
OFFSET CHICANE

PARKS
Standard Drawing
P–0015
A | B



DETAIL A



PLAN

REVERSE CURVE

NOTES

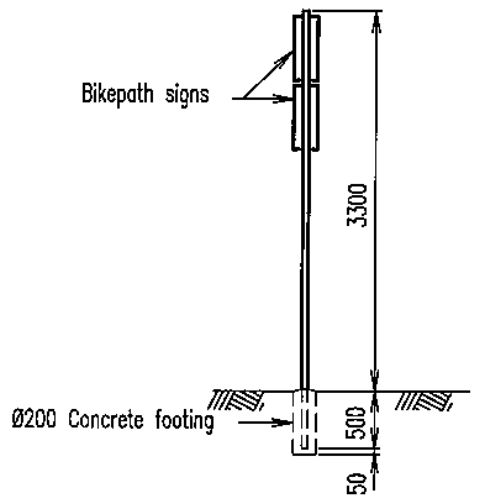
1. Concrete N25 in accordance with AS 1379 and AS 3600.
2. Concrete slab to be 100mm thick, refer Standard Drawing P-0012.
3. C.C.A. log barrier to be 150mm diameter, Grade A superlogs or equivalent.
4. Kerb ramp details refer Standard Drawing R-0084.
5. Rest rails, refer project drawings and Standard Drawing P-0010.
6. The nominal 2500 bikepath width may need to be increased.
7. Refer Standard Drawing P-0010 for log barrier details, adjust location of posts and height to suit dimensions on this drawing.
8. Retroreflective tape to AS/NZS 1906.1. Apply in accordance with manufacturer's recommendations.
9. All dimensions in millimetres.

B	Rest rail on verge omitted. Kerb ramp width not specified	16/1/97
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

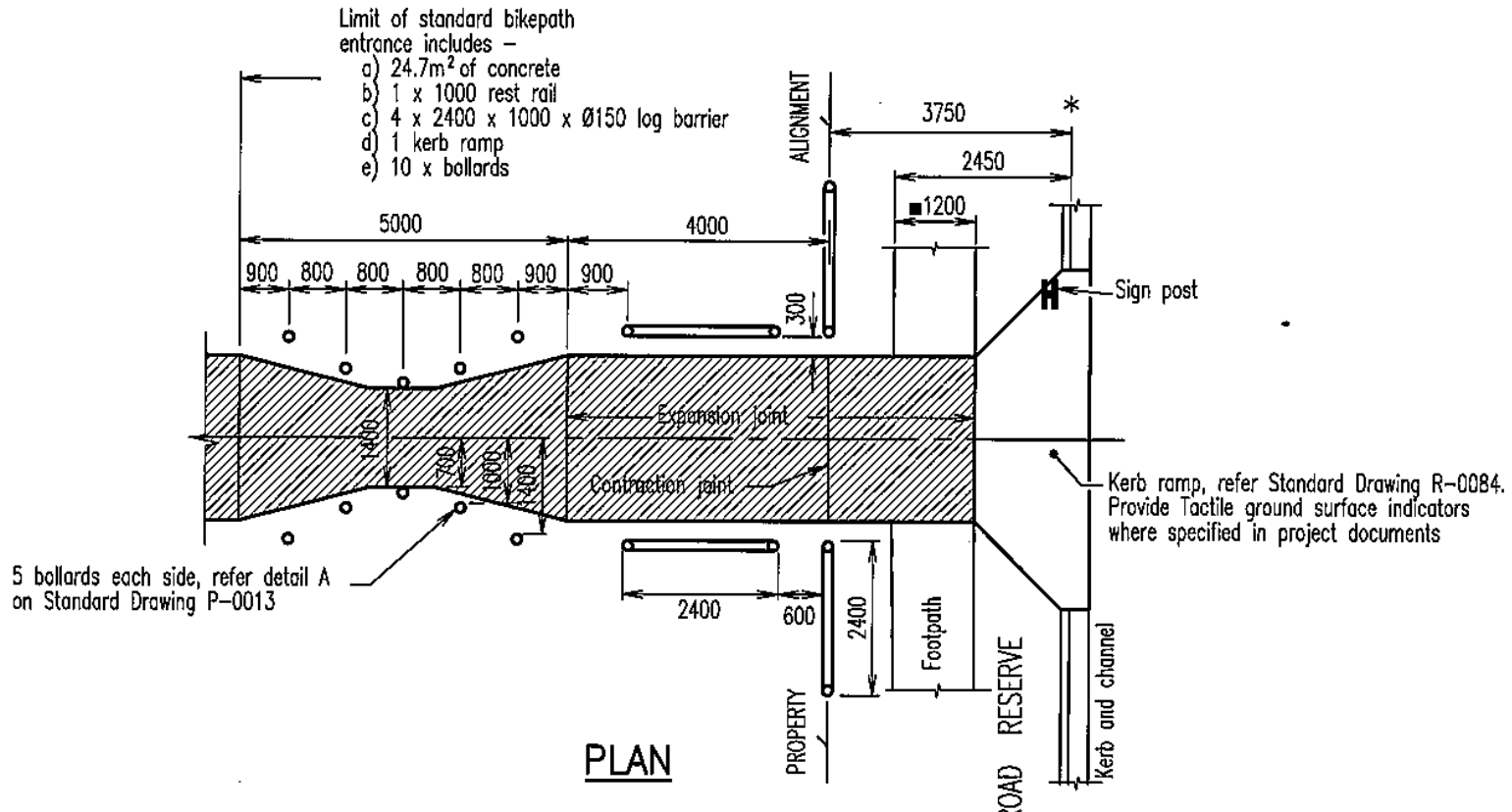
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

BIKEPATH SLOWDOWN CONTROL REVERSE CURVE

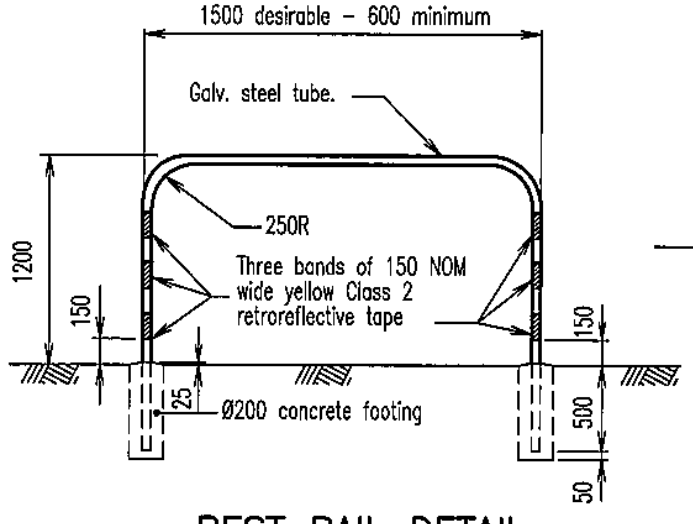
PARKS
Standard Drawing
P-0013
A B



SIGN POST DETAIL

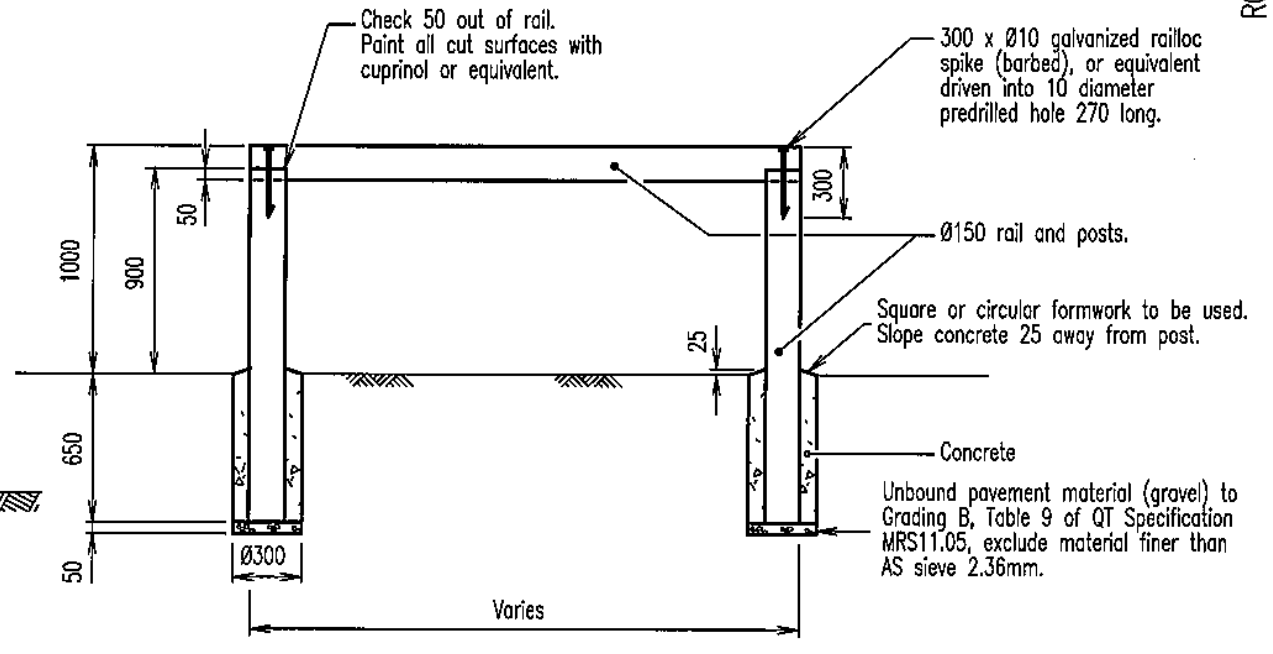


PLAN



REST RAIL DETAIL

Refer project drawing for specification



LOG BARRIER FENCE DETAIL

LEGEND

- ■ Unless otherwise specified
- * NOM kerb line

NOTES

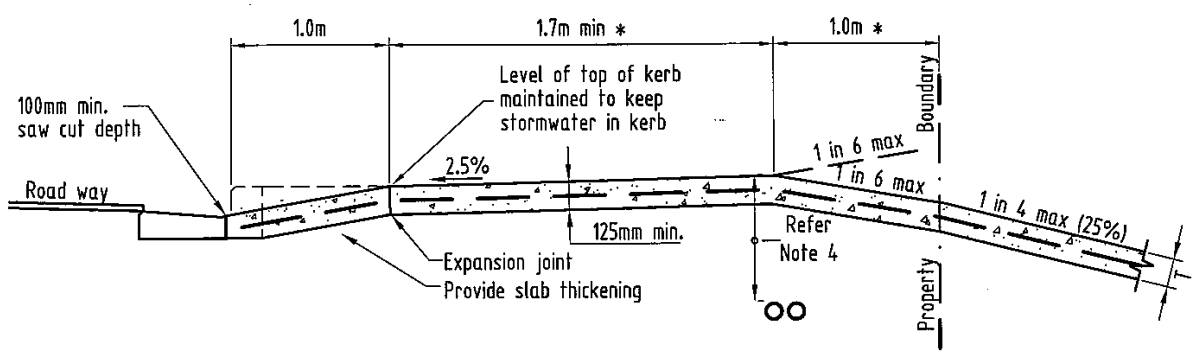
1. Concrete N25 in accordance with AS 1379 and AS 3600.
2. Concrete slab to be 100mm thick, refer Standard Drawing P–0012.
3. C.C.A. log barriers to be Ø150, Grade A superlogs or equivalent.
4. Kerb ramp details as per Standard Drawing R–0084.
5. Rest rail to be 60.3 x 3.6 CHS in accordance with AS 1163/C250.
6. Galvanizing to AS 1650.
7. Clear opening in log barrier fence along the property alignment to be 4700 where a lockrail if specified.
8. All dimensions in millimetres.

B	Rest rail on verge omitted, kerb ramp width not specified	16/1/97
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

BIKEPATH ENTRANCE TO ROAD RESERVE

PARKS
Standard Drawing
P–0010
A B

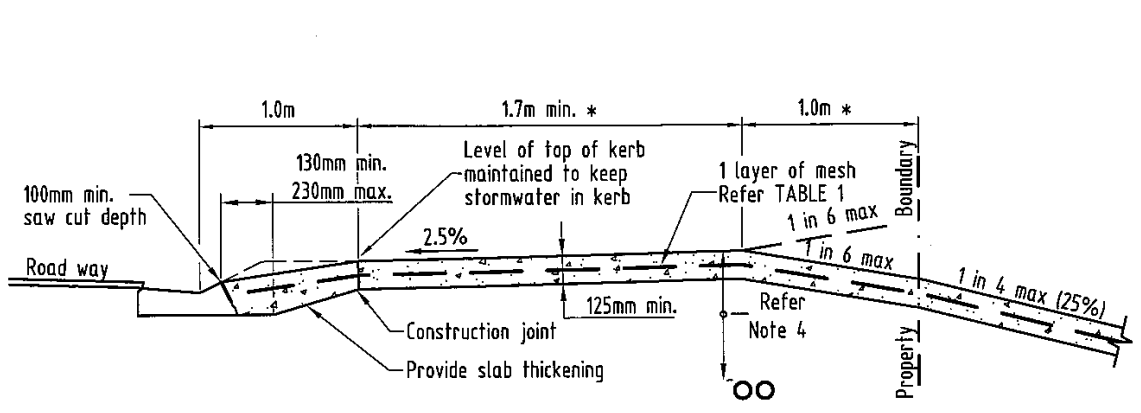


SECTION - BARRIER KERB & CHANNEL CROSSING

SCALE N.T.S.

TABLE 1

Use	T	Mesh
Residental	125	F62
Industrial	150	F82

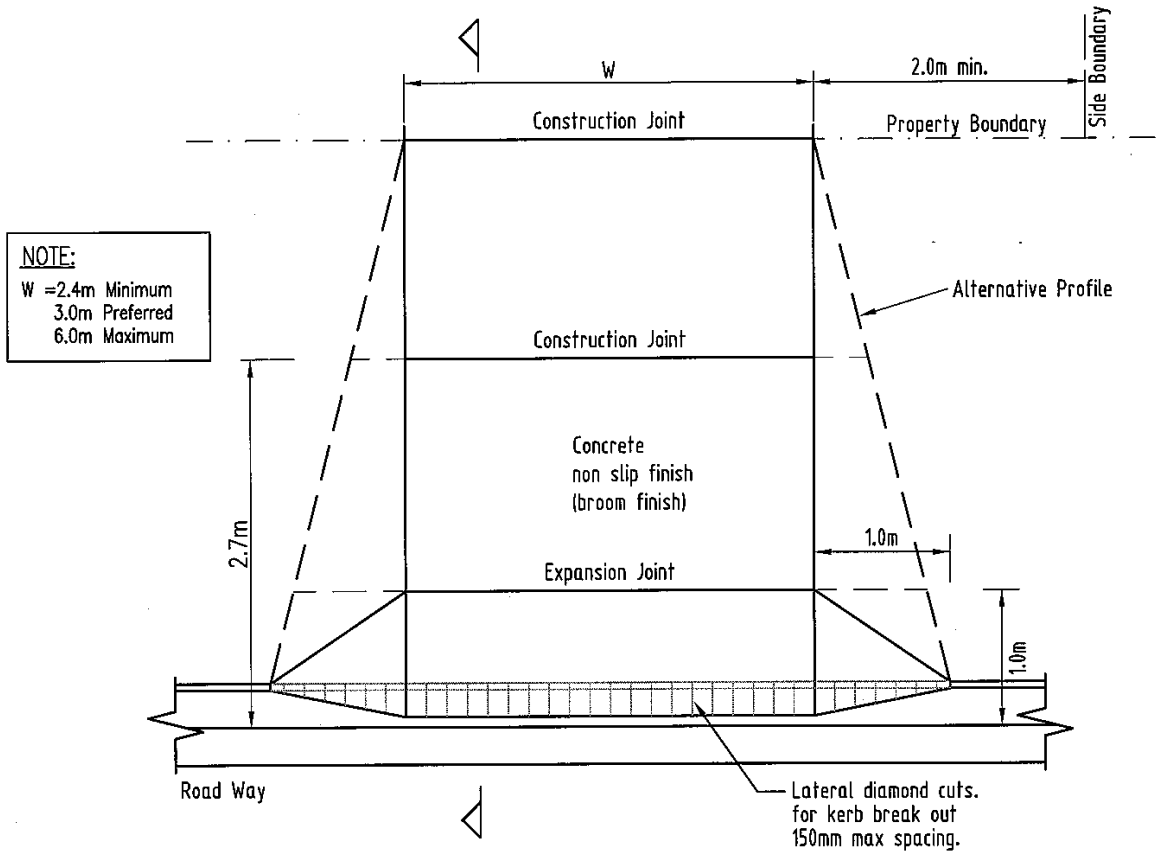


SECTION - LAYBACK KERB & CHANNEL CROSSING

(KERB 90mm LOWER) SCALE N.T.S.

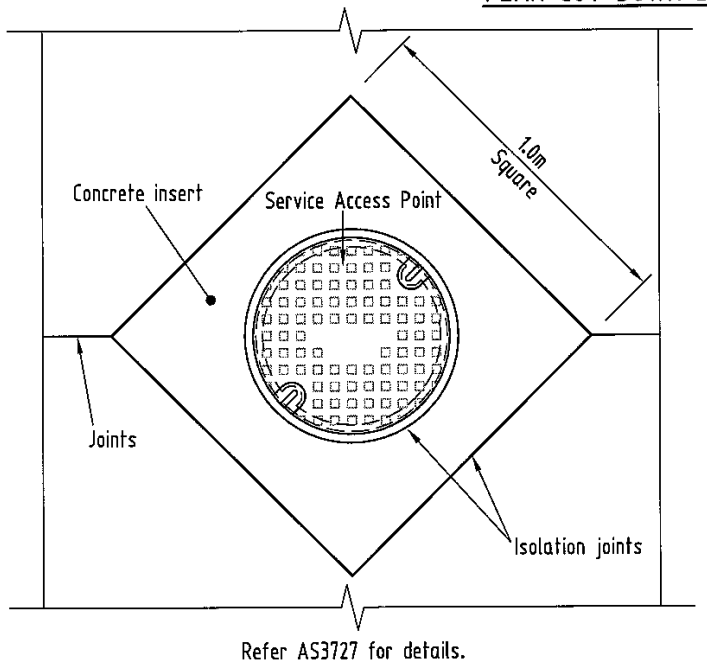
* OTHER MATERIALS MAY BE USED IN THIS SECTION – REFER SECTION 8.1 OF THIS STANDARD.
DIMENSIONS SET FOR 4–6m WIDE VERGE.
COUNCIL PERMISSION REQUIRED FOR VARIATION OF THIS DIMENSION.

NOTE:
W =2.4m Minimum
3.0m Preferred
6.0m Maximum



PLAN-CUT DOWN DRIVEWAY - LAYBACK KERB

SCALE 1:50



Refer AS3727 for details.

SERVICES IN DRIVEWAY

SCALE 1:50

NOTES:

1. Concrete N25 to AS 1379 + AS 3600.
2. Crossings are not designed for commercial properties.
3. Footpath section to vary where necessary to match concrete footpaths and verge profiles. Footpath earthworks adjoining concrete must be well compacted and transition smoothly to and from driveway.
4. Ensure 600mm MIN cover to services in footpath.
5. No tracks permitted across foothpath.
6. Concrete path shall be continuous across driveways as pedestrian and cyclists should have right of way.
7. Refer IPWEA P–0012 for concrete joint details.
8. Brass disks embedded in kerb and channel shall not be removed with out the permission of council.
9. A street opening permit must be obtained from Council for driveway before cutting or altering the kerb and channel.
Seek approval of location and levels prior to construction.
10. Driveway may be used by the public to the property boundary including refuse or delivery vehicles.
11. Surface treatment may not be matched by Council if repairs are needed to services under driveway.
12. Concrete driveway surface in road reserve shall have a non slip finish (broom finish).

CITY OF GLADSTONE

CALLIOPE SHIRE COUNCIL

SCALE	NOT TO SCALE
DRAWN	S.G.MCDONALD
FILE	RT–0055.DWG
DATE	JAN.05
DESIGNED	G.J.PENHALIGON

AMENDMENTS

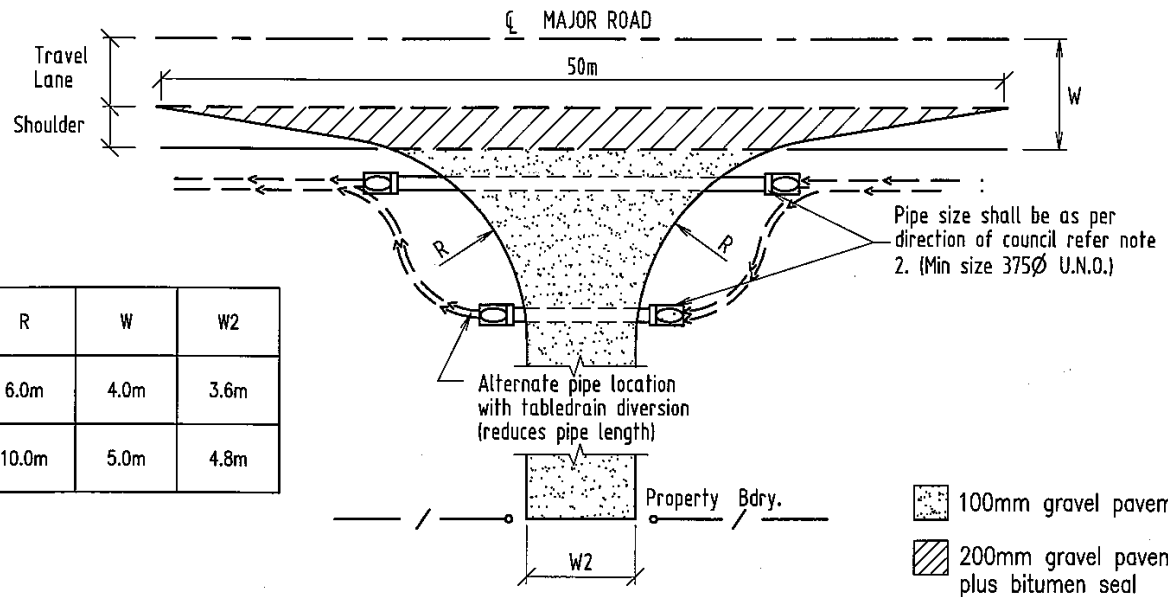
ITEM	DESCRIPTION	DATE	INTL

CUT DOWN DRIVEWAY
MOUNTABLE KERB AND CHANNEL

STD. DRAWING NO.

RT-0055

REVISION CODE **A**

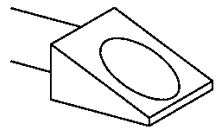


Major Road	R	W	W2
Gravel	6.0m	4.0m	3.6m
Bitumen	10.0m	5.0m	4.8m

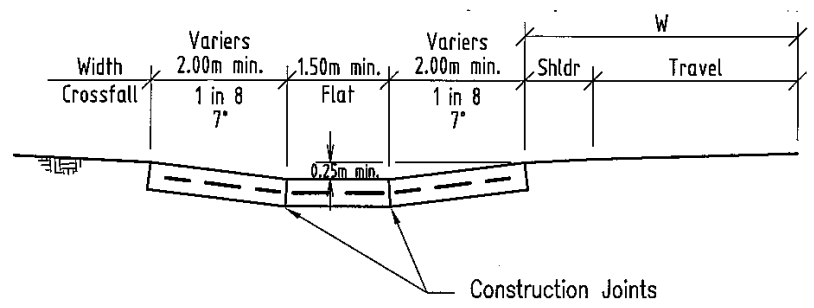
PLAN

100mm gravel pavement

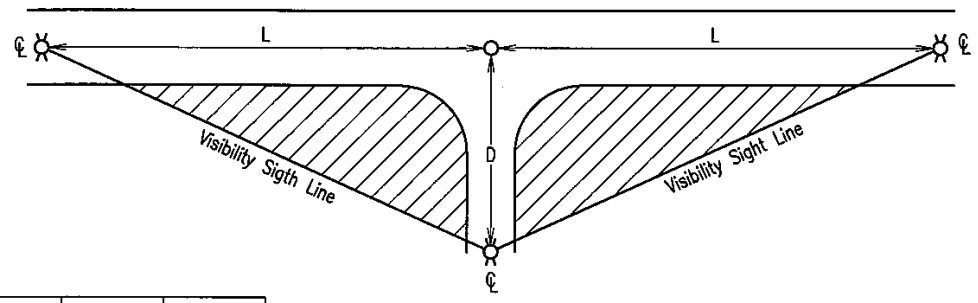
200mm gravel pavement plus bitumen seal (may be required only if major road is bitumen)



PRECAST SLOPING HEADWALL



FLAT TERRAIN CROSSING

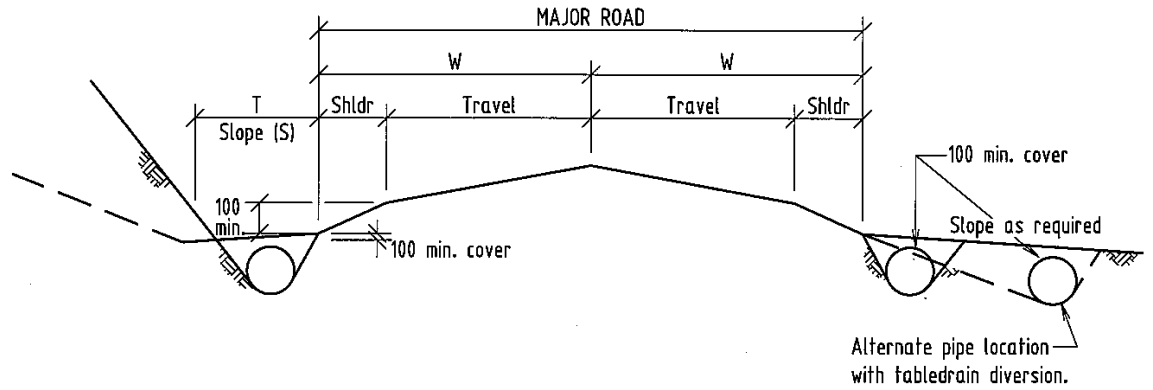


Major Road	D	L (desirable)	L (absol. min)
Gravel	6m	140m	80m
Bitumen	10m	280m	170m

VISIBILITY TRIANGLE

Sight Line 1.15m above roadway at these three (3) locations

1. Vegetation clearing
2. Earthworks to 600mm below visibilty sight line level.
3. Trim area to be maintainable with a tractor and slasher.



PIPE CULVERT CROSS SECTION

Major Road	W	T	Slope (S)
Gravel	4m	2m	level
Bitumen	5m	2m	away from road

NOTES:

1. Pipe crossing shall be an 'RCP' pipe with sloping precast conc. headwall
2. Where depth of table drain is less than 250mm in flat terrain a concrete slab 150mm thick + F62 mesh may be permitted by council on request.

CITY OF GLADSTONE

CALLIOPE SHIRE COUNCIL

SCALE **NOT TO SCALE**

DRAWN	S.G.MCDONALD
FILE	RT-0056.DWG
DATE	JAN.05
DESIGNED	G.J.PENHALIGON

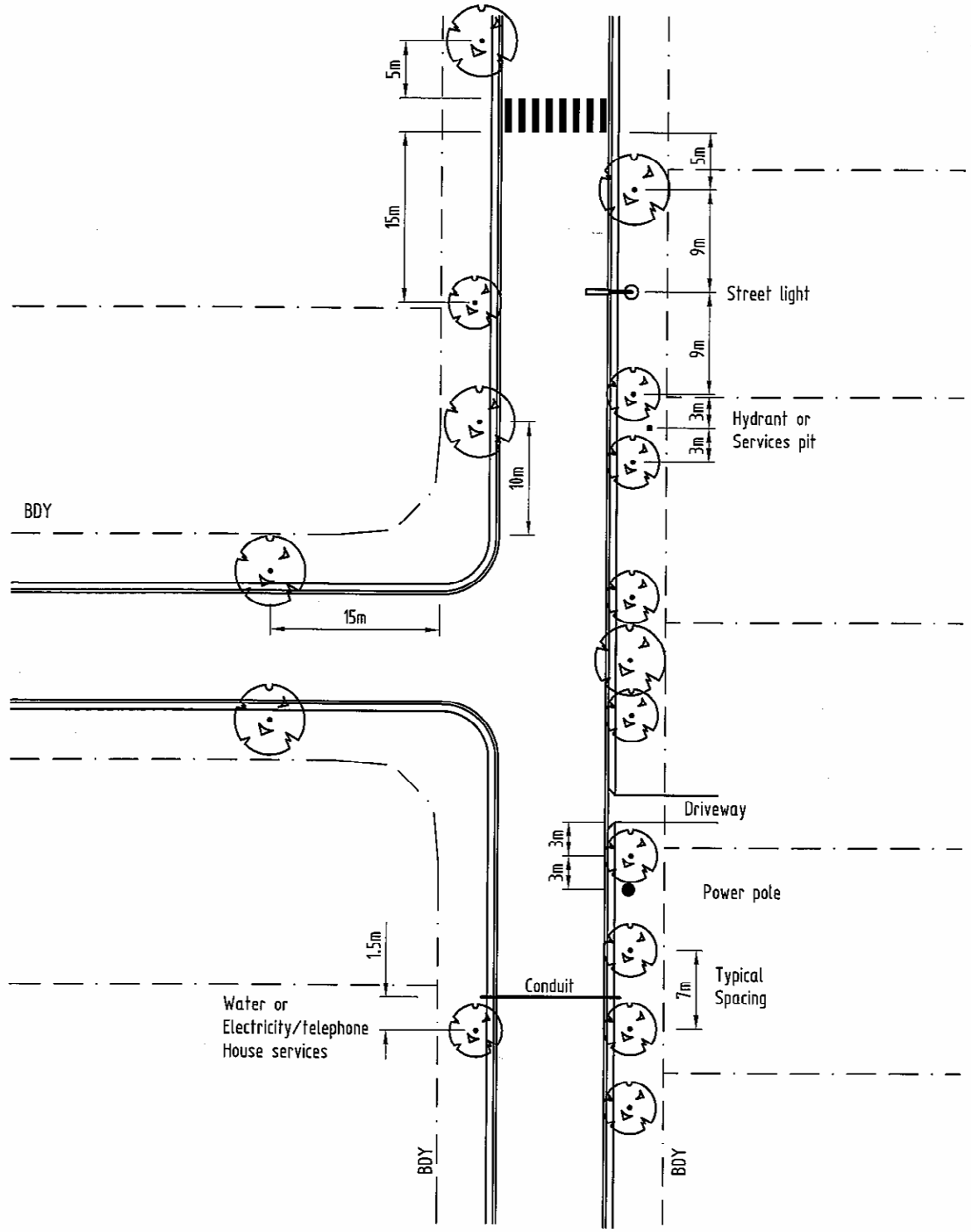
AMENDMENTS

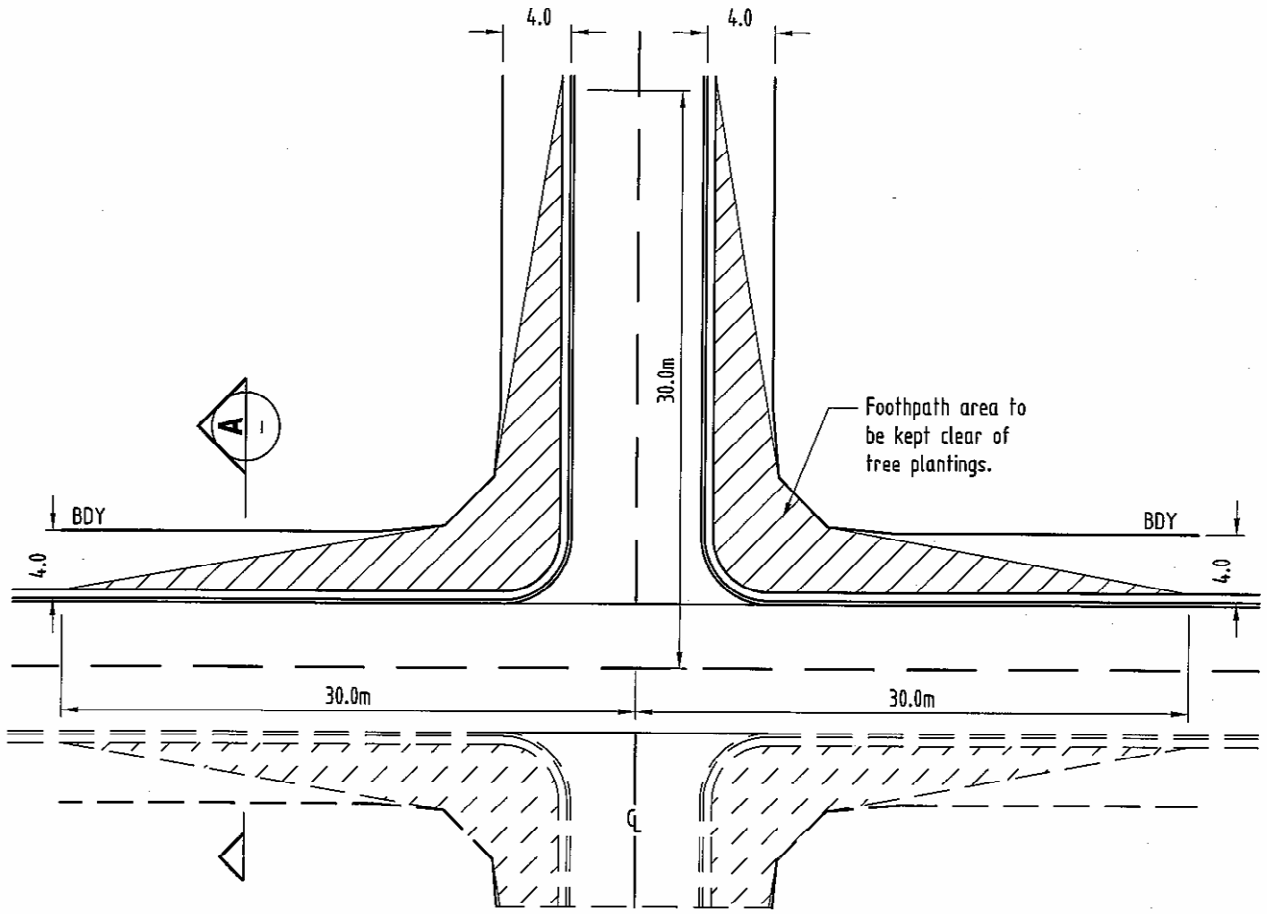
ITEM	DESCRIPTION	DATE	INTL

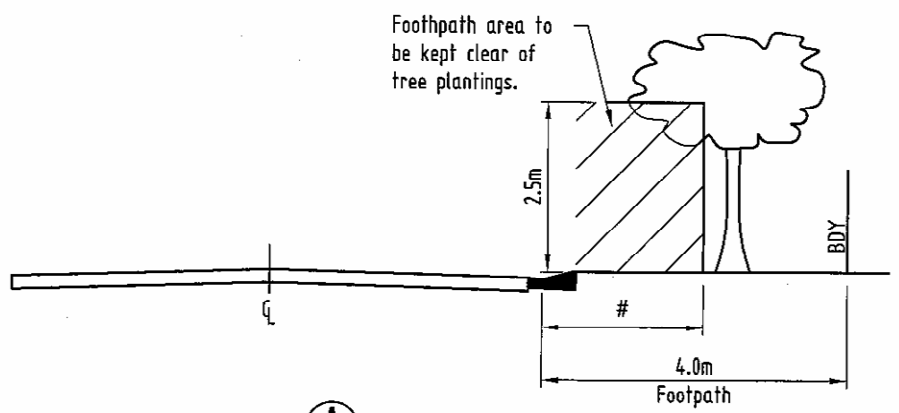
RURAL PROPERTY ACCESS

STD. DRAWING NO. **RT-0056**

REVISION CODE **A**







SECTION (A)

NOTES:

1. Species planted on the footpath shall be of a clean trunk species, having a minimum canopy height of 1.5m. Other shrubs to be a maximum 0.6m high. This may need to be varied in undulating country.

NOTE:
Varies as per visibility triangle

CITY OF GLADSTONE

CALLIOPE SHIRE COUNCIL

SCALE	NOT TO SCALE
DRAWN	S.G.MCDONALD
FILE	RT-0170.DWG
DATE	JAN.05
DESIGNED	G.J.PENHALIGON

AMENDMENTS

ITEM	DESCRIPTION	DATE	INTL

STREET TREE CLEARANCES

STD. DRAWING NO.

RT-0170

REVISION CODE **A**

SECTION 16. - INDEX

Q

R

S

T

U

V

W

REFERENCES

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