PART 3 : ROAD WORKS

3.1 INTRODUCTION

The relevant District Plan sets out the required outcome, means of compliance and performance assessment criteria for development within the city.

This Manual provides standards for one means of compliance in terms of engineering design and construction.

Other means of compliance will be considered in engineering design but must be supported by detailed design philosophy and calculations.

3.1.1 Definitions

RRU means Road Research Unit
NZTA means NZ Transport Agency

3.2 ROAD CLASSIFICATION

The District Plan defines Road Hierarchy Classifications, Rule 3.3, Appendix 3.3-1 under four titles:
- Major Arterial
- Minor Arterial
- Collector
- Local Roads.

The Collector and Local Roads are further classified in Table 3.1 to form a hierarchy of roads in accordance with the degree of access that each road offers to adjacent land and the proportion of through traffic it carries. Table 3.1 defines the classifications in relation to traffic function and provides some of the geometric and structural standards for the classifications.

Major and Minor Arterials will only occasionally be part of a subdivision and standards for their development are not included in this manual but will be defined by the Transportation Manager on a case by case basis.

3.2.1 District Rural Requirements

Typical cross section requirements relating to each of the six participating district councils are provided in Volume 5 in the form of individual Table 3.1’s Appendices 1-6.
### Table 3.1 — Road Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Hierarchy</th>
<th>Traffic Volume (v.p.d.)</th>
<th>Area Served</th>
<th>Design Speed (k.p.h.)</th>
<th>Min. Kerb Radius of Minor Road</th>
<th>Min. Carriageway Width</th>
<th>Min. Road Width</th>
<th>Recommended Pavement Depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RESIDENTIAL ROADS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Roads</td>
<td>Short cul-de-sac</td>
<td>≤15 hu</td>
<td>≤80 m</td>
<td>6.0</td>
<td>i) Shared environment</td>
<td>To suit ≥12</td>
<td>150 GAP 40</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ii) 7.0m plus parking in cds head</td>
<td>16.0</td>
<td>150 GAP 40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Long cul-de-sac</td>
<td>≤400</td>
<td>≤50 hu</td>
<td>20</td>
<td>6.0</td>
<td>7.5m plus parking in cds head</td>
<td>16.5</td>
<td>175 GAP 40</td>
</tr>
<tr>
<td></td>
<td>Minor Access</td>
<td>≤800</td>
<td>≤100 hu</td>
<td>30</td>
<td>7.5</td>
<td>9.0</td>
<td>18.0</td>
<td>225 GAP 40</td>
</tr>
<tr>
<td>Collector</td>
<td></td>
<td>800 - 3000</td>
<td>&gt;100 hu</td>
<td>50</td>
<td>12.0</td>
<td>10.0</td>
<td>19.0</td>
<td>150 GAP 65</td>
</tr>
<tr>
<td><strong>INDUSTRIAL ROADS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Roads</td>
<td></td>
<td>≤1000</td>
<td></td>
<td>40</td>
<td>15.0</td>
<td>8.0</td>
<td>17.0</td>
<td>Specific Design by NZTA Manual Design Method or Austroads Pavement Design</td>
</tr>
<tr>
<td>Collector</td>
<td></td>
<td>&gt;1000</td>
<td></td>
<td>50</td>
<td>15.0</td>
<td>11.0</td>
<td>20.0</td>
<td></td>
</tr>
</tbody>
</table>

**Notes for Table 3.1**

- hu = Household unit as defined in the Local Government Act 1974, Section 270.
- cul-de-sac = a road having the same exit and entry location off another road.
- cul-de-sac length = length from the kerb line of the road the cul-de-sac comes off, along the road centre line, to the furthest point on the kerb in the cul-de-sac head.
- On road parking shall be provided in residential areas at a rate of 1 park/hu.
- For private access ways, refer to diagram DG301.
- Carriageway widths on residential roads may be reduced provided that off-carriageway parking, acceptable to the Transportation Unit Manager, is provided.
- Minimum road width shall be the carriageway width plus twice the standard berm width of 4.5m.
- A shared environment is one where pedestrians, cyclists and motor vehicles mix on the road width with stringent design controls on the movement of motor vehicles to permit the safe mixing of all users.
- Traffic volume — as a guideline in residential areas allow 7 vpd/hu.
- Roads that serve a school, sportsground or reserve require special consideration.
- The design speeds are desirable speeds to be achieved through the design of the roads; if the design does not create this speed environment, higher values will need to be used in assessing sight distance criteria.
- Basecourse depths assume compatibility with subgrade, transition layers will be necessary otherwise.
3.3 ROAD NETWORK

3.3.1 Guidelines

To improve the living environment, local roads providing property access should be designed to form a network which does not attract external through traffic. Through their design and layout, local roads should encourage vehicle speeds appropriate to the environment, while providing convenience of access to residents and essential services.

In designing the layout of a road network to serve the land to be developed, the following issues must be considered:

- zoning of the land
- likely usage of the land
- connections to existing roads
- mitigation of adverse effects of traffic
  - volume
  - speed
  - manoeuvrability
  - function
  - parking
  - safety
- linkages to other developments and amenities
- relationship to the concept for the total area
- recognition of the road hierarchy classification
- public transport requirements
- service corridors
- protection of unique features
- pedestrian needs
- cyclist needs
- needs of mobility or visually impaired persons.

T-junctions are preferred to cross intersections particularly for local roads. Acute-angle and Y-junctions are to be avoided. Multi-leg intersections may require control by roundabouts.

Intersections on curves, particularly on the inside of curves, other than large radius curves, should be avoided.

Generally, roads should intersect only with roads in the same class or those immediately above or below in classification.

Other than in specifically designed shared environments, pedestrian, cyclist and vehicular traffic should be separated and areas of potential conflict between pedestrians, cyclists and vehicles should be designed to minimise risk.

The advantages of pedestrian walkways outside of road reserves should be considered.

The City has a policy of increasing the popularity and safety of cycling. Road networks should provide a convenient and safe cycle access, through a combination of on and off road facilities. All landscape planting design and implementation within the road reserve
shall be as per Volume 2, Part 7. See Clause 3.10 for further details.

3.4 PARKING

3.4.1 General

Provision shall be made for the parking of vehicles on all roads. The carriageway widths and design speeds specified in Table 3.1 recognise that carriageway parking will occur. Alternative widths and layouts may be suitable which provide for parking in defined areas clear of the through traffic.

3.4.2 Carriageway Parking

As the traffic function of a road becomes more important, it is necessary to provide more specifically for vehicle parking that moving traffic is not impeded:

In residential areas, carriageway parking shall be provided at a rate of 1 park/hu. See Drawing DG 306 for layout of on road parking areas.

In industrial roads, because of the mixing of light vehicles with long, less manoeuvrable, heavy vehicles, parking width shall be provided on each side of the carriageway to leave a clear line for moving traffic only.

3.4.3 Indented Parking

To facilitate a clear traffic pathway, indented parking bays and parking in the middle of cul-de-sac heads may be considered.

3.4.4 Mobility Parking

Mobility parking spaces shall be designed according to NZS4121:2001 Design for Access and Mobility — Buildings and Associated Facilities.

3.5 ROAD, CARRIAGEWAY, AND FORMATION WIDTHS

3.5.1 Road Width

The road width is to provide for:
- carriageway
- parking
- cycling
- footpaths
- berms
- services
- traffic facilities
- landscaping
- road furniture.

Minimum road widths are scheduled in Table 3.1.
Preservation, or capitalisation, of some natural feature of a landscape or existing specimen trees may dictate an irregular shaped road width. Certain carriageway and berm geometrics may require that the road width be increased, usually locally.

3.5.2 Carriageway Width

Two lanes for moving traffic shall be provided on all roads except where a device is used for traffic control or there is a shared environment (as defined in Table 3.1).

The minimum lane width for moving traffic is 3.0m, and this should be increased to 3.5m where the traffic function is dominant. Where there is significant cycle traffic on high volume collector roads, the lane width should be increased and in some cases a marked cycle lane should be provided.

In residential areas, the carriageway may be split into separate one-way lanes for aesthetic or landscaping reasons or to suit ground levels on steep terrain, whilst still retaining adequate manoeuvrability and property access.

Carriageway widths shall be not less than those shown in Table 3.1.

For “local roads” narrower widths may be appropriate for special conditions and designs for these shall be based on actual vehicle and turning dimensions and shall be at the discretion of the Transportation Manager.

Where topography or other considerations make carriageway and berm widths technically difficult and uneconomical, they may be reduced providing that there is no loss of functionality and subject to approval from the Transportation Manager.

3.5.3 Formation Width

Formation width shall be sufficient to contain the functions described in 3.5.1 above (see Drawing DG 300). Where topography permits, the formation width should extend beyond the road boundary by 500mm, with batters providing a smooth transition to the adjacent building lot grades.

Where structures retaining private lots are required, these shall be fully located on the lot, not on the road.

3.6 ROAD GEOMETRY

3.6.1 Road Alignment

Horizontal alignment of roads should be based on terrain and the design speed applicable to the road function.

Vertical alignment of residential roads should ensure that inclines can be negotiated during all weather conditions and sight distances are adequate for safety. The ideal gradient should be considered as a planning factor when selecting locations for shopping centres, service centres, walks or footpaths.

Generally local roads will not require super-elevation or transition curves.
a) **Intersection Spacings**

The table below sets out minimum spacings between adjacent intersections on different categories of road. All distances are measured along the centreline of the more major road between the centrelines of the intersecting roads.

<table>
<thead>
<tr>
<th></th>
<th>Local Roads</th>
<th>Collector or Arterial</th>
<th>Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same Side</td>
<td>60 m</td>
<td>90 m</td>
<td>200 m</td>
</tr>
<tr>
<td>Opposite Sides</td>
<td>30 m</td>
<td>45 m</td>
<td>100 m</td>
</tr>
</tbody>
</table>

In all cases a right/left stagger is preferred. If cross roads are unavoidable a roundabout is required for all but low volume roads.

b) **Intersection Alignments**

The preferred angle of intersection shall be 90°. Kerb radius shall not be less than 6m (refer Table 3.1).

c) **Grades at Intersections**

Gradients within 30m of intersections shall be:

- for Local Roads - a maximum of 1 in 10; ideally less than 1 in 33
- for Collector & Arterial Roads - less than 1 in 50.

d) **Roadmarking and Signing**

The requirements of the NZTA Manual of Traffic Signs and Markings shall be met for priority intersections, as either “Give Way” or “Stop”.

e) **Channelisation at Intersections**

All side roads which have a direct access to a collector or arterial road (existing or proposed as defined by the relevant District Plan Road Hierarchy Map) shall be channelised using either kerb extensions and or a central throat island at the intersection with the collector or arterial road. Such treatments are to be designed and constructed in accordance with this Development Manual.

Side roads expected to carry less than 120 v.p.d (15 dwellings) and have a carriageway width of 8m or less do not require channelisation.

### 3.6.2 Visibility Requirement

Driver sight distances need to be related to traffic function and vehicle speeds and the resulting visibility splays and envelopes may require the road boundary to be set back.

Tree planting should not be placed in the visibility splay. Only road lighting columns and road signs shall be considered. More detail on requirements for planting within visibility splays is given in Volume 2, Part 7.

All visibility requirements shall be to Austroads standards.

a) **Mid-Block Visibility Requirement**

Horizontal and vertical sight distances along a road shall be designed in accordance with Austroads “Rural Road Design”.

The designer shall submit with the engineering plans the criteria used in determining the visibility distances.
The stopping sight distance measured round a curve shall be along a line 1.5m into the lane width from the inside kerb.

b) Intersections
Intersections shall be designed in accordance with Austroads Guide to Traffic Engineering Practice, Part 5, Intersections at Grade.

The designer shall show on the engineering plans, the sight distance provided at each intersection, plus the following information:
- Design Speed
- Design Vehicle
- LV - Distance from limit lines to viewpoint
- ASD - Approach Sight Distance
- ESD - Entering Sight Distance
- SISD - Safe Intersection Sight Distance
- All radii.

For the SISD determination an object height of 0.6m shall be used.

c) Roundabouts
The size of a roundabout has a significant role in the performance for capacity, traffic safety and turning movements of vehicles.

Roundabouts shall be designed in accordance with Austroads Guide to Traffic Engineering Practice, Part 6, Roundabouts. The following minimum design criteria shall be applied:

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Central Island Diameter</th>
<th>Circulating Width</th>
<th>LV Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Road</td>
<td>16m including a 2m concrete collar</td>
<td>Single lane - 7.0m</td>
<td>5.0m</td>
</tr>
<tr>
<td>Collector Road</td>
<td>20m including a 2m concrete collar</td>
<td>Single lane - 7.0m</td>
<td>9.0m</td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td>Dual lane - 10.5m</td>
<td></td>
</tr>
<tr>
<td>Arterial Road</td>
<td>24m including a 2m concrete collar</td>
<td>Single lane - 7.0m</td>
<td>9.0m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dual lane - 10.0m</td>
<td></td>
</tr>
</tbody>
</table>

(LV Distance is defined as the minimum distance from limit lines to viewpoint)

Visibility is an important factor to ensure safety standards are met. Achievement of Austroads Criterion Visibility 3 is desirable. The minimum acceptable will be Criterion 1 & 2 using LV distances as per table.

Minimum criterion may be reduced where:
- Physical constraints such as a building/structure prevent practical implementation of minimum design criterion.
- Roundabout can be shown to form a traffic control device as part of a Local Area traffic management scheme (mini Roundabouts).

Approval of any roundabout below minimum design criteria will be required from the Transportation Manager.

The designer shall submit evidence supporting that the design will meet capacity, safety and turning movements of intended vehicles.
Traffic modelling shall show that the design can mitigate the effects of traffic generation due to the development. Where applicable, consideration should be given for future network growth and development. This could include intersection modelling using software such as SIDRA.

Prior to submitting Engineering Plans the designer shall have a Stage 3 “Detailed Design” current version of Transfund’s Safety Audit Procedures. Any issues rated as serious must be rectified prior to submitting Engineering Plans. Items rated Important will be evaluated and considered for inclusion with consent conditions.

The designer shall show on Engineering Plans the visibility splays for each approach of each roundabout, landscaping details, signage, road marking, and state the:
- Design Speed
- Design Vehicle
- LV Distance
- Central Island Diameter
- Circulating Width
- Level of Service

A copy of the Stage 3 Detailed Design Safety Audit and evidence of compliance with recommendations.

3.6.3 Gradients

a) Longitudinal Gradient

Longitudinal gradient will depend on terrain:
- Minimum gradient subject to evidence that 0.4% is unobtainable up to 0.33%
- Minimum gradient 0.40%
- Maximum gradient (on collector and industrial roads) 8.33%
- Maximum gradient (on residential roads) 12.50%

b) Vertical Curves

Vertical curves shall generally comply with the requirements of Austroads Rural Road Design.

For areas where the design speed is \( \leq 50 \text{ Km/h} \), vertical curves shall have a minimum length of 20 m, except where the grade change is \( \leq 1\% \) where the minimum vertical curve length is 10 m.

c) Super-elevation

Super-elevation will not normally be needed on local and collector roads.

d) Crossfall

Normal crossfall = 3%.

Single crossfall will be considered on carriageways up to 7.0m where normal crossfall is unobtainable.

3.6.4 Horizontal Curves

The minimum centreline radius for industrial roads, residential collector and sub-collector roads is 80m. The minimum centreline radius for local residential roads is 15 m.

Reverse curves are to be separated by an adequate length of straight.
3.6.5 **Extra Widening**

Where the centreline radius is greater than 60m, extra widening on curves is not required.

Where curves are less than 60m radius, extra widening may be applied to the carriageway. In such cases the minimum berm width shall not be reduced.

3.6.6 **Cul-de-sac Heads**

Every cul-de-sac should be provided with a carriageway such that the Design Car (refer Austroads standards) may turn without reversing.

Provision should also be made, near the end of a cul-de-sac, for three-point turning utilising insets in the kerbline or kerb crossings for the design single unit vehicle (see Drawing DG 304). Such kerb crossings shall be specifically designed, such that:

- Outside radius turning circle - minimum radius 6.3 m
- For simple bulbous head - “ “ 9.0 m
- For simple bulbous head in industrial roads - “ “ 13.0 m

Off-carriageway parking may be provided in cul-de-sac heads (refer to Section 3.4.3).

3.6.7 **Crossfall on Berms**

- Footpath crossfall - typical 2.5%
- Balance of grass berm crossfall - typical 4.0%.

Localised footpath crossfalls in the range of 2% to 4% may be permitted where levels make the typical crossfalls impractical. Localised grass berm crossfalls may similarly range between 2% and 10%. Engineering drawings should identify any variances from the typical crossfalls.

Berm crossfall shall be satisfactory for vehicle crossings.

3.7 **ROAD PAVEMENT**

3.7.1 **Flexible Pavement Design**

Pavement design may be carried out by one of two methods.

Method 1 shall be undertaken by an engineer experienced in pavement design. It shall apply to all industrial and high volume (over 3000 vpd) collector residential roads and any roads of higher classification.

Method 2 is use of the minimum compliance figures given in Table 3.1. This will generally apply to local roads and collector roads with AADT less than 3000 vpd. Use of Method 2 will not relieve the Developer from achieving the minimum structural requirements for the pavement.

a) **Method 1**

Pavement design shall be by either the design charts in the State Highway Pavement Design and Rehabilitation Manual or by the Austroads Pavement Design Guide. NZTA design shall be for Lower Grade Pavements up to the collector classification and for Premium Flexible Pavements for roads of higher classification.

NZTA design shall be for Premium Flexible Pavements. Factors to be included in the design are:
### Design Period - 25 years
- Annual HCV growth factor - 3%
- Load factor EDA/HCV
  - 0.6 local roads
  - 0.7 collector roads
  - 0.9 arterial and industrial roads
- % HCV
  - 2.5% local road
  - 3.5% collector and higher classification
  - 10% industrial roads

The designer shall provide a design report with the engineering drawings, including the following information as a minimum:
- results of soils investigations
- design assumptions and figures
- QA measures for construction.

#### b) Method 2

Pavement design shall comply with the depth and aggregate specified in Table 3.1.

These designs are based on an insitu subgrade having a soaked CBR of 15 for a minimum depth of 0.6m. If this does not occur, pavement design shall be carried out by an Engineer using Method 1.

#### c) CBR Tests

All designs shall be based on soaked CBRs.

Insitu CBR results used for compliance shall be the 10 percentile value of tests.

### 3.7.2 Subgrade Compliance

The subgrade shall be tested for compliance with the CBR and other properties required by the applicable design method. Testing shall be in accordance with the Technical Specification (Volume 3 of this Manual).

Subgrade compliance shall be subject to approval by Council before construction of the next pavement layer.

### 3.7.3 Sub-base Layer

- Compaction to CBR ≥ 40.

Sub-base compliance shall be subject to approval by Council before construction of the next pavement layer.

### 3.7.4 Basecourse

Aggregate shall be NZTA M4 or GAP as specified in the Technical Specification.
- Compaction to CBR ≥ 80.

The finished pavement shall be tested as set out in Part 3 Clause 2.3 of the Standard Technical Specifications (Vol 3). The results of the test will be considered in terms of compliance to the table in 2.3.3 giving regard to the method of pavement design, time of year, uniformity of pavement deflection recording and proposed final surfacing. Bowl deflection results may be required to assist in the consideration.
3.7.5 Pavement Layer Construction
Pavement construction below the kerb and channel shall extend 500mm behind the kerb face.

3.7.6 Surface Sealing
All carriageways must be surfaced with either a chip seal or asphaltic concrete. Interlocking block paving will be considered on a case by case basis.

Asphaltic concrete on first coat seal is mandatory on industrial roads, rotary intersections, arterial roads, all cul-de-sac turning circles and any other site subject to high turning movements. On cul-de-sac heads, asphalt shall be applied until the carriageway becomes constant width.

a) Chip Seal Surfaces
A two coat chip seal comprising a first coat of Grade 3 chip wet locked with a second coat of Grade 5 chip is appropriate as a first coat seal for most residential roads but other chip seal designs will be considered. This must be followed by a second coat chip seal between 3 and 18 months later as part of the project cost.

b) Asphaltic Concrete on First Coat Chip Seal
An asphaltic concrete layer must be applied over a waterproofing chip seal of Grade 4 or Grade 5 chip with a residual bitumen application of 1.0 litre/m².

A NZTA M/10 specification Mix 10 is appropriate for residential applications but industrial and arterial sites should consider use of SMA 10. Selection of an appropriate mix for arterial and industrial sites should be agreed with the Asset Manager.

Ramp asphalt to existing sealed surfaces (refer Drawing TS 327). Minimum thickness asphaltic concrete 25mm at Mix 10.

3.7.7 Concrete Block Paving
The road pavement may be surfaced with concrete block pavers.

The concrete blocks shall comply, and laying shall be in accordance with NZS 3116:2002 “Interlocking Concrete Block Paving”. Construction guidelines are available in RRU Technical Recommendation TR10: “Interlocking Concrete Block Paving”. Pavements in NZS 3116:2002 titled “Light vehicular” are not acceptable. Pavers shall be 80mm thick Firth Holland Autumn Tones or Black Sands pavers, or similar approved. On carriageways, pavers shall be laid in a herringbone pattern at 45° to the centreline with the long zigzag parallel to the centreline. See drawing TS318.

ROAD DRAINAGE

3.8.1 Subsoil Drains
Where topography dictates or soils are not free draining, subsoil drains will be required behind the kerb as follows:
- Minimum subsoil pipe size - 90 mm
- Minimum depth to pipe invert - 700 mm.

Refer to Technical Specification Drawing TS321 (Volume 3).
3.8.2 Batter Drains
Batter drains behind the boundary may be required to prevent water entering into or onto the berm. They must be constructed as for 3.8.1 above.

3.8.3 Drain Outlet Inverts
Subsoil and batter drain outlets shall be to catchpits or manholes.

3.8.4 Kerb and Channel, Vertical Kerb & Island Kerb
All profiles are to be founded on subgrade with CBR of 15. Where pavement depth (refer Table 3.1) is greater than 150mm, profile shall be laid on a minimum of 75mm of compacted GAP40.

For kerbs with radii tighter than the minimum specified in Table 3.1, or carriageway narrower than standard, “Heavy Duty Kerb and Channel” shall be used.

Refer to Drawings TS 311 and TS 313.

3.8.5 Catchpits
a) For developments where the stormwater connection is direct from each lot to stormwater drainage pipes, the area drained per catchpit:
   - gross area drained (carriageway, berm & footpath) Maximum 900 m$^2$
   - area of carriageway Maximum 450 m$^2$
   - maximum spacing of catchpits 100 m
   - maximum spacing of catchpits where private houses connect stormwater to kerb & channel 60 m

b) Prefered location of catchpits:
   - at intersections, at the kerbline tangent point
   - upstream of pram crossings
   - at changes of gradient on steep roads
   - cul-de-sac heads.

c) A double catchpit will be required:
   - at the lowest point in a sag vertical curve
   - at the ends of a cul-de-sac where water falls to the end
   - on all channels where the gradient is steeper than 5%
   - Grates shall be the alternative type with bars parallel to the kerb.

d) Catchpits and swales require a specific design.

Catchpits shall be of the type referred to in Drawing TS 349 & TS 351.

3.8.6 Dish Channels
Refer to profiles in Technical Specification Drawing TS 308.
For dish channels with footpaths or accessways, concrete is to be on subgrade with CBR not less than 7.

Where possible, the design should avoid a requirement for dish channels.
3.9 FOOTPATHS

3.9.1 General
In general, all roads shall have a footpath on both sides.

In the following cases, consideration will be given to one path only:
- where a short cul-de-sac has been deliberately designed to create a slow speed environment;
- on minor roads in industrial areas where it can be demonstrated that a second footpath is not justified.

In the case of a properly designed shared environment, i.e. where both vehicles and pedestrians have equal priority, a footpath will not be required.

In locations with high concentrations of pedestrians, e.g. shopping areas, outside schools and leading to schools, footpath widths require specific design in consultation with the Transportation Manager:
- Footpath crossfall shall be as specified in Clause 3.6.7.
- Where footpath gradients are steeper than 8.33%, a non-skid surface shall be provided.
- Footpaths shall not be depressed by vehicular crossings.
- In new subdivisions, footpaths should generally be constructed in concrete.
- Footpaths shall generally be located centrally in the berm — Refer to Drawing DG 302.
* Land Transport New Zealand publication RTS 14 “Guidelines for Facilities that Assist Blind and Visually Impaired Pedestrians” should be incorporated into new roading infrastructure as appropriate.

3.9.2 Footpath Width
- Local roads & sub-collectors (mid berm) 1.5 m
- Collector roads (mid berm) 1.8 m
- Adjacent to boundaries or kerb and channel on roads up to collector classification 1.8 m
- Adjacent to boundaries or kerb and channel on arterials 2.4 m
- Shared use cycleway footpaths 2.5 m min (3.0 m pref)

3.9.3 Concrete Footpaths
- Minimum depth of concrete on 25 mm compacted fine granular material 100 mm
- Subgrade CBR Minimum 7

Subgrade preparation shall extend 200 mm beyond the edges of footpath.

3.9.4 Asphalt Surfaced Footpaths
- Minimum depth asphalt 25mm Mix 10
- Minimum depth basecourse 75mm GAP 20
- Subgrade CBR Minimum 7
- Timber edging and stakes shall be as per Drawing TS 314.

3.9.5 Paved Footpaths
- 50 mm Firth Holland Autumn Leaves Pavers as approved equivalent
- 25 mm bedding Sanford Park
3.9.6 Pram-Wheelchair Crossings

Pram crossings shall be provided at all intersections (refer Drawings TS 309 and TS 312:

- Maximum gradient 8.33%

The lip of the crossing shall be flush with the invert of the channel.

3.10 CYCLE TRAFFIC

Provision for cyclists on and off the carriageway shall be subject to scheme plan approvals and designed in consultation with the Transportation Manager and, where appropriate, the Manager Parks & Gardens Unit.

Provision for cyclists on the carriageway should be in line with “engineering best practise” and generally in accordance with Austroads Guide to Traffic Engineering Practice, Part 14 Bicycles. The preferred width of on road cycle lanes is 1.5 m.

Paths designed for use by cyclists, either exclusively or shared with pedestrians, shall be in accordance with Austroads, Guide to Traffic Engineering Practice, Part 14 Bicycles. The preferred width of shared use paths is 3.0 m.

3.11 VEHICLE CROSSINGS

Vehicle crossings shall be provided where vehicles are crossing the kerb and berm.

Vehicle crossings shall be provided as part of the subdivision development for private ways and to lots with road frontage less than 5m in width. (Refer to Technical Specification for details of widths and construction standards).

Crossings shall be designed so that the footpath is continuous through the site. In particular:

- Vehicle crossings shall not interfere with the profile of the footpath or the berm except that minor filling may be permitted between the property boundary and the footpath. No retaining walls or structures are permitted to encroach onto the berm and no lowering of the berm is permitted.
- Vehicle crossings shall be constructed with the same material as the adjacent footpath except that for chipsealed or slurry sealed footpaths, the crossing shall be surfaced with asphaltic concrete. Where there is no existing footpath the crossing may be surfaced with either concrete or asphalt.
- For wide commercial crossings in areas of moderate to high pedestrian use consideration should be given to reinforce the priority of the footpath over the crossing. A pavement marked pedestrian crossing may be appropriate.
- Construction details are included in Volume 3, Part 3 and drawings TS 309 and TS 310.
- The vehicle crossing standards apply to the full width of the berm between the kerb and road boundary).
- When constructing a new vehicle crossing, if an existing footpath exists, the footpath is to be cut out and reconstructed to the vehicle crossing standard.
• Where the existing kerb and channel is cracked, the kerb and channel is to be removed and incorporated into the vehicle crossing construction works.
• Chip seal surface applies only in rural environments.
• Sub-grade and sub-base preparation is to extend 200m beyond the edges of the crossing.
• Surface joints to be sealed as required in Volume 3, Part 3, Clause 6.4.4 or Clause 13.1.

For properties at intersections, the vehicle crossing should be off the minor road rather than the major road.

3.11.1 Rural Vehicle Crossings
Vehicle crossings in rural areas shall be constructed to the same standard as the road they come off. Design shall be as per Drawing DCS 301 (Volume 5).

3.12 BERMS
Berms shall accommodate footpath, road lighting, underground services, landscaping and grass areas.

The minimum width of berm shall be 4.50 m except for private ways and shared environments. (For layout see Drawing No. DG300 and DG302).
• Subgrade to grassed areas to have minimum CBR of 7.
• Minimum compacted depth of topsoil 75 mm.
• Approved grass seed = Perennial Rye.,
• Sowing rate = 1.5 kg/100 m²
Berms are to be mown during the defects liability period as well as prior to take over by Council.

All landscape planting design and implementation within the road reserve shall be as per Volume 2, part 7 — Street Landscaping. This includes, but is not restricted to the Dedicated Tree Planting Corridor referenced in Clause 7.3.2.2 that requires a minimum 900 mm wide service-free corridor within the berm.

3.13 ROAD LIGHTING
Road lighting is to be provided on all roads, accessways and service lanes that are, or will be, under the control of Council.

Walkways and cycleways that provide connectivity between roads generally require lighting. In case of doubt, refer to the Council Asset Manager.

All lighting shall be designed in accordance with AS/NZS 1158 Road Lighting by a suitably qualified and experienced designer.
3.13.1 Specifications, Regulations And Codes Of Practice
The completed design shall comply with all statutory requirements and specifications including, but not limited to, the following:

- a) Relevant Statutory Acts, Regulations and Bylaws
- b) Local authority regulations and requirements
- c) Health and Safety in Employment Act 1992 and associated regulations
- d) Electricity Regulations 1997, handbook to the electricity regulations
- e) The Electricity Act 1992
- f) Electrical code of practices
- g) New Zealand Radio Interference Regulations and Interference Notices
- h) Ministry of Health Code of Practice for the Safe Management of PCBs
- i) NZTA M/19 : 1999 Tubular Steel Lighting Columns
- j) NZTA M/19 : 2002 Notes Tubular Steel Lighting
- k) AS/NZS 1158 : Road Lighting
- l) NZS 6705 : 1996 Luminaires for Road and Street Lighting
- m) NZS 3000 : 1997 Electrical Installations — Buildings, structures and premises
- n) AS/NZS 4676 : 2000 Structural Design requirements for Services Utility Poles
- o) AS/NZS 4677 : 2000 Steel Service Utility Poles

3.13.2 Lighting Design

3.13.2.1 Lighting Parameters
Lighting installations shall be designed to AS/NZS 1158 part 1.1 (Category V) or part 3.1 (Category P).

Lighting categories for the various classes of roads as defined in the Hamilton District Plan are:
- Major Arterials Category V 2
- Minor Arterials Category V 3
- Collectors Category V 4
- Local roads Category P 2.5 *
- Walkways/Cycleways Category P 1

* This is a category between P 2 and P 3. The installation shall generally be designed to P 3 standards except that the technical parameters in Table 2.1 shall be modified to:
  - Maintained average horizontal illuminance 2.4 lux
  - Maintained horizontal illuminance 0.5 lux
  - Maintained vertical illuminance 0.5 lux

All luminaires shall be Type 4 luminaires detailed in AS/NZS 1158 except that the upward waste light ratio shall be less than 6%.

Note that special requirements applying in the vicinity of the Astronomical Society Observatory in Brymer Road are detailed in clause 3.13.3.3.

The standards above are minimum light levels but designers must also be careful to avoid over lighting an area, as this leads not only to increased energy and maintenance costs but can also cause nuisance to adjacent residents. Clause 3.13.8 Audit Lighting System has maximum and minimum light levels that will be checked during post construction audits. Additionally light uniformity and luminance levels shall not exceed the standard by more than 20%.
3.13.2.2 Design Life
All materials shall have the following minimum design lives
- Columns: 50 years
- Outreach Arms: 50 years
- Luminaires: 15 years
- Lamps: 16,000 hours

3.13.2.3 Brymer Road Special Lighting Area
In order to reduce “Light Pollution” in the vicinity of the Hamilton Astronomical Society’s observatory on Brymer Road the following provisions apply.
- Installations within a 1.0 km radius of the observatory shall use luminaires with full cut off optics.
- Within 150 m of the observatory low pressure sodium monochromatic lamps shall be used. This may require modifications to luminaires.
- The UWLR should be limited to 0.5%
- If this produces difficulty in meeting the other design requirements this should be discussed with the Transportation Manager.

3.13.3 Road Lighting Equipment
All materials supplied shall be new. All fittings and materials used shall be consistent throughout the installation and where there is an addition to an existing system the new fittings and materials shall match the existing.

3.13.3.1 Column and Luminaire Types
The standard column to be used on arterial and collector roads is galvanized steel, octagonal section (Oclyte or similar), with elliptical outreachs. To assist with minimising maintenance costs it is desirable that columns and luminaires on new local roads are the same as a type already in use within the City. If a different column or luminaire is proposed full details of the specification, including independent verification of compliance with relevant specifications, is to be supplied with the design details. These details should include:
- Structural design and manufacture
- Corrosion resistance
- Decorative finish
- Light outputs and characteristics
- IP ratings of fittings

3.13.3.2 Column Location
Columns shall be located generally in accordance with the following criteria:
- Columns should be positioned in the grass berm, a minimum of 1.0 m behind the front face of the kerb, and no closer than 300 mm to the edge of a footpath.
- Columns should placed so that a minimum 1.8 m corridor width is available between structures for pedestrians
- Ideally columns shall be longitudinally located in line with property side boundaries. If this is impracticable then columns should not be located within 6.0 m of side boundaries in order to minimise potential conflict with driveways.
- Staggered installations are preferred.
• At an intersection the first column on the joining road shall be on the left side of
the road when entering from the through road and not more than 15 m from the
through road kerb line.
• In a cul de sac the distance from last column to the front boundary of the end
property shall be not more than 40% of the standard column spacing.

3.13.3.3 Lamps
• High Pressure Sodium Lamps shall be used in all lights unless specific approval for
an alternative type is received.
• High pressure sodium lamps shall have pulse type/superimposed multi pulse type
igniters fitted. Power factor correction shall give a power factor 0.95 lagging.
HRC fuse cartridges of the appropriate size shall be fitted. Lamps with internal
fitted igniters will only be accepted where approved by the Engineer.

3.13.4 Circuit Cabling
Design of cabling, including control method, shall be in accordance to the
specifications and requirements of the local Network Owner. Currently this is
contained in the "Design and Construction Manual" of WEL Networks Ltd.

Where lighting columns or circuits are being relocated, extended or upgraded the
existing supply, protective devices and switching control may be reused if it is in
compliance with this specification.

All new installations shall be designed to be controlled through the Network Owner’s
ripple control system. No other system will be considered.

3.13.5 Design Check
In order to demonstrate compliance with this standard the documentation listed in
Appendix C of AS/NZS 1158 part 1.1 and part 3.1 shall be supplied with subdivision
engineering plans.

3.13.6 Audit Lighting System
Upon installation and commissioning the streetlights may be audited by Council. This
final audit will ensure that the asset’s performance and quality of the work comply
with Council’s requirements.

The audit parameters and methodology are defined as follows:
• Min and Max luminance values (Lux) — Values are extrapolated from field
luminance measurements approximately along a line 1.0m off-set from the road
centre line and at a height of 1.5m
• Quality of hardware and installation work — site check for indications of items
which may affect performance of the light output, hardware or pose a threat to
the safety of the public.

If the installation fails to meet these criteria the developer/installer will be liable to
remedy the installation to ensure it meet the requirements. This audit maybe carried
out up to 3 months after the system has been in service.
3.14 SIGNS AND ROADMARKING

All regulatory signs and road name signs shall be provided. These shall be located and mounted in accordance with the Volume 3, Part 3, Section 14. White powder coated steel poles shall be used.

Road marking shall be shown on the plans and applied in accordance with Volume 3, Part 3, Section 15.

3.15 SERVICE LANES

Minimum carriageway width is 3.5 m.

Carriageway is to have concrete edging both sides. Stormwater is to be collected and disposed of. Specific geometric and pavement design is required. Carriageway surfacing is to be asphalt.

3.16 PRIVATEWAYS

3.16.1 Urban Residential Privateways

For layout refer to Drawing DG 301.

For dimensions and sealed pavement structure, see Table 3.1 of this Part.

The minimum inside radius of curves shall be 9.0 m. The gradient shall not exceed 1:6 unless approved by the Engineer. Where the gradient exceeds 1:6, such safety provisions as may be required by the Engineer shall be provided. Privateways longer than 75m shall provide a passing bay.

For concrete pavements:
- Depth of concrete for 2-4 hu = 125 mm
- Depth of concrete for 5-10 hu = 150 mm

Concrete is to be on 75 mm of compacted GAP20 on compacted sub-grade with CBR ≥10. Pavement may be interlocking block pavers as specified in Section 3.7.7 above. Stormwater shall be collected and piped into the stormwater collection system. Stormwater shall not discharge across the vehicle crossing from the privateway to the road.

Vehicle crossings to privateway shall be designed and constructed in accordance with Clause 3.11 and Drawings TS 309 and TS 310.

3.16.2 Industrial Privateways

- Serving one lot: minimum carriageway width = 4 m
- Serving two or more lots: minimum carriageway width = 6.4 m
- Minimum inside radius of curves = 12 m
- Kerb and channel to be heavy duty as per Technical Specification Drawing TS 308
- Minimum berm width each side = 1.8 m
- Stormwater drainage as specified in Section 3.16.1 above.
3.16.3 Rural Residential Privateways

Serving \( \leq 4 \) lots and \( \leq 250 \) length:
- Sealed carriageway minimum width 3.5 m
- Privateway minimum width 7.0 m.

Serving \( \geq 5 \) lots and \( \geq 250 \) m length:
- Sealed carriageway minimum width 4.0 m
- Privateway minimum width 7.5 m
- Crossfall 4%.

All rural residential privateways shall have:
- Pavement GAP40 minimum depth 150 mm
- Subgrade minimum CBR 15.

For particular design requirements of individual district councils refer to Part 3 Volume 5 (relevant Table 3.1).

3.17 PARKING BAYS

Parking bays shall be constructed to the same standard as the road and continue the carriageway crossfall.

Surfacing may be with interlocking pavers as specified in Section 3.7.7 above.

3.18 FEATURES AND BERM FURNITURE

3.18.1 Feature Walls

Feature entrance walls will be permitted providing that the following criteria are adhered to:
- All permanent structures shall be erected on land other than road reserve.
- The structure must comply with all building consent and District Plan requirements.
- The structure shall be constructed from durable materials such as concrete, brick, stone, metal, timber.
- No lighting shall be installed that could potentially be hazardous to motorists or irritating to residents, nor shall it compromise the required road lighting.
- Plaque type name plates may be attached to the walls provided the sign complies with the District Plan Ordinances (individual lettering will not be permitted).
- No services shall be affected by the location and construction of the structure.
- All maintenance costs (including electricity supply if required) shall be at the expense of the lot owner upon which the structure is sited.
- The structures shall not create traffic safety problems.
- The structure shall be set to permanent levels.

3.18.2 Berm Furniture

Structures or features which are not part of signage or traffic control will not be permitted on road.
3.19 ACCESS WAYS

Access ways may be provided to link one road to another in order to improve pedestrian and cyclist access.

- Access ways shall be a minimum of 5 m wide (boundary to boundary).
- Access ways shall be provided with lighting to P1 standard (see Clause 3.13.2.1 of this Part).
- Footpaths shall be a minimum of 3 m wide.
- If it is necessary to incorporate steps into the access way, a cycle ramp shall also be provided.
- Access paths bounded by private lots and linking between public roads shall be fenced both sides by the Developer. The fence shall be a minimum of 1.2 m high, 3 rails with timber palings. A suitable design is shown in drawing DG...But other designs that achieve similar outcomes will be considered.
- Access ways should have sight lines from one end to the other.

The fence shall provide security for the resident and allow passive surveillance of the walkway.

Facilities for Vision Impaired Pedestrians

Tactile pavers shall be installed in accordance with RTS14 Guidelines for the Blind and Vision Impaired Pedestrians at:

- Crossing points across Arterial or Collector Roads, including pedestrian throat islands, refuge islands and median islands.
- Other points where significant numbers of pedestrians cross an access way or side road.
- Railway crossings.
- Other highly pedestrianised areas.