

4.1 INTRODUCTION

This section details the requirements or the design of roads and footpaths.

Engineering design plans and specifications are to be submitted to Council's Engineer for approval. These shall include details of geometric design, existing and proposed levels and gradients on the longitudinal sections, cross sections, kerb returns, existing services and structures, cut and fill, site regrading, intersection design and any other relevant details.

4.2 CONSULTATION

Design consultants are encouraged to seek Council's and other relevant Authorities advice prior to the preparation of detailed engineering designs.

4.3 GEOMETRIC DESIGN

4.3.1 Widths of Carriageways

Widths of carriageways, footpaths and road reserves are detailed in Council's Subdivision Code or relevant DCP and are generally established as part of the development consent. Variations, however, may be necessary as a result of engineering requirements.

4.3.2 Grades

| | |
|------|-------------------|
| 1% | Desirable minimum |
| 0.5% | Absolute minimum |
| 16% | Desirable maximum |
| 20% | Absolute maximum |

The above will also depend on the length of such grade, traffic type and volume. Special consideration will be given to major routes and proposed bus routes.

4.3.3 Crossfalls and Superelevation

- (a) Desirably, roads should be crowned in the centre. A standard 4% crossfall will apply to straight roads. Unsealed roads should have a minimum of 6% crossfall.
- (b) The use of superelevation will only be permitted on major urban and rural roads with design speeds of 80kph or greater, unless otherwise advised by Council's Engineer.
- (c) Superelevation and transitions will be provided in accordance with either the R.T.A. Road Design Manual 1992 or the current Austroads Guide to Traffic Engineering Practice.

4.3.4 Design Speed

- (a) Generally the following design speeds are to be adopted for the design of subdivision roads:

| URBAN | | RURAL | |
|----------------------|----------|----------------------------|--------------|
| Cul-de-sac Accessway | 25kph | Cul-de-sac(Pending Length) | 40-60kph |
| Local | 40/50kph | Other | 60/80/100kph |
| Collector | 60kph | | |
| Distributor | 60/80kph | | |

These above design speeds should be verified with Council prior to detail design.

- (b) Design speeds for industrial, commercial and main roads are to be determined by Council's Engineer.
- (c) Difficult topography, intersection locations and other constraints may affect desirable design speeds. In such instances design speeds may be reduced or increased. Attention must be given to ensure that potentially hazardous situations are forewarned by providing adequate traffic engineering measures.

4.3.5 Horizontal Curves

- (a) Such curves are generally established within the approved Development Plan.
- (b) The minimum deflection for which a curve is necessary is 0.75 of a degree (45 minutes). This is subject to the location of the angle within the vertical plane.
- (c) The minimum centreline radius for a proposed bus route is 60 metres.
- (d) Horizontal curves on distributor or main urban and rural roads are to be in accordance with either the R.T.A. Road Design Manual 1992 or the current Austroads Guide to Traffic Engineering Practice.

4.3.6 Vertical Curves

- (a) All vertical curves are to be designed for a minimum 60kph, stopping sight distance excepting urban accessways.
- (b) Reaction times are to be 1.5 seconds for urban areas and 2.5 seconds for rural areas.
- (c) Intersections, accesses and driveways are to be located to provide adequate stopping sight distance.
- (d) Sag vertical curves are to be of a length to provide adequate riding comfort.
- (e) Sag vertical curves will be designed to address the following:

- (i) Have an instantaneous grade greater than 0.1% for five (5) metres either side of the sag stormwater pit.
 - (ii) The provision of a formal overland flow path to cater for storms in excess of the piped system capacity to limit the depth of ponding to no greater than 0.2 metres.
- (f) Points (a) to (d) are to be designed in accordance with the R.T.A. Road Design Manual 1992 or the current Austroads Guide to Traffic Engineering Practice.

4.3.7 *Intersections*

Are to be designed in accordance with the R.T.A. Road Design Manual 1992 or the current Austroads Guide to Traffic Engineering Practice, paying particular attention to the following requirements:

- (a) Adequate capacity for projected traffic volumes.
- (b) Adequate stopping sight distance.
- (c) Provision for future Service Authority requirements and intersection legs.
- (d) Pedestrians.
- (e) Single unit and semi-trailer turning paths.
- (f) Adequate site specific designed street lighting.
- (g) Intersections with R.T.A. classified roads are to be designed, approved and constructed in accordance with their requirements.
- (h) Geometric adequacy of existing roads at the location of the proposed intersection.
- (i) Signposting and pavement marking.
- (j) Drainage aspects in accordance with road classifications.
- (k) Minor intersections are to be designed to industry best practice standards. Such intersections will adequately cater for the turning paths of the appropriate design vehicle.

Desirable minimum kerb return radii will be 7.5 metres for urban residential areas and 10.0 metres for industrial areas.

- (l) Commercial and industrial entry and exit access locations and widths are to be in accordance with the R.T.A. Guide to Traffic Generating Development Manual and to industry best practice standards.

4.3.8 *Roundabouts*

Roundabouts are to be generally designed in accordance with the current Austroads Guide to Traffic Engineering Practice, paying particular attention to the following requirements:-

- (a) Adequate capacity for projected traffic volumes.
- (b) Adequate sight distance for vehicles approaching and entering the roundabout and pedestrians.
- (c) Provisions for Service Authorities future needs.
- (d) Geometry to satisfy deflection and driver guidance requirements. It is preferable to attain deflection prior to entering the roundabout.
- (e) Adequate drainage.
- (f) Site specific designed street lighting.
- (g) Signposting and pavement marking.
- (h) Design vehicle turning paths.
- (i) The provision of suitable landscaping.
- (j) Designs adopting alternative criteria will be considered on their merits.
- (k) Minor roundabouts for use as traffic calming devices in local roads are to be designed in accordance with Council's Engineer's requirements.

Roundabouts on R.T.A. classified roads are to be approved and constructed in accordance with their requirements.

4.3.9 Cul-de-sac and Hammer Head Facilities

The following minimum requirements will apply to turning facilities:

- (a) Cul-de-sacs:-

| | |
|-------------------|---|
| Urban Residential | 8.5m radius to face of kerb |
| Rural Residential | 8.5m radius to edge of seal with an additional 1.2m shoulder |
| Urban Industrial | 13m radius to face of kerb |
| Rural Industrial | 13.5m radius to edge of seal with an additional 1.2m shoulder |

Where concrete dish gutters or similar are required in rural areas, the 1.2m shoulder width may be deleted.

- (b) Hammer Heads - Variations of hammer head turning facilities will be permitted where circumstances warrant.
- (c) Grades and Crossfalls - The following is to apply to all turning facilities:

| | |
|-------|-------------------|
| 0.5% | Absolute Minimum |
| 0.75% | Desirable Minimum |
| 5% | Desirable Maximum |
| 7% | Absolute Maximum |

4.3.10 Traffic Control Devices

- (a) Traffic control devices are to be provided to reduce travel speeds in accordance with design speeds generally where road geometry cannot provide this requirement.
- (b) Such devices are to be designed and spaced Generally in accordance with AMCORD or the current Austorads Guide to Traffic Engineering Practice recommendations and are to be approved by Council's Engineer.
- (c) Control device design should generally cater for the following:
 - (i) Design vehicle turning paths.
 - (ii) Pedestrians and cyclists.
 - (ii) Drainage.
 - (iv) Street lighting.
 - (v) Be part of an overall scheme (Local Area Traffic Management).
 - (vi) Special consideration for bus routes.
 - (vii) Sight distance.
 - (vii) Signposting and pavement marking.
 - (ix) Emergency vehicles.
 - (x) Private accesses.

4.3.11 Footpaths

Footpaths widths are to be determined in accordance with Council's road hierarchy.

Crossfalls are to be 3%. However, variations to this may be considered under special circumstances.

Generally longitudinal grades are to be the same as the adjacent roadway, being an absolute minimum of 0.5% and a desirable maximum of 16%.

Where grades exceed 10%, special consideration is to be given to provide for pedestrians. A small bank of steps, handrails and regrading of the footpath may be required. In such instances consideration is to be given to lot access and Service Authority requirements.

4.4 RURAL ROAD DESIGN

4.4.1 General

The following requirements apply to roads identified as being within rural areas.

4.4.2 Design Speed

Rural road design speeds are provided in Clause 4.3.4 and once established are generally used as the basic parameter for determining minimum design requirements for other elements.

4.4.3 Design Criteria

Generally rural roads are to be designed in accordance with the current Austroads Geometric Design of Rural Roads.

Intersections should generally be designed in accordance with the current Austroads Guide to Traffic Engineering Practice.

4.5 **ANCILLARY REQUIREMENTS**

4.5.1 Signposting and Pavement Marking

- (a) Signposting and pavement marking should generally be provided to roads, intersections, traffic control devices, cycleways and carparks in accordance with Australian Standard 1742.1-13 and the R.T.A. Interim Guide to Signs and Markings.
- (b) Street name plates are to be of the standard type throughout the Cessnock City area unless otherwise approved. Refer to Section 4.7.5 for street sign and location details.

"No Through Road" signs are to be placed in accordance with Council's requirements where roads do not continue. In the instance of staged constructions, the sign is to be relocated or removed to suit new works.

4.5.2 Guardrail and Guideposts

- (a) Where there is a warrant, guardrails are to be provided in accordance with R.T.A. specification, where shown on the approved engineering plans or as directed by Council's Engineer,
- (b) Guideposts are to be provided in accordance with R.T.A. requirements, where shown on the approved engineering plans or as directed by Council's Engineer.

4.5.3 Cyclists

Consideration is to be given for cyclists in all aspects of road design. Cycleways and other provisions are to be included in the design where specifically nominated in the consent, Council's Bicycle Plan or nominated by Council's Engineer.

Such works should generally comply with the requirements of the current Austroads Guide to Traffic Engineering Practice.

4.5.4 Pathways

- (a) Concrete pathways are to be provided where shown on the approved engineering plans.
- (b) Such pathways are generally used to link cul-de-sacs and also used as overland flow paths.

- (c) The following should apply when designing pathways:
 - (i) A minimum width of 1.2m.
 - (ii) A desirable crossfall of 3%.
 - (iii) Have an integral 150mm kerb on the low side.
 - (iv) Have sufficient capacity to carry the overland flow with nominated freeboard.
 - (v) Be provided with footpath barriers at either end at the property boundary line unless otherwise specified.
 - (vi) Have a minimum grade of 0.5% and maximum grade of 16%.
 - (vii) Where grades exceed 16% steps are required.
 - (vii) Further details and acceptable variations can be discussed with Council's Manager Urban Roads.

4.5.5 Service Authorities

The developer must provide all Service Authorities with finished surface levels and/or up and down measurements from the top of kerb at the proposed property boundary and/or the proposed location of the Service Authorities pit, marker etc. to ensure that:

- (a) All Service Authority conduits etc. have correct cover.
- (b) All Service Authority pits, markers etc. do not require future costly adjustments to suit driveways, footpaths etc.

It is advisable the developer liaise with Service Authorities at any early stage of the development process to ensure that engineering designs are compatible with Service Authority's requirements.

4.5.6 Batter Details

Cut or fill batters should generally comply to the following requirements unless otherwise advised by Geotechnical Engineers or requested by Council's Engineer.

- (a) Fill Batters:-

| | |
|---------------------------------|-------------------|
| Six horizontal to one vertical | Preferred |
| Four horizontal to one vertical | Desirable maximum |
| Two horizontal to one vertical | Absolute maximum |

All fill batters to be stabilised in accordance with Section 3.8.2 and 3.8.3 Erosion and Sediment Control.

- (b) Cut Batters:-

| | |
|---------------------------------|-------------------|
| Six horizontal to one vertical | Preferred |
| Four horizontal to one vertical | Desirable maximum |
| Two horizontal to one vertical | Absolute maximum |

All cut batters to be stabilised in accordance with Section 3.8.2 and 3.8.3 Erosion and Sediment Control.

Cuttings in rock may be steeper than 2 to 1, up to 1 to 4 only where geotechnical reports and in field testing proves the stable nature of the rock,

- (c) Lot Batters & Accesses - All batters are to commence at the property boundary. Variations may be approved under special circumstances. Refer to Clause 4.3.11 Footpaths.
- (d) Vehicle access must be obtainable to each lot within close proximity to the building line. Maximum vehicular access grade to be 25%. Refer to Drawing S.D.3.
- (e) Batters are generally to intersect with the natural surface prior to the proposed building line.

4.5.7 Temporary Turning Facilities

- (a) Bus Routes - When a proposed road being a designated bus route is constructed in stages and the accumulated or initial length warrants a bus service, a temporary turning facility is to be provided in accordance with this specification.
- (b) Residential Streets - When there is the likelihood of a delay in the construction of a further stage of a subdivision which creates dead ends of minimum 90 metres in length, a temporary gravel turning facility is to be provided, preferably a hammer head or a turning circle in accordance with this specification. Refer to Clause 4.3.9.

4.5.8 Parking

- (a) Generally parking areas should be designed in accordance with best industry practice and Council's Carparking Policy which refers to Australian Standard 2890, the current Austroads Guide to Traffic Engineering Practice and the R.I.A. Guidelines to Traffic Generating Developments.
- (b) Particular attention should be made to the following design requirements:
 - (i) Grades and crossfalls to be an absolute minimum of 1%, desirably 3%, and an absolute maximum of 5%.
 - (ii) Drainage aspects, especially where the carpark area is used for on-site detention of stormwater.
 - (iii) Car space yield.
 - (iv) Circulation and aisle length.
 - (v) Ingress and egress requirements.

4.5.9 Urban Roads - Carriageway Widths

| Street Type | Width Reserve | Maximum Traffic Volume | Dwellings Served | Carriageway Width Between | Parking Provisions Within Street | Kerb Type | Footpath Requirements | Cul-de-Sac Radius |
|--|---------------|------------------------|--|--|---------------------------------------|---------------------------|-------------------------|-------------------------------------|
| Access Place or Shared Way | 10.5 | 100 | Up to 20 | 3.5m | One (1) space per two (2) allocations | Rolled layback or | Min. 3.5m wide footpath | Shunt head treatment or carriageway |
| Local Access Street | 13 to 15 | 1000 | 20 to 120 and less than 1km in total length 5m to 3m | 8.5 to 9m | Indent parking bay or carriageway | Rolled layback or upright | Min. 3.5m footpath | Reserve- 12.0m Carriageway - 8.5m |
| Collector Road | 18 | 3000 | On Merits | 7m to 11m | Carriage-way | Upright only | Min. 3.5m footpath | Reserve 13.0m Carriageway - 9.0m |
| Collector Road | 18 | 3000 | On Merits | 7m to 11m | Carriage-way | Upright only | Min. 3.5m footpath | Reserve 13.0m Carriageway - 9.0m |
| Collector Road with Bus Route or Cycle way | 20 | 3000 | On Merits | 13m | Carriage-way | Upright only | Min. 3.5m footpath | Reserve 13.0m Carriageway - 10m |
| Trunk Collector Sub-Arterial Roads | 23 | 8000 | on Merits | 2x3.5m travelling lanes parking lane 3.0m median | Restricted carriageway | Upright only | Min. 3.5m footpath | |

4.5.10 Industrial Roads

| Street Type | Reserve Width | Maximum Traffic Volume | Lots Served | Carriageway Width Between Nominal Face Kerbs | Parking Provisions Within Street Reserve | Kerb Type | Footpath Requirements | Cul-de-Sac Radius |
|------------------------------------|---------------|------------------------|-------------|--|--|-----------|-----------------------|--|
| Industrial Subdivision Urban/Rural | 20 | - | - | 14m | On Site | Upright | Min 3.5m footpath | Reserve – 18.5m Carriageway – 15m Absolute minimum to face of berb – 13.5m 13.5m road to edge of seal with an additional 1.2m shoulder |

4.5.11 Rural Roads

| Street Type | Reserve Width | Maximum Traffic Volume | Dwellings served | Carriageway Width Between Nominat Face Kerbs | Edge Treatment | Footpath Requirements | Cul-de-Sac Radius |
|--|---------------|------------------------|------------------|---|----------------------|-----------------------|--|
| Rural Subdivision | 20m | On Merits | On Merits | 7.0m (2 x 3,5m travelling lanes) 2x1m shoulder | Grassed dish drain | Min. 3.5m footpath | Reserve – 120mR Carriageway - 8.5mR with additional 1.0m shoulder |
| Semi Rural Roads Generally (1c) zoned land | 18-20m | On Merits | On Merits | 6.0m min. | Concrete rolled kerb | Min. 3.5m footpath | Reserve-120mR Carriageway - 8,5mR with a |

The standard of road construction for rural roads will be assessed for each case. Where longitudinal grades exceed 6%, and depending upon soil types, it should be expected that roads shall be sealed and that concrete table drains will be necessary and will need to be protected against erosion.

4.5.12 *Existing Rural Road Reserves*

| AADT | Pavement Width | Seal Width | Reserve Width |
|----------------|----------------|------------|---------------|
| Less than 200 | 6.0m | - | 18 |
| 200 to 500 | 8.0m | 7.0m | 20 |
| 500 to 1000 | 8.5m | 7.5m | 20 |
| 1000 to 2000 | 10.5m | 7.5m | 20 |
| More than 2000 | 11.0m | 9.0m | 20 |

4.5.13 *Minor Rural Access Roads - Generally existing tracks within Crown Reserve Roads & Not Maintained by Council*

| Category | Definition | Pavement Width | Shoulder | Formation | Road Reserve | Design/Construction Standard |
|----------------------|------------------------|----------------|---|-----------|--------------|---|
| Minor Rural Road (A) | Servicing 1 to 2 lots | 3.0m | Passing bays at 200m intervals or closer where sight distance is limited. Passing bays shall be 7m x 2.5m | | | All weather with 100mm compacted thickness of approved gravel |
| Minor Rural Road (B) | Servicing 3 to 5 lots | 3.6m | 1.2 x 2 | 6.0m | 20m | Min. 150mm compacted thickness of approved gravel for full pavement formation |
| Rural Road (C) | Servicing 6 to 10 lots | 6.2m | 1.2 x 2 | 8.6m | 20m | Min. design speed 80km/hr Full engineering design Gravel pavement in accordance with ARRB Special Report No. 41 |

4.6 **ROAD PAVEMENT DESIGN**

4.6.1 *Evaluation of Subgrade Strength*

Council will require investigation and testing by a qualified geotechnical engineer through a NATA registered laboratory of the anticipated subgrade material.

The geotechnical report will be subject to Council's approval and under no circumstances are any roadworks to commence prior to its approval.

Assessment of the strength of the supporting subgrade is to be in accordance with ARRB Special Report No. 41, Section 2.

4.6.2 *Design Traffic Loadings in ESA's*

The design traffic loading shall be calculated in accordance with Section 7 of Austroads (1992) and Section 3 of A.R.R.B. Special Report No. 41 for main and other roads respectively. Traffic loading calculations shall be submitted to Council for its records at the time of preliminary design plans.

Alternatively, the figures in the following table may be assumed. Council should be consulted to clarify road types.

| Road Type | Design ESA's for Flexible Pavements |
|---|-------------------------------------|
| Urban Residential cul-de-sac/accessway | 1 x 10 ⁴ |
| minor | 6 x 10 ⁴ |
| local access | 3 x 10 ⁵ |
| collector | 1 x 10 ⁶ |
| distributor | 2 x 10 ⁶ |
| Rural Residential cul-de-sac | 1x10 ⁴ |
| other | 3 x 10 ⁵ |
| Commercial & Industrial | 5 x 10 ⁶ |
| Main Roads | Refer to Council |

4.6.3 *Public Road Pavements*

Pavement thickness calculations shall be submitted to and approved of by Council before any earthworks commence on the site.

Pavement thickness calculations are subject to variation should changes in the subgrade become evident during construction.

Confirmation by a qualified geotechnical engineer of preliminary subgrade conditions will be required following initial excavation. In deep cuttings, deep fills or other instances where testing of subgrade is possible only at time of construction, a separate pavement design will be required during construction.

These pavement designs shall also be submitted to and approved by Council.

4.6.4 *Flexible Pavements*

(a) Evaluation of Pavement Thickness - Pavement thickness design shall be based on the assessed subgrade strength and in accordance with the following:-

- * Figure 7 in A.R.R.B. Special Report No. 41 for urban residential streets that are expected to receive less than one million ESA load applications per lane.
- * Figure 10 in A.R.R.B. Special Report No. 41 for rural residential streets that are expected to receive less than one million ESA load repetitions per lane.
- * Figure 8.4 in Austroads (1992) for roads with design traffic loadings greater than 106 ESA/lane.

- (b) Minimum Pavement Layer Thickness - The minimum thickness of any cement stabilised layer shall be 150mm. The minimum asphaltic concrete layer thickness shall be 2.5 times the maximum particle size. The minimum thickness of granular pavement layers shall be 100mm or 2.5 times the maximum particle size, whichever is the greater.

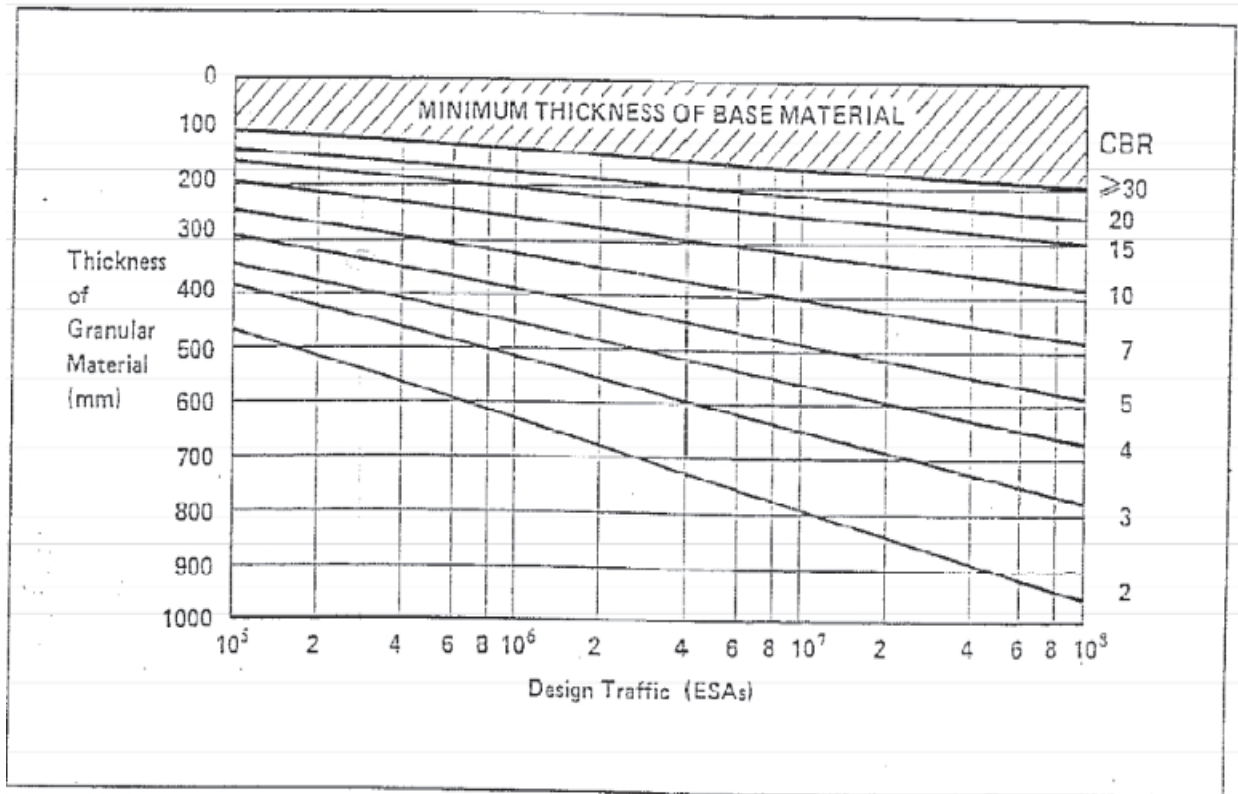


FIGURE 8.4 DESIGN CHART FOR GRANULAR PAVEMENTS WITH THIN BITUMINOUS SURFACING

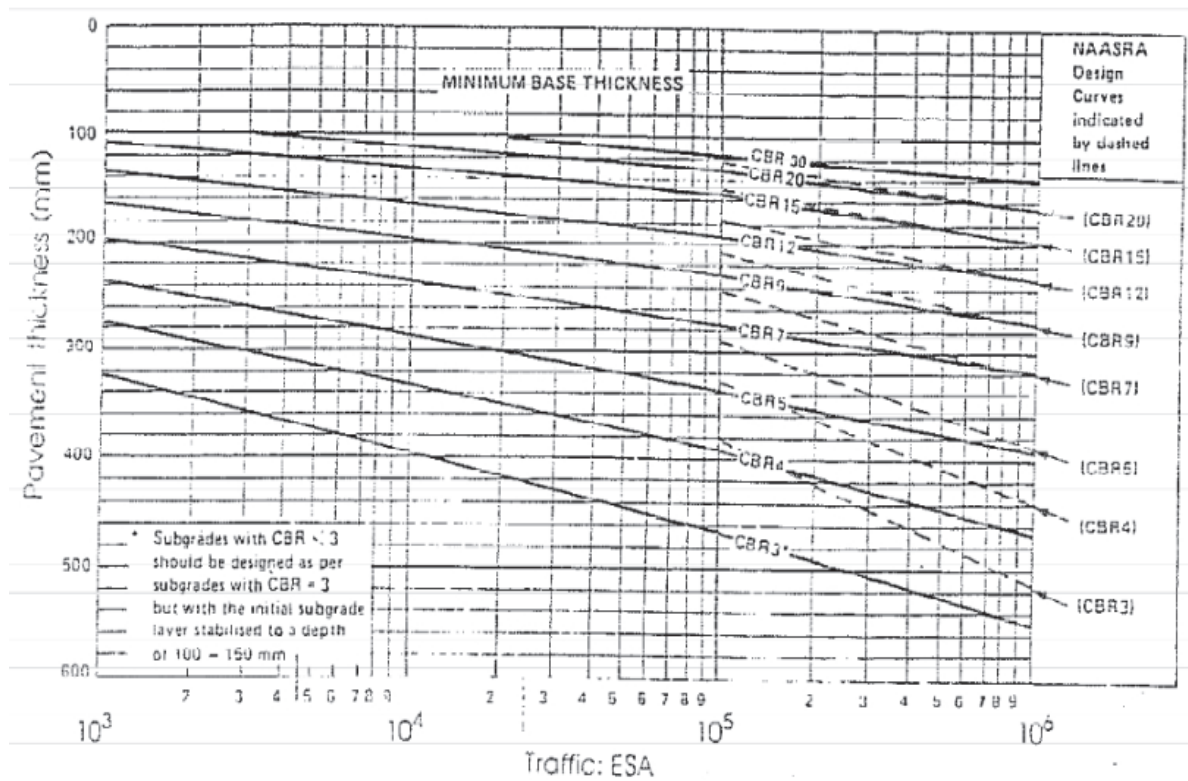


Fig. 7 - Interim thickness design curves for residential street pavements, based on a 95 per cent confidence limit (Mulholland 1986; Barnard 1986)

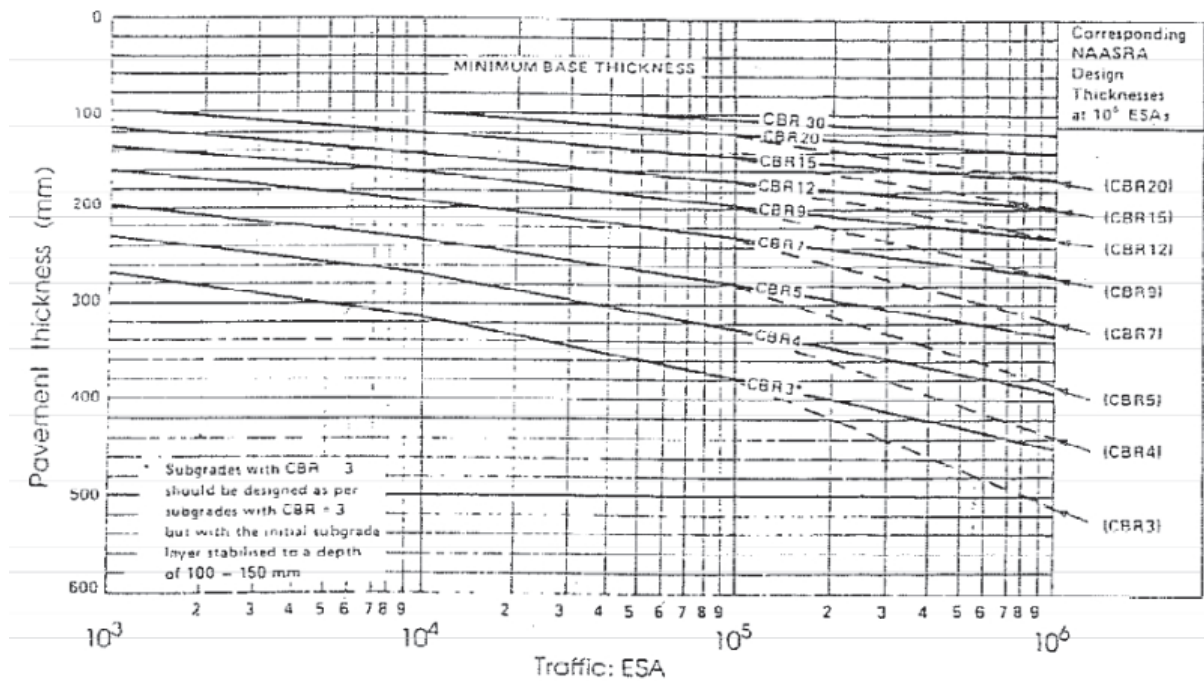


Fig. 10 - Interim thickness design curves for residential steel pavements, based on a 90 percent confidence limit (Barnard 1986)

4.6.5 Rigid Pavements

- (a) General - All rigid pavements on public roads shall be designed and constructed in accordance with the following documents:
- * Austroads Pavement Guide (1992).
 - * R.T.A. Form No. 76 (1992) (supplement to the Austroads Guide).
 - * R.T.A. Concrete Pavement Manual.
- (b) Minimum Pavement Thickness & Layer Thickness - Notwithstanding subgrade testing and subsequent rigid pavement thickness design:
- * The minimum thickness of sub-base shall be 100mm.
 - * The minimum thickness of base course shall be 150mm.

4.6.6 Accessway Pavements

- (a) General - Accessways by definition will serve up to 15 dwellings and may be constructed in full flexible pavement or rigid pavement. Requirements of Section 4.6.3 shall apply.
- (b) Flexible Pavements for Individual Accesses - Thickness of flexible pavements for individual access driveways shall be determined from CSIRO "Bituminous Driveways" Construction Note.
- (c) Decorative Pavements/Surface Treatments:
- * To be discussed with Council at preliminary design stage.
 - * Type of treatment to be considered/approved by Council.
 - * To be supported by relevant technical information/design manuals or manuals nominated by Council.
- (d) Rigid Pavements - Design details shall be in accordance with the following Cement and Concrete Association of Australia documents:
- * For design - "Concrete Street & Parking Area Pavement Design" (1984).
 - * For construction - "Outline Guide for Construction of Concrete Road Pavements (TN50).

4.7 **ROAD DELINEATION**

Road delineation refers to components such as guardrail, guideposts, line-marking and pavement marking. Assessment for the need of these components will be determined by Council's Manager Traffic Engineering.

4.7.1 Guardrail

Shall be supplied and installed in accordance with R.T.A. specifications, delineators shall be of a type recommended by Council and installed to Council's requirements.

4.7.2 Guideposts

Shall be of a type preferred by Council and installed in accordance with Council and the manufacturers specifications. Guideposts shall be installed off the edge of the shoulder, being an absolute minimum of 1.0 metre from the edge of the traffic lane, otherwise between 2.0 and 3.0 metres, depending on shoulder widths. Guidepost spacing shall be in accordance with R.T.A. specifications.

4.7.3 Linemarking

Shall be in accordance with R.T.A. Specification, AS1742.2, and to the satisfaction of Council's Road Safety Manager.

4.7.4 Pavement Marking

Shall be in accordance with R.T.A. Specification, AS1742.2. The type preferred and installation method shall be in accordance with Council's requirements.

4.7.5 Street Nameplates

Signs are to be of the standard type throughout the City. Posts shall be 50mm (2") I.D. galvanised pipe fitted with downe caps and clamp for sign. Details are as follows:-

- * Blade
 - P.V.C. 6mm U.V. stabilised.
 - 125mm depth.
 - Square ended for midblock/pointed blade for commencement of street.
- * Lettering
 - Double sided.
 - 100mm series "C" lettering.
 - Black vinyl.
- .
- * Background
 - White reflective Class 2-3M or equivalent
- * Posts
 - 50mm N.B. gal. steel posts.
- * Brackets
 - Aluminium to suit steel posts.
- * Erection
 - By subdivider under Council supervision or by Council by arrangement and payment of the appropriate fee.

The post is to be set in concrete 600mm in the ground and the sign fitted 2.5 metres above ground level. For location of street signs refer to AS1742.5.

