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Narrandera Shire Council

Engineering Guidelines for Subdivisions and Development Standards

Part 2 - Roads Design

February 2011



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1. Introduction

This section of the Engineering Guidelines for Subdivisions and Developments outlines Council's recommended practice for the design of rural and urban roads. It is in no way a comprehensive "Design Manual" and it is to be read in conjunction with and as a supplement to referenced standards.

The Subdivision and Development Guidelines comprise the following:

- Part 1 General Requirements
- Part 2 Guidelines for Design of Roads**
- Part 3 Guidelines for Design of Drainage
- Part 4 Guidelines for Design of Water Reticulation
- Part 5 Guidelines for Design of Sewers
- Part 6 Guidelines for Landscaping and Measures for
Erosion, Sedimentation and Pollution Control
- Part 7 - Guidelines for Testing



2. Urban Roads

The following section applies to the provision of roads in urban areas, the classification of these roads as urban will be a determination of the Council.

2.1 Plans

A1 Plans should include the following:

- ▶ Cover sheet with locality plan and drawing list;
- ▶ Lot Boundaries and Numbers;
- ▶ Road Centreline Chainages, Radii, Tangent Points and Deflection Angles;
- ▶ Benchmarks at spacings of 100 metres within the development site;
- ▶ Street Names and North Point;
- ▶ Bar Scales;
- ▶ Existing surface levels, features services and structures;
- ▶ Proposed Service Crossings;
- ▶ Road Reserve and Carriage width;
- ▶ Australian Height Datum;
- ▶ A schedule of symbols;
- ▶ Radii on Kerb Returns and Kerb Lines;
- ▶ Vehicular Crossings;
- ▶ Contours and Finished Surface Levels on Lot Corners;
- ▶ Details of abutting roads and streets necessary to ensure matching in of levels and grades;
and
- ▶ 1:500 Scale.

Infrastructure service design is not to be undertaken in isolation rather as an integrated approach that anticipates conflict.

2.2 Centreline Longitudinal Section

The centreline longitudinal section should include the following:

Scales 1:500 horizontal; 1:100 vertical

- ▶ Chainages;
- ▶ Reduced level of existing surface and of design level of road, left and right kerbs where variations in crossfall occur and building lines;
- ▶ Design grades;
- ▶ Length of vertical curves; and



- ▶ Existing and proposed services.

Longitudinal levels at:

- ▶ 20 metre intervals on straight grades;
- ▶ 5 metre intervals in vertical curves; and
- ▶ At all intermediate changes of grade.

Longitudinal sections and cross sections should be taken along existing intersecting roads (approx. 50 metres) to enable kerb returns, dish crossings and drainage design.

2.3 Cross Sections

Cross sections are to be viewed from the direction of increasing chainage. Information to be provided as follows:

- ▶ 20 metre intervals;
- ▶ Natural scales of 1:100;
- ▶ Chainage;
- ▶ Reduced levels of existing surface; and
- ▶ The design level and cross fall of pavement;

Typical cross sections shall provide information as follows:

- ▶ Type of kerb & channel;
- ▶ Batters of cuttings and embankments are to be shown beyond the property alignment;
- ▶ Depth and type of material in each layer of pavement;
- ▶ Type of surfacing;
- ▶ Subsoil drainage (if required);
- ▶ Pavement and nature strip crossfalls;
- ▶ Footpath offset;
- ▶ Service corridors;
- ▶ Landscaping;
- ▶ Road width between inverts;
- ▶ Centreline; and
- ▶ Road crown.



2.4 Kerb Returns

Kerb profiles should be shown for all kerb returns, cul-de-sac bulbs and turning tees.

A scale of 1: 200 horizontally and 1:20 vertically is suggested. Levels at ¼ points. Kerb return radius shall be 7.5 metres in residential streets and 12 metres for industrial areas. Where bus routes are provided vehicle-turning paths shall be provided for at intersections.

2.5 Standard Road Classifications and Associated Widths

The guidelines below are not to be considered as inflexible development standards. The principles detailed in the Australian Model Code for Residential Development (1995) are generally supported. Accordingly, Developers/subdividers are advised that Council will consider and, to some degree, encourage departures from the below guidelines where it can be clearly established such departures:

- ▶ Improve environmental and water quality outcomes;
- ▶ Landscaping and urban design outcomes; and
- ▶ Are regarded as contributing to the amenity of the area.

Changes to road width standards, should be considered in the context of an integrated approach to:

- ▶ New Urbanism Principles;
- ▶ Land-Use Strategies;
- ▶ Master Plan's for Precincts; and
- ▶ Subdivisional Master Plans.

For road widths narrower than six (6) metres Council reserves the right to consider these on a case-by-case basis.



The road hierarchy comprises; Local distributor; Collector; Local access; Cul-de-sac and minor access.

Table 1 Road Standards, Urban Street Network – Narrandera Shire Council

Classification of Road	Local Distributor	Collector	Local Access	Cul-De-Sac & minor access
Maximum traffic Volume (vehicles/day)	5000-7000	3000	1000	150
Number of dwellings	500-750	300	100	15
Carriageway Width (m)	13	11	8	6
Footway Width (m)	2 x 5.5	2 x 5.5	2 x 3.5 or 2x 5.5	2 x 3.5
Road Reserve (m)	24	22	15 or 19	13
Lane Provision	2 Moving Parking	2 Moving Intermittent Parking	2 Moving Intermittent Parking	2 Moving Intermittent Parking
Maximum desirable speed (km/h)	40-60	30-50	20-30	15-25
Maximum design speed (km/h) (for sight distance calculations)	60	60	40	30
Footpaths (confirm requirements with Council)	Both sides	Both sides	One side	Not required
Cycle Ways	2.5m wide shared cycleway footpath on one side	Marked	On road shared	On road shared
Kerb and Channel	150 mm high integral barrier	150 mm high integral barrier	Integral barrier or semi mountable	Semi mountable

Roads used as bus routes are usually designed to local distributor standards, i.e. 13-metre carriageway width or provision for two moving and two parking lanes. Where bus routes are provided in low traffic environments then consideration may be given to a reduction in width and or the provision of indented bus bays, however such approval will only be considered on a case-by-case basis.

Standard road widths are measured between kerb inverts as shown on the standard drawings.

For any carriageway width less than 8 metres off-street parking conditions will apply.



2.6 Kerb and Channel

All urban streets are to have sealed pavement with kerb and channel.

Alternative kerb and gutter treatments that achieve water sensitive urban design outcomes are encouraged subject to prior approval as part of concept development.

The design of kerb and channel shall comply with drainage requirements of Australian Rainfall and Runoff.

Kerb types are as shown on Council's Standard Drawings.

Variations are subject to Council approval.

2.7 Road Surfacing

All new roads shall have a 7 mm prime coat applied prior to the application of a two coat seal.

2.8 Access and Vehicular Crossings

Vehicle-crossovers are to be provided into each allotment and are to be in accordance with Council Standards and are to be within the following width ranges. Vehicle crossovers for subdivision are to be provided at the time of house construction.

Table 2 Vehicular Crossings

	<i>Minimum Width (m)</i>	<i>Maximum Width (m)</i>
Residential Crossing	3	7.5
Light Industrial Crossing	3.6	8
Heavy Industrial	3.6	12

Note: Widths are at the property boundary and do not include splays.

Where kerb and gutter is provided:

- Access and vehicular crossovers are to be a minimum of 1000 mm clear of all drainage structures on the kerb and gutter and are not to interfere with the existing public utility infrastructure, including council drainage structures. Where driveway impacts on these structures it is to be located clear of the driveway;
- Where kerb and gutter is not required by Council construct concrete vehicular access to the lot incorporating a preferred 375 mm diameter stormwater pipe and concrete headwalls. Where it is impractical to construct a 375 mm pipe, a reduced pipe size or concrete dish crossing may be considered subject to approval on a case-by-case basis;
- Property access is to be provide for forward entry and exit for other than single residential development;
- Access to adjacent properties may be fully combined or alternatively separated by a minimum distance of 2 metre;



- ▶ Access to residential corner allotments shall be at least 6 metres from the road intersection property boundary;
- ▶ The portion of the crossing that passes through the footpath is to be designed to AS 1428 “Design for Access and Mobility”;
- ▶ Where driveway access slopes are in excess of 1:10 then a design car template should be used to check access;
- ▶ On steeper sites that includes battle axe blocks the design and construction of the driveway is to account for stormwater;
- ▶ Bridge type gutter crossings are not permitted;
- ▶ Multiple driveways to each lot are discouraged and require specific approval, and
- ▶ Road access to cuttings is to be clear of services located in the embankment.

2.9 Staged Road Construction

Where roads are constructed in stages as part of staged subdivision development, a permanent type barricade is to be constructed at the end of each stage to warn motorists of the dead-end and prevent their passage beyond. Such barricades are to be removed when it is safe for through traffic to use this road and approval from Council has been received in writing.

The barricade should be made from a D4-2-1 Chevron or similar (refer AS 1743 Supp 1-1992).

2.10 Road Crossings

Trench backfill for all services including conduits is to be 3% cement stabilised sand to subgrade level. All conduit trenches should be at a grade of not less than one (1) percent and should be clearly located on relevant drawings.

2.11 Traffic Generation

A local area traffic management plan shall be provided for the subdivision as part of the agreed masterplan. This plan shall detail average annual daily traffic volumes (AADT), within the subdivision, assess the impacts of traffic on the surrounding street network. Where adverse impacts are identified traffic mitigation measures shall be implemented.

Qualified traffic consultants shall determine projected traffic volumes that account for existing traffic patterns, predicted future development and associated traffic generation.

In the absence of sophisticated traffic modelling, an assessment of trip traffic generation shall be based on 10 vehicle trips per allotment per day.

2.12 Pavement Design

2.12.1 Flexible Pavements

Road pavement design shall be based on the provision of flexible road pavements as follows:



- ▶ Australian Road Research Board “Pavement Design for Light Traffic: a supplement to the Austroads pavement design guide”; and
- ▶ Classified Road and Industrial road pavements are to be designed in accordance with “A guide to the Structural Design of Road Pavements” - AUSTRROADS.

A minimum design life of 20 years should be used to determine the pavement thickness.

Designers are to submit traffic loading calculations based on Australian Road Research Board “Pavement Design for Light Traffic: a supplement to the Austroads pavement design guide”;

Design subgrade CBR values should be determined by either Geotechnical Engineering Consultants and/or agents of a N.A.T.A. registered laboratory. The investigation will include “logging” of test holes to a depth not less than 1 metre below design subgrade levels (unless rock is encountered). Soil samples should be taken at the design depth and CBR tests undertaken after soaking the samples for four days.

The frequency of test holes should be in accordance with Australian Road Research Board “Pavement Design for Light Traffic: a supplement to the Austroads pavement design guide”.

A copy of the site investigation report including test results should be submitted with the pavement design and the Engineering Drawings.

The minimum pavement thickness shall be 280 mm for roads and 150 mm for carparks.

2.12.2 Rigid Pavement Design

Requires approval in principle prior to commencement of design. Concrete pavements are to be designed in accordance with Guide to residential streets and paths, Cement Concrete and Aggregates Australia.

2.13 Subsoil Drainage

Subsoil drainage is to be provided as required by the Standard Drawing and is to be drained to an appropriate stormwater pit. Flushing points are to be provided at all upstream ends. The minimum grade for subsoil drainage is 1:250 with an absolute minimum grade of 1:300.

Subsoil drainage shall be provided on the topside of the road. Where stormwater drainage is provided and there is granular backfill surrounding the pipes this negates the need to provide subsoil drainage. Note that granular backfill for stormwater drainage pipework provides a free draining medium provided a slotted drainage pipe with geofabric surround connects to the stormwater pits.

The intention of subsoil drainage is to prevent water ingress into the road pavement. Subject to approval of Council on a case by case basis, subsoil drainage may be omitted where sandy free draining soils are present or on the downhill slope of the road pavement.



2.14 Geometric Standards

The geometric design of arterial roads is to be based on the current AUSTRROADS design standards for urban roads for an 80 km/hour travel speed.

The design of all other urban roads is to provide smooth, safe trafficable horizontal and vertical alignments, adequate sight distance with consideration being given to the road classification requirements, pedestrian access to each allotment, provision for utilities and stormwater drainage.

The design speed to be used for a particular road is as per Table 1 –Road Standards for the Urban Street Network.

For design speeds up to 60 km/hour, the use of transition curves is not considered necessary.

The minimum radius of horizontal curves is detailed in Table 3: -

Table 3 Minimum Radius of Horizontal Curves

Minimum Deflection Angle	Minimum Radius (m)
75°	20
60°	33
40°	65
30°	75
20°	100

Where the deflection angle is 90° and travel speed is not an issue, the size of the horizontal curve is to be related to the turning requirements of vehicles such as single unit trucks (removalist vans and garbage trucks). Details on the relationship between speed, radius and tangent lengths are referred to in AMCORD.

2.15 Vertical Alignment

The maximum permissible grade on an arterial road is to be 8%, with a minimum grade of 0.5%.

The maximum permissible grade on all other roads is to be 16% for a maximum distance of 50 metres and 12% where the length of straight grade exceeds 50 metres. The minimum grade is 0.33%.

A maximum permissible grade of 10% (1 to 10) should be used adjacent to street intersection, locations of poor visibility, horizontal curves of radius 15 metres or less and at cul-de-sacs. Turning circles in cul-de-sacs on steep grades should have grades less than 5%.

Council's drainage requirements on steep grades may involve special structures and extensive piping through easements. Refer also to AR&R limitations on velocities.

Kerb and channel is to have a desirable minimum grade of 0.50% (1 in 200) with an absolute minimum of 0.33% (1 in 300). Saw tooth shaped profiles that are reliant upon pipe drainage are discouraged. Special consideration is required for directing of the major flow path of water to designed flow paths.

Roads are to be designed to provide accessibility to the adjacent footpaths in accordance with AS 1428.2 Design for Access and Mobility.



Grades through intersections are not to exceed 4% to provide for stationery vehicles queued at intersections.

2.16 Vertical Curves

Vertical curves are to be provided at all changes of grade and where practical should coincide with the horizontal curvature. The values given in Guide to the Geometric Design of Rural Roads - by AUSTRROADS, are applicable to urban conditions in the relevant ranges.

Eccentric vertical curves will only be accepted in difficult design situations with prior written approval.

2.17 Pavement Crossfalls

The normal crossfall on bituminous pavements should be 3%.

The maximum crossfall permitted is 6% and will occur in super-elevated curves sideling land and road intersections.

Super-elevation of horizontal curves is to be based on the current AUSTRROADS design policy for urban roads. The relative change in grade of kerb line and centreline is not to exceed 0.5%.

2.18 Offset Crown

The crown may be shifted towards the higher side of the road. The crown should be not closer to the kerb line than 2.0 metres to ensure that the kerb retains capacity to transport stormwater flows. The designer is to assess the storm water capacity of the system.

2.19 Split Level Carriageways

Use of split-level carriageways is strongly discouraged.

The median may include a permanently retained batter not steeper than 1 in 4 (1 horizontally and 4 vertically). Maintenance and occupational health and safety issues must be resolved prior to approval of split level carriageways.

Crossfall on each carriageway is to be one way and toward the kerb and channel. The crossfall of the median should not exceed 1 in 4, to permit maintenance to be carried out.

Long lengths of two level roads will not be permitted nor may this type of construction be carried across street intersections without the special approval of Council.



2.20 Batters

All roads should be cleared full width and 0.5 metres inside the lot boundaries, or to a sufficient width to include cut and fill batters.

Footpaths reserves should be formed so as to extend 0.3 metres past the road alignment into the adjacent allotments to enable fences to be constructed at road level. Road batters should lie wholly within the adjacent allotments commencing 0.3 metres beyond road boundaries.

- ▶ Such batters should be 1 vertical to 6 horizontal to allow for safe maintenance. Steeper batter slopes of 1 vertical to 4 horizontal are a minimum requirement; and
- ▶ Where the Developer provides special treatments to these batter slopes that reduce maintenance and occupational health and safety issues, then steeper slopes may be tolerated subject to Council approval.

2.21 Batter Encroachment

Where any cutting or filling undertaken by a Developer, whether shown on the plan or not, encroaches on any private or crown property, is retained by an existing structure, or could possibly undermine or remove the support of any existing structure, the Developer should either:

- a. Take out an easement of support over such batter in favour of Council and pay such compensation as may be satisfactorily arranged with the owner or decided by a judicial body; or
- b. Construct an Engineer designed retaining wall.

2.22 Road Embankments

Road embankments exceeding two metres in height, (measured vertically from the top of batter to the intersection of a batter line) sloping steeper than or equal to one (1) vertical to one and a half (1½) horizontal with the natural surface should be protected by means of a safety fence. Safety fences should not be used on road boundaries opposite residential allotments.

2.23 Road Reserve Boundaries

Road boundaries may be curved, but where they are to be fenced as chords, these should be not less than six metres. Where a number of such chords occur adjacent to each other, they should, as far as possible, be practically equal.

2.24 Cul-de-Sacs, Y-Heads and T-Heads

Design Considerations are as follows:

- ▶ Demonstrate compliance with the turning path requirements for service vehicles;
- ▶ The kerb line radius of a cul-de-sac should not be less than 9.5 metres;
- ▶ Special provision should be made to take drainage from down hill cul-de-sacs through easements or drainage reserves that accommodate extreme flood events via underground drainage or via overland flow paths. The capacity of the major drainage system should be the 1



in 100 year ARI stormwater event. As there is potential for upstream stormwater pits to block allow for overland flow paths of water through public owned land and reserves rather than private property;

- ▶ Safety in design principles require street lighting to be located to improve the safety and the illumination of any pathways or reserves;
- ▶ Y heads & T heads are to be minimum length of 13 metres from the centreline intersection to end; and
- ▶ Design intersections that provide for solar orientation of blocks. Note that cul de sacs are not efficient in provision of solar orientation of blocks.

2.25 Pathways, Lanes and Footpaths

2.25.1 Definitions

A Lane is a public road of width greater than three metres but not greater than six metres and is to be used primarily for access to the rear of premises.

A Pathway is a public road of width three metres or less. The maximum width to be adopted for pathways is three metres and is primarily for the use of pedestrians and/or cyclists.

A Footpath Reserve is that part of a public road exclusive of the carriageway and in the case of residential roads may not be less than two (2) metres in width. Residential roads are public roads used primarily for access to residences.

2.25.2 Lanes

Lanes dedicated to the public as access from or between roads, or as access to public gardens and recreation space should be cleared, formed, graded, sealed, kerb and channelled and drained and be suitable for vehicular access. In general, the maximum permissible grade to be used in lanes should be 15%.

2.25.3 Pathways

Pathways dedicated to the public as access from or between roads, or as access to public garden and recreation space should be designed in accordance with 'safer by design principles'. These pathways should be clear and provide uninterrupted lines of site with lighting located at the ends of the pathway.

In general, the maximum permissible grade to be used in pathways should be 15%.

Although plans will not generally be required, the Developer should grade and provide drainage for pathways.

The maximum permissible grade to be used in pathways providing access to public gardens and reserves shall be 8%.



2.25.4 Footpaths

As part of the Development approval process should footpaths be required, then provide in accordance with the requirements as detailed in Table 4.

Table 4 Footpath requirements specific to Narrandera Shire Council

Footpath Width	1.5 metres
Shared footpaths and cycle ways	2.5 metres
The construction of the footpath	At the Developers cost after the building works are completed.
Footpath materials	Reinforced concrete SL72 125 mm thick, at time of subdivision.
Location of the footpath	300 mm from the property boundary
Requirement for footpath	Refer to Road Standards for the Urban Street Network and Masterplan.

Design in accordance with AUSTRROADS “Guide to Traffic Engineering Part 14 – Bicycle Facilities”.

Perambulator ramps should be provided at all kerb crossings. Design is to be in accordance with Australian Standard AS 1428 – “Design for Access and Mobility”.

The requirement for footpaths is dependent on road classification and citywide master planning for footpaths and cycle ways. In the absence of a master plan consult with Council in respect of Councils overall strategy.

Footpath Crossfalls

In areas where the footpath reservation is to be totally paved from the top of the kerb to the adjacent boundary, the crossfall is to be 1 in 50 towards the kerb (2%).

In areas where the footpath is unpaved or partially paved, crossfall from kerb to the adjacent boundaries is to be 1 in 35 towards the kerb (3%). Alternative treatments that achieve water sensitive urban design outcomes are encouraged subject to prior approval as part of the concept design development. The design of footpath crossfalls shall comply with the drainage requirements in Australian Rainfall and Runoff. 1% ARI flows shall be contained within the road reserve, public reserves or piped.

Vehicle access is to be checked using standard vehicle templates.

2.26 Cycleways

Cycleways are to be provided in accordance with Council’s cycleway strategy that encourages alternative forms of transport. Cycleways shall be designed in accordance with AUSTRROADS “Guide to



Traffic Engineering Part 14 – Bicycle Facilities”. In the absence of a documented cycleway plan, discuss with Council and incorporate provision for cycleways in accordance with Council directions.

2.27 Street Signs

Street signs are to be erected at all street intersections and are to be in accordance with Councils standard drawings and requirements.

2.28 Half Width construction

Where proposed subdivisions or developments front an existing sealed road and the existing pavement is of adequate strength and the vertical alignment is satisfactory, the existing pavement may be retained. The remainder of the half width construction is to be carried out to the equivalent standard of full width construction.

Should the authority determine the existing pavement is to be unsatisfactory, then the pavement construction is to be extended to the road centreline.

In all cases, the new seal should extend to the road centreline to avoid irregularities.

Any unsealed road must be sealed for the full width as per this manual for the entire length of the development.

2.29 Intersections

- ▶ Intersection design should be based on the AUSTRROADS publication “Intersections at Grade, Part 5”;
- ▶ “T” junctions should be adopted in preference to four-way intersections. Where staggered “T” junctions are to be provided, the intersecting roads should be located a minimum distance of two times stopping distance for the travel speed along the through-road (1.5 second reaction time);
- ▶ Roads should intersect at not less than 70°;
- ▶ The minimum centreline spacing between intersections is 50 metres in urban areas;
- ▶ Four-way intersections or cross intersections shall be designed with roundabouts; and
- ▶ Where intersections are in a configuration likely to cause traffic problems, the construction of traffic islands, or such traffic facilities are required to provide traffic control and safety.

2.30 Turning Movements for Design Vehicles

Turning movements shall be provided for the design vehicle. Prior to commencement of design process consultation is required with Council to determine the design vehicles for the different street classifications. The fire emergency services vehicle is frequently the design vehicle.

Vehicle turning movements must allow for left turn from the left lane without crossing lanes for design vehicles. Where requested traffic movement paths shall be presented using such packages as “Autoturn” or similar. Clearance of 500 mm shall be provided to the total swept path.



2.31 Local Area Traffic Management

Traffic Management devices are to be designed in accordance with AUSTRROADS publication “Guide to Traffic Engineering Practice – Part 10”. Local Area Traffic Management Devices may be required as a condition of Development Consent. Alternatively, Developers may elect to install these devices where appropriate. The use and installation of the devices should be in accordance with Australian Standard 1742 (Part 13) - Local Area Traffic Management.

2.32 Guide Posts

Guideposts and protection fencing are to be provided in accordance AS 1742, AUSTRROADS and RTA guidelines.

2.33 Signposting and Pavement Markings

Signposting and pavement markings are to be provided where required in accordance with “Manual of Uniform Traffic control Devices” Roads, Intersections, Traffic Control Devices, Cycle Ways, and RTA Road Design and Car Parks in accordance with AS 1742 Parts 1-13 and the guidelines.

2.34 Car Parking

Car parking is to be provided in accordance with:

- ▶ DCP and LEP;
- ▶ AUSTRROADS “Guide to Traffic Engineering Practice Part 11 – Parking”; and
- ▶ AS 2890.

Indented parking will only be considered as part of an integrated solution that enhances environmental and aesthetic outcomes such as for water sensitive urban design and entry features.

The Developer is responsible for providing parking associated with the development onsite. Parking on the street is regarded as being additional to development generated parking and is for general public parking.

All car parking and manoeuvring surfaces are to be bitumen sealed or equivalent.



2.35 Flooding

The design of the road system must account for the major flow paths associated with flood events as the piped stormwater drainage networks typically account for flow paths of water during minor events, the flow path of water during major events frequently involves the road network. In particular intersections shall be designed to direct the major flow path of water in accordance with an approved subdivision master plan.

Road longitudinal section sag points must direct flows to major open channels or intersections. Sag points mid block are discouraged and will only be approved if consistent with an agreed drainage master plan. Direction of water to cul-de-sacs, Y-heads and T-heads is discouraged.

2.36 Earthworks

In all new development areas lot filling is to ensure that finished surface levels are 500 mm above the 1% ARI flood levels. Where infill development occurs consult with council regarding local requirements and council flood policies.

Fire trails are to be graded to divert stormwater and graded to divert waters away from residential properties to either drainage reserves or road reserves.

Filling of depressions requires consent, as there is potential to redirect the major flow path of water and for subsequent land settlement. Earthworks are to be in accordance with AS 3798 "Guidelines on Earthworks for Commercial and Residential Development".

2.37 Testing of Roads

All pavement courses, surfacing and subgrade are to be tested in accordance with an approved testing regime and are to demonstrate that the pavement meets the requirement of the specification. Refer to part 7 Guidelines for Testing.

2.38 Street Lighting

Comply with the current Australian Standard as is to provide for pedestrian and vehicular movements. Lighting designs are to be prepared by consultants approved for lighting design by the energy authority and Council.

2.39 Road Safety Audits

A road safety audit is to be undertaken of the road design to provide documentary evidence that the road design has taken in to account risk and safety issues.



3. Rural/Rural Residential Roads

In addition to the preceding section relating to urban road design this section applies to the provision of roads and access to rural and rural residential areas. Council is responsible for making the determination of areas where rural residential design standards apply.

3.1 Standard Road Widths

New road widths require discussion with Council and should generally be in accordance with the following:

Table 5 Rural / Rural Residential

AADT	ROAD RESERVE	CARRIAGEWAY	SHOULDER	FORMATION
<100	20	5.5	1.2	7.9
100-500	20	6.0	1.2	8.4
500-1000	20	6.5	1.2	8.9
1000-2000	20	6.5	1.8	10.1
>2000 (and all B double routes)	25	7.0	1.8	10.6

NB:

- In all cases AADT is that predicted at the end of the design period (usually 20 years);
- The designed pavement thickness is to extend for the full formation; and
- The road reserve width is nominal only and consideration is to be given to the extent of cut and fill batters, catch drains, intersection layout requirements, and provision for public utilities adjacent to the road reserve boundary. A minimum allowance of three metres from the batter point to the boundary is to be provided.

3.2 Plan

Plans should be drawn at a scale of 1:1000 and show lot boundaries and numbers, road centreline chainages, radii and bearings, road names, locality sketch and a north point.

Road numbering shall be in accordance with rural addressing principles.

Plans should show the following;

- The location and reduced level of the bench marks used in the survey works;
- The location of vehicular entrances;
- Existing drainage structures;
- Trees;



- ▶ Public utilities;
- ▶ Schedules including location and reduced levels of recovery pegs and/or control points for co-ordination surveys; and
- ▶ All datum references referred to Australian Height Datum.

3.3 Longitudinal Section

A longitudinal section of the centreline of the roads should be supplied at scales of:

- ▶ 1:1000 horizontal; and
- ▶ 1:100 vertical.

The longitudinal section of the centreline of roads should show:

- ▶ Chainages;
- ▶ Reduced level of existing surface and of design level of road;
- ▶ Design grades;
- ▶ Length of vertical curves;
- ▶ Have done drainage information; and
- ▶ Extent of works.

Longitudinal levels are to be at:

- ▶ 40m intervals along straight alignments and horizontal curves exceeding R1000 m;
- ▶ 20m intervals for horizontal curves between R 150 m and R 1000 m;
- ▶ 10m intervals for horizontal curves less than R 150 m; and
- ▶ All intermediate changes of grade.

Longitudinal sections and cross sections should be taken along existing intersecting roads for a sufficient distance to enable design requirements to be satisfied.

3.4 Cross Sections

Cross sections are to be at:

- ▶ 40m intervals along straight alignments and horizontal curves exceeding R1000 m;
- ▶ 20m intervals for horizontal curves R1000 and less;
- ▶ All culvert sites; and
- ▶ The SS, TS, TP and SC of each horizontal curve.

The scale should be 1:100 natural.

Cross sections should not be terminated at the property alignment but should be levelled sufficiently beyond the road boundaries to enable batters of cut and fill to be shown.

Cross sections should show:

- ▶ Chainages;



- ▶ Reduced level of existing surface;
- ▶ Design surface levels on the road centreline;
- ▶ Cross falls;
- ▶ Centreline offsets;
- ▶ Lateral dimensions if pavement and formation widths vary; and
- ▶ Batter slopes that vary from those shown on the typical cross section.

Typical cross sections shall show:

- ▶ Pavement details;
- ▶ Typical width;
- ▶ Subsoil drainage; and
- ▶ Road surfacing.

3.5 Pavement Design

Road pavements are to be designed in accordance with the Australian Road Research Board Publications:

- ▶ Rural Residential Pavement design for local traffic: a supplement to the Austroads pavement design guide; and
- ▶ Rural Sealed Local Roads Manual.

A minimum design life of 20 years should be used to determine the pavement thickness.

Designers are to submit traffic loading calculations.

Design subgrade CBR values should be determined by either Geotechnical Engineering Consultants and/or agents of a NATA registered laboratory. The investigation will include “logging” of test holes to a depth not less than one metre below design subgrade levels (unless rock is encountered). Soil samples should be taken at the design depth and CBR tests undertaken after soaking the samples for four days.

The frequency of test holes should be in accordance with *Pavement Design For Local Traffic: a supplement to the Austroads Pavement Design Guide*.

A copy of the site investigation report including test results should be submitted with the pavement design and the engineering drawings.

3.6 Geometric Standards

The Geometric design of rural roads is to be based on *Guide to the Geometric Design of Rural Roads* by AUSTRROADS.

The design speed to be used for a particular road should be the legal road speed limit for that road.

3.7 Sight Distance

Adequate horizontal and vertical sight distance should be provided for the design speed in accordance with *Guide to the Geometric Design of Rural Roads* by AUSTRROADS.



Vehicular access to properties is not permitted where the stopping sight distance is unavailable.

Where practical, horizontal and vertical curves should coincide.

3.8 Vertical Alignment

The maximum permissible grade on an arterial road is to be 8% with a minimum grade of 0.5%.

The maximum permissible grade on all other roads is to be 16% for a maximum distance of 150 metres on straight alignment with a minimum grade of 0.5%.

The maximum permissible grade of 10% (1 in 10) should be used adjacent to street intersections, locations of poor visibility, horizontal curves of radius 15 metres or less and at cul-de-sacs. Turning circles in cul-de-sacs on steep grades should have grades less than 5%.

3.9 Pavement Crossfalls

The normal crossfall on bituminous pavements should be 3% and the normal crossfall on unsealed shoulders should be 4%.

The maximum crossfall permitted is 6% and will occur on super-elevation curves and road intersections.

3.10 Clearing and Grubbing

All road reserves should be cleared approximately 0.5 metres beyond the extent of roadworks. All trees to be removed must be clearly marked on the plan with a diameter of the canopy and the trunk represented diagrammatically on the plan. Native and threatened species impacts are to be identified and are subject to approval.

3.11 Vehicular Access

Roads should be located and designed so that vehicular access can be readily obtained at every lot of a subdivision. Where the natural surface slopes steeply to or from the road, the access to each lot should be given special consideration. Preference for limitation of the number of access points to the road network.

Access to rural properties shall provide safe access and egress, having regard to fire risk.

The driveway access to the property boundary is to be all weather construction from the edge of the existing road.

All vehicle access to be 4.88 metres minimum wide culverts.

End walls to be trafficable when located within a clear zone (refer to RTA standard drawings).

Hydraulic capacity shall be a minimum of 1 in 5 years.

Install a 375 mm minimum diameter pipe culvert in the table drain.

Calculate pipe flows in the drain and provide capacity for 1 in 100 year overland design flows. For flows in excess of the pipe capacity check flow path to ensure that risk to the public and physical assets is minimised or eliminated. Major flow path of water to be clear of the edge of gravel and sealed roads.



3.12 Bus Routes

Where there is potential for future access by school bus services turning provision is required.

3.13 Guide Posts

Guideposts and protection fencing are to be provided in accordance AS 1742, AUSTRROADS and RTA guidelines.

3.14 Road Name Signs

Road name signs are to be manufactured to accord with Council's Standard and should be erected at all intersections. The road name and colour of signs are to be in accordance with an approved sign location drawing.

Signs are to be in accordance with Rural Addressing.

3.15 Intersections

"T" junctions should be adopted in preference to four-way intersections. Where staggered "T" junctions are to be provided Intersection design should be based on Austroads publication "Guide to traffic engineering practice part 5 intersections at grade."

Roads should intersect at not less than 70°.

Where intersections are in a configuration likely to cause traffic problems, the construction of traffic islands, or such traffic facilities as required providing traffic control and safety.

3.16 Public Utilities

All public utilities in subdivisions should be provided underground. An early approach is to be made to those authorities for their requirements regarding conduits, contributions, layout plans and other relevant details.

The location of proposed conduits beneath the carriageway is to be shown on the plans. Location markers are to be attached to the kerb following completion of works.

3.17 Steep Grades

Where grades exceed 6%, a one-coat bitumen seal is to be provided on the road shoulders. Where shoulders are sealed, edge line marking is to be provided.

Where the grade of the table drain exceeds 6% and scouring is likely, a concrete lined drain is required.

Where the terrain permits, batters in the region of 4 horizontal to 1 vertical are desirable. Proposed batters of greater slope than 4 horizontal to 1 vertical require separate approval.

3.18 Signposting and Pavement Markings

Signposting and pavement markings in accordance with Australian Standard AS 1742 - Manual of Uniform Traffic Control Devices", are to be provided where required.



3.19 Fire Trails

Fire trails are to be provided as part of an integrated network that improves community safety from the risk of fire.

Fire trails are to have a desirable maximum grade of 1 in 200. In localised sections steeper grades will be permitted with these sections requiring erosion treatment of gutters and drains.

3.20 Road Surfacing

The carriageway of Rural/Rural Residential roads should be sealed to a minimum standard of two coat spray bitumen seal.

The shoulders should be sealed 0.3 metres wide with a 120 mm wide edge line for roads with AADT greater than 1,000 vehicles per day.

The shoulder adjacent to a barrier centreline is to be widened to 3.0 metres.

A prime coat will be required prior to application of two coat seal.

Application rates of aggregates and binder, and the Average Least Dimension of aggregates, shall be submitted for approval prior to commencement of sealing on-site.

3.21 Dust Suppression

Consideration is on a case-by-case basis having regard to

- ▶ Existing impacts on buildings within 100 metres;
- ▶ Potential future impacts;
- ▶ Provide sealed surface 75 metres each side of access to building;
- ▶ Where less than 30 vehicles per day provide 4.5 metre seal; and
- ▶ Where greater than 30 vehicles per day provide 6.2 metre seal.

3.22 Causeways and Flooding

Rural roads that include causeway crossings require calculation of flows and recurrence interval of events. Direction from Council will be required on the design criteria and risk assessment approach required.

3.23 Erosion Protection

Where water is concentrated such as for piped culverts, the outlet system should be designed to minimise erosion potential.

3.24 Splays at Intersections

Provide splays at intersections.



3.25 Rural Road Design Philosophy

Rural road pavements are typically elevated in comparison to urban pavements, which are depressed to provide for the major flow path of surface water.

3.26 Guardrails

Provide in accordance with Austroads standards.

3.27 Maintenance

The road reserve area shall be constructed with batter and drain slopes that permit routine access for mowing. This requires desirable minimum batter slopes of 4 horizontal to 1 vertical.

3.28 Standard Drawings

All work is to be in accordance to approved Council Standard Drawings (subject to availability).



4. Drawings

Table 6 Standard Drawings Narrandera Shire Council

No.	Description	Drawing No.
1	Standard Kerb Profiles	To be developed
2	Australian Standard Kerb Profiles Acceptable for use in the City of Narrandera.	To be developed
3	Standard Perambulator Ramp on New Construction	To be developed
4	Standard Residential Invert on New Construction	To be developed
5	Standard Residential Crossing including Removal of Kerb	To be developed
6	Standard Residential Invert on Existing Construction	To be developed
7	Joining of Residential Crossing onto Existing Drive Invert	To be developed
8	Joining of Residential Crossing onto Existing Invert (Pre 1993 Standard)	To be developed
9	Standard Light Industrial Crossing	To be developed
10	Standard Heavy Industrial Crossing	To be developed



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