User's Guide

IDSM - Section 3 Transportation

Infrastructure Design Standards (IDSM) - Issue 10, 2009

Contents

CHAPTER 1

Section 3 - Transportation

In This Chapter

3.1 Scope

This Section of the Infrastructure Design Standards (IDS) covers the engineering design requirements for transportation issues associated with all new and upgrading work within North Shore City. These standards are to assist developers, consultants, contractors and Council Engineers to obtain a consistently high standard of infrastructure. This section should be read in conjunction with other standards in this manual.

This section provides:

a) The relevant performance criteria.

b) The relevant criteria for design submissions

c) Specification for design and materials.

d) Standard Details.

From 1st August 2008, Transit NZ and Land Transport NZ have amalgamated to become the New Zealand Transport Agency – NZTA (http://www.nzta.govt.nz). Therefore, the reference to any guidelines or manuals shall be considered accordingly.

3.2 Performance Criteria

3.2.1 Objectives

The objective of this section is to facilitate safe, comfortable and efficient travel throughout North Shore City. This will be accomplished through environmentally sustainable engineering designs and construction that achieve the following:

a Meeting all relevant standards and criteria of the District Plan, road hierarchy and classification.

b Produce designs that are aligned with the strategic direction contained within the Council's Strategic Plan, City Blueprint, Transportation Strategy, (including the Cycle Strategy), Transport Asset Management Plan and Council's Stormwater Policy. These documents include Council's commitments to the principles of environmental sustainability.

c Providing for safe, efficient and comfortable passage of vehicular and non-vehicular traffic.

d Providing for the safe and efficient passage of cyclists, compatible with the Council's Cycle Strategy.

e Providing safe access for pedestrians, wheel chairs, mobility scooters, etc with appropriate width, gradient and crossfall, mindful of the future use of the area (e.g. retirement villages).

f Consideration of alternative, environmentally sustainable designs.

g Pavements of sufficient strength to cope with design loads for their design life.

h Pavements of adequate width, gradient and crossfall to allow ease of passage.

i Providing for stormwater management, landscaping and utility services.

j Minimising noise to a level compatible with the character of the neighborhood.

k Providing all lots with adequate access compatible with future parking requirements.

l Designs that are compatible with the existing environment, especially in heritage areas and areas where different materials have been used.

m Complying with the standards, guidelines and other references prescribed in this document.

Any solution that does not conform to this manual shall be developed in conjunction with Council staff and approved by the Transport Asset Manager.

3.2.2 Reference and Precedent Documents

Where there are conflicting requirements between this section of the document and any reference or supporting documents nominated, the following documents shall take precedence in the order listed below:

a District Plan (including Structure Plans)

b Resource Consent Conditions

c Infrastructure Design Standards

d AUSTROADS Design Manual

e NZS 4404:2004 where otherwise not covered

f Approved Engineering Drawings

Notes:

1. The Long Bay Structure Plan (Variation 66 of the District Plan) has special requirements. Accordingly, a set of Practice Notes has been developed for works within the Long Bay Structure Plan area. These are to be read in conjunction with this manual and are available on request from Transport Services, and are available on the Council internet site.

2. The Albany Centre transport network has special requirements which are included in the "Albany Centre Streetscape Design and Planting Guidelines". These are to be read in conjunction with this manual and are available on request from Transport Services.

3. Within towncentres, intensive residential areas and some arterial roads, a higher standard of pedestrian and landscape amenity may be required. Refer to the "Albany Centre Streetscape and Planting Guidelines" for example of accepted technical details.

3.3 Carriageway Design standards

3.3.1 Designer Responsibilities

The person undertaking road and traffic design shall design roads that provide vehicle access to each site, links to the existing roading network and is able to accommodate the predicted traffic volume and type of vehicle movements associated with the adjacent properties and surrounding roading network.

The designer shall use engineering judgement in their design and where the mandatory requirements of Council conflict with the proposed design, the designer is required to discuss the matters with the Council's Transport Asset Manager.

To obtain surrounding network traffic volumes the designer should contact Council's Transport Asset Manager.

3.3.2 Geometric Design

All roading design shall comply with AUSTROADS Guide to Traffic Engineering Practice. Design standards for specific areas of the city experiencing rapid growth are also covered by the Urban Expansion Structure Plans contained within the District Plan.

The following guides shall be used:

AUSTROADS Guide to Traffic Engineering Practice

AUSTROADS Urban Road Design Guide

AUSTROADS Rural Road Design Guide

For issues not covered by the above guides refer to Council's Transport Asset Manager.

3.3.2.1 Design Speeds and Speed Environment

This shall generally be determined in accordance with AUSTROADS publications unless Council requests otherwise.

3.3.2.2 Carriageway Widths and Alignment

The carriageway/sealed widths in Table 3.1 shall be a minimum requirement except where a specific design or development proposal has the Transport Asset Manager's approval.

ROAD CATEGORY	TYPE	AREA SERVED	MINIMUM ROAD RESERVE WIDTH	MINIMUM CARRIAGEWAY WIDTH[2]			
				PARKING	CYCLES	TRAFFIC	MEN
LOCAL	RESIDENTIAL	UP TO 60 DU[1]	20	-	-	2 x 3.0	-
	RESIDENTIAL	MORE THAN 60 DU	20	1 x 2.2	-	2 x 3.0	-
	INDUSTRIAL	-	20	2 x 2.2	-	2 x 3.0	-
COLLECTOR	RESIDENTIAL	-	22	1 x 2.2	2 x 1.2	2 x 3.0	-
	INDUSTRIAL	-	25	2 x 2.2	-	2 x 3.5	2.5
SECONDARY (DISTRICT) ARTERIAL	-	-	22	1 x 2.2	1 x 1.5	2 x 3.5	-
PRIMARY (REGIONAL) ARTERIAL	2 LANE	-	30	1 x 2.2	1 x 1.5	2 x 3.5	2.8
	4 LANE	-	30	1 x 2.2	1 x 1.5	4 x 3.5	2.8

PRIVATE ROADS	2 LANE	-	10	-	-	2 x 2.5	-

Notes:

1. DU – Dwelling Units.

2. Carriageway widths are measured from kerb face to kerb face and include 300mm allowance for drainage channel, on either side.

3. Minimum carriageway width shall be increased to 7.5m for a distance of 20m on approaches to intersections.

4. Extra parking in recessed bays to be provided as required.

5. No stopping on one side of the road to be considered if necessary.

6. Minimum carriageway width may be reduced to 6.6m, if adequate recessed parking bays are provided.

7. Parking may be allowed on both sides of the road.

8. Parking on both sides may be considered.

9. The minimum road reserve width shown in this table may have to be increased if Swales / Bio filtration strips are to be included.

10. The minimum carriageway width shall be increased to 5.5m at the curves and entrances.

Notes:

1. DU - Dwelling Units.
2. Carriageway widths are measured from kerb face to kerb face and include 300mm allowance for drainage channel, on either side.
3. Minimum carriageway width shall be increased to 7.5m for a distance of 20m on approaches to intersections.
4. Extra parking in recessed bays to be provided as required.
5. No stopping on one side of the road to be considered if necessary.
6. Minimum carriageway width may be reduced to 6.6m, if adequate recessed parking bays are provided.
7. Parking may be allowed on both sides of the road.
8. Parking on both sides may be considered.
9. The minimum road reserve width shown in this table may have to be increased if Swales / Bio filtration strips are to be included.

10. The minimum carriageway width shall be increased to 5.5m at the curves and entrances.

Road reserve width may need to be increased or decreased for reasons other than traffic and will be varied at Council's discretion. Measures such as storm water treatment (Swales and Bio filtration strips) would need to be considered in this situation. The road reserve width is measured from property boundary to property boundary.

Where appropriate, parking is to be provided in recessed areas constructed with permeable pavement / surface.

Consideration shall be given to the likely operating speeds, parking and maneuvering requirements and safety of all road users when determining an appropriate carriageway width.

The design speed for the road shall generally be 10km/h above the posted speed limit for all arterial and collector roads and a minimum of 30km/h for all local roads (refer District Plan). The default design speed shall be 60km/h for all urban roads.

The roading hierarchical system provides a clear distinction between each type of road based on function. A description of each category is contained in Drawing TRS 1 and the District Plan. Generally the zoning category of the lots served by a road determines whether the road is residential or industrial.

3.3.2.3 Horizontal Alignment

Where reverse horizontal curves are proposed, approval shall be obtained from the Transport Asset Manager before detailed design is completed.

The following minimum centerline radii shall be used:

Local Residential Roads 25m

Local Industrial, Collectors and above 80m

Curve widening may be appropriate on some curves and shall be designed in accordance with AUSTROADS guidelines. Tracking curves will be required to show that vehicles can negotiate curves that are narrow or have a small radius.

All turning movements shall be designed to accommodate all expected turning vehicles, including vehicle crossings from kerbline to boundary without driving over footpaths/berms. Vehicle tracking curves shall be provided if required by the Transport Asset Manager in addition to those already presented in the District Plan. Minimum widths may need to be increased at bends/intersections to allow large vehicles to maneuver safely. This is particularly relevant in industrial streets.

3.3.2.4 Super-Elevation And Crossfall

Super-elevation shall be applied in accordance with AUSTROADS guidelines unless otherwise required by the Transport Asset Manager.

Super-elevation on curves is required where the longitudinal gradient is steeper than 8% to achieve the design speed for the road.

Crossfall of 3% towards the outer edge of the road is required on all roads but where existing features mean this cannot be attained the crossfall may vary between 2% and 4%.

Side roads shall match the camber of the through road at the junction.

3.3.2.5 Single Crossfall Roads

Single crossfall roads will be acceptable for roads with a carriageway of up to 8.8m wide. Runoff from berms, footpaths, driveways, swales and private properties on the uphill side shall be collected and piped to the stormwater system and shall not be allowed to cross the carriageway unless otherwise approved by the Transport Asset Manager having due regard for road safety, stormwater management and overall environmental impact. Single crossfall roads wider than 8.8m shall require approval from Council's Transport Asset Manager.

3.3.2.6 Sight Distance

Sight distances for stopping, overtaking, curves and obstructions shall be calculated to ensure that all possible road hazards are perceived by the driver within an appropriate time. This shall comply with AUSTROADS requirements.

All new intersections shall be lit in accordance with Clause 3.15 of this document that refers to Clause 3.23 - Exterior Lighting.

3.3.2.7 Vehicle Tracking

Tracking curves of critical vehicle movements shall be used to verify the suitability of proposed layout geometry. The vehicles chosen shall be appropriate to the type of vehicle that will use the road.

For on road usage and site maneuvering or parking refer to:

a) *For guidance to road controlling authorities and engineers in the geometric design of roads and intersections refer to: "RTS18 - New Zealand On-Road Tracking Curves for Heavy Vehicles 2007", which replaces the similar document published by Land Transport Safety Authority in October 1995.*

b) *AS/NZS 2890.1 Part 1: Off street car parking*

A design vehicle of suitable dimensions and turning characteristics representative of the 90-percentile vehicle shall be used (i.e. the vehicle for which only 10% of vehicles in its category have more critical dimensions). Future vehicle usage shall be considered by the designer.

3.3.2.8 Intersections

Intersections are generally to be designed at right angles to the major road and shall be consistent with the AUSTROADS design publications. Intersections shall be designed to comply fully with required sight distances taking into account future landscaping and street furniture.

3.3.2.9 Gradients

The gradient shall not be steeper than an average of 10% with localised maximum grades not exceeding 12.5%. Adverse effects of horizontal alignments shall be considered where the gradient is near the maximum limit. Where there are strong supporting arguments contained within a design report by a person experienced in this area, the Transport Asset Manager may approve steeper grades.

Crest curves and sag curves shall be designed in accordance with Austroad Rural Road Design guide which gives appropriate K values.

The intersection point of any vertical curve shall be at least 10m from the line of the through road kerb (15m on arterial roads)

3.3.2.10 Wait Platforms

Wait platforms, 6 metres long and at a grade not exceeding 1 in 20 (5%), shall be designed at the entry to all intersections where vehicles may have to stop and/or give way to opposing traffic. The 6 metres shall be measured from an extension of the kerb line. Where there are strong supporting arguments, the Transport Asset Manager may approve alternative designs.

3.3.2.11 Cul-de-sacs

Cul-de-sacs shall comply with Drawing TRS 4, which shows the required turning areas. Designers should give consideration to ways of discouraging vehicles from parking in areas where they could inhibit turning vehicles.

The lower half of a downward sloping cul-de-sac head shall have a gradient no greater than 1 in 20 (5%). The head shall be designed so that stormwater can properly drain and future driveways will not conflict with stormwater catchpits etc.

Every cul-de-sac, whether the end of the road is in its final position or not, shall be provided with a turning area at the end of the useable road. Parking places shall be provided off the carriageway.

The following document shall be used for reference:

RTS 6 - Guidelines for Visibility at Driveways, LTNZ (Land Transport New Zealand)

New Zealand Standard – Land Development and Subdivision Engineering – NZS 4404:2004

3.3.2.12 Privateways/Driveways

Where property access is by privateway, the full length of the privateway shall have an all weather surface in accordance with Drawing TRS 11. If the CBR of the subgrade is less than 7 then specific design of the privateway is required.

Longitudinal gradient shall not be greater than 1:5 without resource consent. A gradient steeper than 1:5 may be allowed for short lengths (less than 10m) at the discretion of the Transport Asset Manager. It will be necessary to demonstrate that good transitional geometry for maneuvering vehicles can be obtained.

The crossfall shall not be greater than 6%. The maximum crossfall for a maneuvering vehicle (i.e. at right angles to the direction of movement) is 10%. This relates to access points off privateways, garage entrances, anywhere a vehicle turns off the privateway. This may result in flatter sections of a steep driveway at these locations.

Passing bays shall be provided every 70m and be 15m long. Typically the carriageway width should increase to 5.5m wide over a 5m long taper at both ends with a 5m long space to stop between tapers.

The spacing of catchpits or other stormwater runoff collection facilities on steep driveways shall be specifically designed to ensure that water can enter efficiently. Minimum requirements for road drainage are not usually suitable.

The following document shall be used for reference:

RTS 6 - Guidelines for Visibility at Driveways, LTNZ

Where appropriate, twin strip carriageways may be proposed for written approval of Council. Specific design is required, which shall include consideration of all stormwater management issues. Submissions will need to demonstrate that paving over the entire carriageway width is provided for all likely turning or maneuvering tracking paths. Twin strip carriageways are normally considered for privateways serving three lots or less. The minimum width of each strip should be 900mm and the gap between strips should be less than 700mm.

Lighting for private ways/driveways should be provided in accordance with Clause 3.23 Exterior Lighting, Table 1.1 (Reference category P5).

Privateways, where appropriate, shall be provided with a street name sign as per the Drawing no. S22 of this manual, provided that the Council’s approval has been obtained.

3.3.2.13 Private Roads

Private Road is defined in the Local Government Act 1974 as follows: “Private Roads means any roadway, place or arcade laid out or formed within a district on private land, whether this be before or after the commencement of this Part of the Act, by the owner thereof, but intended for the use of the public generally”.

Under the current District Plan, private roads (accessways) are allowed to serve up to 10 lots or/and with a total length less than 70m. Private roads outside these threshold limits may be considered subject to obtaining all other necessary consents from the Council.

The minimum width of the strip of land for vehicular, pedestrian usage including placement of any needed utility services and any landscaping or stormwater mitigation requirements shall be 10.0m. It may need to be increased for reasons other than traffic (such as storm water management) at Council’s discretion. The minimum carriageway width shall be 5m (see Table 3.1 – Carriageway Widths) with adequate curve widening. Longitudinal gradient shall be maintained less than 16% with mild gradients at corners. Maximum of 20% longitudinal gradient may be allowed for shorter distances if the terrain is difficult.

Private roads shall comply with the requirements of Clause 3.3.2.12 – Privateways/Driveways, however, the following additional requirements will need to be incorporated:

- Specific design for the private roads shall be provided in accordance with clause 3.9 – Pavement Design of this manual;
- Stormwater design for the private roads shall comply with Clause 3.12 of this manual;
- Footpaths shall also be provided in on at least one side along the full length of the private road as per Clause 3.7 – Footpath of this manual;
- Utility services shall be generally located on grass berm complying with Drawing no TRS 23 and/or TRS 24. Minimum cover to services shall be in accordance with clause 3.16.2.2 of this manual;
- A turning circle complying to Drawing TRS 4 of this manual shall be provided at the end of the road that will facilitate turning of rigid trucks (9m long) without damaging the drainage facilities and footpaths;
- All private roads shall be provided with a street name sign as per the Drawing no. S22 of this manual provided that the Council’s approval has been obtained;
- Lighting for private roads should be provided in accordance with Clause 3.23 Exterior Lighting, Table 1.1 – Reference Category P5. The Category shall be increased to P4 if the ADT (average daily traffic) is likely to exceed 200vpd.

3.3.2.14 Parking and Parking Bays

Parking dimensions shall be in accordance with the provisions of the District Plan and specifically Section 12.4.2.5.

All off street parking shall be provided with "Please pay here" sign as per the Drawing no. S23 of this manual.

Vehicle crossings exiting into recessed parking bays should be avoided. If recessed parking bays are used, the designer shall locate vehicle crossings outside the recessed parking bays where practical. If subsequent owners wish to relocate these vehicle crossings, then their Building Consent application should include relocating the parking bay within their road frontage, including removing of the redundant crossing. Building consent application should be submitted with an Engineering Works Application together with Road Opening Notice Application for the proposed work.

Parking bay pavements should be designed to the same parameters as the adjacent traffic lanes. Alternative surfacing may be used to distinguish them from the road. Where unit pavers, gobi blocks, cobblestones etc. are used they shall be adequately contained against movement and drainage provision appropriately designed. The basecourse thickness underneath pavers should be the same as the adjacent road. Parking bays using permeable materials are encouraged for storm water management.

3.3.2.15 Medians

The two types of medians used are raised islands with kerbing or flush medians with line marking.

The appropriate option will be decided in consultation with the Transport Asset Manager, with the following examples as a guideline:

(i) Flush Medians

- Central median for access/turning movements.
- Intersection islands and controls.

(ii) Raised Medians

- Kerbed splitter islands for intersection approaches, lane separation pedestrian refuges and central medians.
- Roundabouts

Refer to the Transit NZ Manual of Traffic Signs and Markings (MOTSAM) for the design of Flush Median and Drawing TRS 14 for raised island details.

3.3.2.16 Cycle Lanes

The current version of "North Shore City Strategic Cycle Plan" published by Transport services shall be complied with where appropriate.

Cyclists need to be considered when designing carriageways. The width of the kerbside cycle lanes are to include a 300mm allowance for the drainage channel.

Design shall follow the following guidelines:

AUSTROADS Guide to Traffic Engineering Practice Pt 14: Bicycles

New Zealand Supplement to the AUSROADS Guide to Traffic Engineering Practice Pt 14: Bicycles

LTNZ Manual of Traffic Signs and Markings Pt 2

3.3.2.17 Bus Bays

The layout of Bus Bays shall comply with Drawings TRS 18, 19 and 20A. The Transport Asset Manager may require the Bus Bays to be recessed.

Bus bay pavements should be designed to the same parameters as the adjacent road. Concrete and Asphalt Concrete bus bays will only be accepted. The channel shall form part of the main bay and not be laid separately.

3.3.2.18 Service Lanes

Service lane pavements should be designed to the same parameters as the adjacent road. Alternative surfacing may be used to distinguish them from the road. Where unit pavers, gobi blocks, cobblestones etc. are used they shall be adequately contained against movement and drainage provision appropriately designed. The basecourse thickness underneath pavers should be the same as the adjacent road.

Refer to the District Plan for further information on Service Lanes.

3.4 Traffic Control

3.4.1 Traffic Control Devices

3.4.1.1 Design Guides

Traffic Control devices shall comply with Transport Services' Traffic Technical Directives current at the time of installation. Traffic Technical Directives will be issued from time to time in accordance with best practice and are available from the Transport Asset Manager.

TNZ, AUSTROADS and LTNZ design guides shall be used with particular reference to the following manuals:

LTNZ RTS 1 - Guidelines for the Implementation of Traffic Control at Crossroads,

LTNZ RTS 4 - Guidelines for Flush Medians,

LTNZ Guidelines for marking multi-lane roundabouts

AUSTROADS Guide to Traffic Engineering Practice

Pt 5 - Intersections at Grade

Pt 6 - Roundabouts

TNZ/LTSA Manual of Traffic Signs and Markings Pts 1 and 2 (MOTSAM)

3.4.1.2 Stop/Give Way

All intersections shall be controlled by a Stop or Give Way sign and markings as a minimum with the following exceptions:

- Where the priority route has less than 2000 vehicles per day and
- Where the adjoining road has less than 500 vehicles per day and
- Where the approach visibility meets AUSTROADS safe intersection sight distance standards

All crossroad intersections shall have a Stop or a Give Way control. The Transport Asset Manager may require Stop or Give Way controls to be installed where visibility restrictions or unusual intersection configurations and traffic flows make them necessary.

3.4.1.3 Roundabouts

Designs shall comply with:

AUSTROADS Guide to Traffic Engineering Practice Pt 6 - Roundabouts.

LTNZ Guidelines for marking multi-lane roundabouts

TNZ/LTNZ Manual of Traffic Signs and Markings Pt 2

Deflection criteria for entry and exits are critical. Splitter islands shall be used on all approaches.

3.4.1.4 Traffic Signals

Any proposal for traffic signals shall be submitted by the designer for approval by the Transport Asset Manager.

Design shall comply with at least the following guidelines:

- *AUSTROADS Guide to Traffic Engineering Practice Pt 7 - Traffic Signals*
- *TNZ/LTNZ - Manual of Traffic Signs and Markings Pt 2*
- *LTNZ - RTS1 - Guidelines for the Implementation of Traffic Control at Crossroads*
- *Traffic Signals and Intersection Design Requirements of the Auckland Traffic Management Unit*

Traffic signal phasing should comply with Auckland Traffic Management Unit standard phasing configuration except for unusual intersection layouts as approved by the Transport Asset Manager. Design drawings, supply and installation of traffic signals shall be to the current National Traffic Signal Specification.

3.4.1.5 Local Area Traffic Management (LATM)

LATM installations shall comply with Council's LATM Policy and Austroads Guide to Traffic Engineering Practice, Part 10. The common LATM devices used to control speed are speed humps and speed tables. For the details of speed humps refer to the Ministry of Transport guidelines for the use and construction of speed control humps. The speed tables shall comply with following parameters:

- The finished height should be 80-100mm above the adjacent road levels
- The plateau length should be 8m-10m long
- The ramps should have a gradient of 1:10 except on bus routes where gradient should be 1:15
- Lighting should be considered at all installations

A typical sinusoidal speed hump is given in Drawing TRS 29 of this manual.

3.4.1.6 Pedestrian Crossings and Refuges

Installation of full pedestrian crossings require a warrant in accordance with the Transport Regulations to be completed and submitted to Council. Their inclusion in any road works should be discussed with Council's Transport Asset Manager at the design stage of a project. Pedestrians can be assisted with a variety of other measures to cross a road and these should be considered at design stage.

Central refuge islands may be installed on principal routes at intervals as agreed with the Transport Asset Manager. Typical details of pedestrian refuge are given in Drawing TRS 27 of this manual. Kerb extensions shall be installed wherever appropriate.

Consideration shall be given to the safety of cyclists and vehicles in providing pedestrian facilities within a carriageway.

Care should be taken not to confuse pedestrians in regard to paving across roads between pram crossings that implies pedestrians have right-of-way.

All new pedestrian crossing facilities shall include upgrading of street lighting design to meet requirements outlined in Clause 3.23.4.2.6 – Pedestrian Crossing Lights of North Shore City Council's Design Standards for Exterior Lighting.

The following guidelines shall be used:

RRU-TR11 Recommended Practice for Pedestrian Crossings - 1988

LTNZ Guidelines for installing pedestrian facilities for people with visual impairment RTS 14 -

AUSTROADS Guide to Traffic Engineering Practice Pt 13 – Pedestrians

LTNZ Pedestrian network planning and facilities design guide (should be used upon its final publication)

When constructing or upgrading pedestrian crossing facilities in commercial areas, installation of tactile pavers and audio tactile pedestrian push buttons may be required at the Transport Asset Manager's discretion. Guidelines for installing pedestrian facilities for people with visual impairment are contained in RTS 14 – LTNZ.

Pedestrian crossings shall comply with Transport Services' Traffic Technical Directives current at the time of installation. Traffic Technical Directives will be issued from time to time in accordance with best practice and are available from the Transport Asset Manager.

3.4.1.7 Bus Shelters

Bus shelters shall be provided along appropriate routes and shall comply with Council's Bus Shelter Policy.The following criteria shall apply to Bus shelters:

a) Located at least 0.5 m away from property boundary and not less than 2.0m from kerb (2.5 m if shared footpath/cycleway in front). Widths less than these shall be approved by the Transport Asset Manager.

b) Not less than 5m away from the nearest edge of any vehicle crossing (10m away is preferred)

c) Footpath to be in front of Bus Shelter

d) Concrete slab to extend to footpath

e) To be located close to the head of bus stop

f) Helpline sign and rubbish bin to be components of Bus Shelter

g) Not to be located within safe intersection sight distance lines (100m for 50 km/hr posted speed - Refer Austroads guidelines)

3.4.1.8 Bus Stops

Bus stops shall be located in accordance with Council's Bus Stops policy.

A Primary consideration is the accident record of the proposed location. Where safety problems exist then the proposed bus stop location shall be referred to the Transport Asset Manager for approval.

3.5 Signage

3.5.1 Traffic Signs

All traffic signs shall be designed and installed in accordance with the requirements of the District Plan and TNZ/LTNZ Manual of Traffic Signs and Markings (MOTSAM).

Traffic signs shall comply with Transport Services' Traffic Technical Directives current at the time of installation. Traffic Technical Directives will be issued from time to time in accordance with best practice and are available from the Transport Asset Manager.

The facing of all traffic signs shall be Class 1 material except in the following situations Class 1A material shall be used:

Signs that have a large lateral or vertical displacement from the driver's view and visibility criteria cannot be met.

Where safety might be compromised by the use of high intensity signs, e.g. RG17 signs on arterial roads, which can become unseen in the headlights of oncoming vehicles at night.

3.5.2 Street Name Blades (Fingerboard signs)

Design shall comply to North Shore City Council's Street Name Blade Standards with street names being approved at scheme plan stage. Street name blades shall be located at all intersections both newly formed and existing.

Consideration shall be given to minimising roadside hazards by locating street name blades on street light poles or traffic signal poles.

3.5.3 Advance Destination Signs

Advance destination signs shall comply with the Council's Policy on these signs.

3.6 Roadmarking

3.6.1 Roadmarking

All roadmarkings shall comply with Transport Services' Traffic Technical Directives current at the time of installation. Traffic Technical Directives will be issued from time to time in accordance with best practice and are available from the Transport Asset Manager.

All roadmarkings with the exception of cycle facilities, shall comply with TNZ/LTNZ Manual of Traffic Signs and Markings and be approved by the Transport Asset Manager. The Transport Asset Manager will provide details for marking cycle facilities where necessary.

Separate drawings showing only the street markings shall be provided for approval of the Transport Asset Manager for all new road, road reconstruction projects and resurfacing projects.

The developer shall take responsibility for maintenance on the road markings for a 12-month period and shall re-spray the road markings at the end of the defects liability period.

Residential parking limit line should comply with Drawing TRS 28.

3.6.2 Additional Markings

All fire hydrants shall be marked in accordance with NZS4501 with blue raised pavement markers (cats eyes) installed in the centre of the road carriageway.

In addition, where a hydrant is located off the carriageway, the top and face of the kerb or on the channel where no kerb is present, shall be painted yellow over a length of 0.6 – 1.0 metres. This should be centered on a line joining the triangle road marking to the center of the hydrant.

3.6.3 RRPMs and Edge Marker Posts

RRPMs and edge marker posts shall be installed in accordance with TNZ/LTNZ Manual of Traffic Signs and Markings and shall comply with Transport Services' Technical Traffic Directives current at the time of installation. Traffic Technical Directives will be issued from time to time in accordance with best practice and are available from the Transport Asset Manager.

3.7 Footpaths

3.7.1 Footpath Design

Footpaths away from the kerb in major roads are preferred because of safety issues and visual amenity of the streetscape.

Alternative designs that provide for better stormwater management are encouraged.

3.7.1.1 Minimum Footpath Widths

The following are the minimum footpath widths:

1500mm residential

1500mm industrial

1500mm pedestrian accessways

2500mm retail/commercial

3000mm footpath/cycleway combined

2000mm for separate off-road cycleway

2000mm within 500m in each direction from school entrances.

Where separate off-road cycleways are installed they shall be between the footpath and the road and be separated by at least 600 mm from the footpath. Footpath widths are measured from the back of the kerb.

The width of footpaths against the kerb may require widening due to obstacles such as poles, bins and signposts. In such instances the minimum clear width adjacent to obstacles shall be 1500mm in residential/industrial areas and 2000mm in retail/commercial areas. All streetscape elements should also have a 600mm clearance from the kerb face to prevent damage by vehicles, particularly poles, lamps, street signs etc.

When designing street furniture, designers shall include the needs of the disabled.

Designers should refer to the following Standards NZS 4121 and NZMP 4122.

In shopping areas (minimum of 5 shops) footpaths require specific design, but the minimum width shall be 2500mm.

Footpaths require localised widening in areas of high pedestrian conflict such as the intersection of arterial roads, school crossings or outside community centers. Where there is angled parking, an additional 800mm should be allowed in the footpath width for vehicle overhang. These should be designed based on the special circumstances relating to each case.

Where there are no handrails along the edge of the footpath, the adjacent ground area should be kept at a slope less than 1:10 for a distance of at least 500mm beyond the edge of the footpath.

Subject to the approval of the Transport Asset Manager footpaths may be installed on only one side of a short street or cul de sac.

3.7.1.2 Longitudinal Gradient

Generally, the longitudinal gradient of a footpath will be the same as the adjacent road. It is unlikely that all footpaths will cater for the needs of people with disabilities or unaided wheelchair users, however where possible the following gradients are preferred.

1 in 33 maximum Continuous grade.

1 in 33 - 1 in 20 1.2m level rest area provided every 15m

1 in 20 and over - Should be treated as a ramp. (refer NZS 4121 Design for Access and Mobility: Buildings and Associated Facilities) Gradients grater than 1:6 or where there are steps, handrail shall be provided in compliance with clause 3.7.3.2 of these standards.

3.7.2 Pram Crossings

Pram crossings shall comply with the requirements of Drawings TRS 10A and 10B.

3.7.2.1 Design

Pram crossings shall be located at all intersections to facilitate pedestrian movement in any direction parallel with the roads, or at other places as desired. They shall be placed so that users have an unobstructed view of the traffic approaching from any direction and shall be designed in accordance with Drawing TRS 10A and 10B and NZS4121:2001.

Pram crossings shall:

have a consistent slope from side to side

be graded to avoid instability of wheelchairs or mobility scooters

have a smooth surface with no upstand at the channel

be provided on both sides of the roadway

In some cases they may be allowed on only one side but this must be applied for at scheme plan stage.

3.7.2.2 Finish

A pram crossing shall have a non-slip finish, contrasting in colour and/or texture with the adjacent footpath and shall comply with the requirements of Drawings TRS 10A and 10B.

3.7.3 Steps and Handrails

3.7.3.1 Steps

Where steps are used to provide for pedestrian access the step geometry shall usually conform to 150mm rise and 300mm tread.

In other cases the rise should be within the limits of 110mm to 180mm and the tread width sized so that the sum of twice the rise plus the tread width equals 600mm.

Steps shall be designed to avoid the ponding of water.

Treads and risers shall be uniform for all steps in any one flight.

A white edge is required on all steps where visibility is a problem.

Where a large number of steps are required, they should be broken into individual lifts containing not more than 14 steps each with a landing of at least 1500mm long between flights.

3.7.3.2 Hand Rails/Pedestrian Safety Barrier

Handrails are required on the outer edge of footpaths where the fall is greater than 500mm vertical height, where the longitudinal gradient is steeper than 1 in 6 or where there are steps.

Hand railing shall comply with the design requirements specified in the Building Act.

Pedestrian safety barriers shall comply with drawing TRS 22.

3.7.4 Pedestrian Accessways

3.7.4.1 Location

A pedestrian accessway will generally be required where it would provide a significantly shorter walking route between roads or from a road to a reserve, shopping centre, community facility or a bus route.

Acceptance of a pedestrian only connection may be approved where Council concludes that provision of a road is not reasonable or cannot physically be constructed.

Accessways shall also be designed as cyclepaths unless otherwise agreed with the Transport Asset Manager.

3.7.4.2 Design

The following guide shall be used:

a *AUSTROADS Guide to Traffic Engineering Practice Pt 13 - Pedestrians*

b Pedestrian accessways shall be as short as possible and have a 3 x 3m splay at each end for visibility reasons.

c The accessway should be visible from end to end from an eye height of 1.5m.

d Any steep pedestrian accessways (greater than 1:7) require exposed aggregate surfaces and even possibly steps in which case handrails should be provided.

e Provision shall be made for disposal of stormwater flowing down the length of the accessway.

f Where pedestrian accessways are restricted to deter vehicles etc. there shall be clear access of 775mm provided to allow mobility scooters to pass.

g Specific designs for both the path and fencing are encouraged to enhance the surrounding properties.

h The minimum width of pedestrian ways shall be 3.0m.

i *AUSTROADS Guide to Traffic Engineering Practice Pt 14: Bicycles.*

j *New Zealand Supplement to Guide to Traffic Engineering Practice Pt 14: Bicycles.*

3.7.4.3 Security

All pedestrian accessways should be provided with “security” style fencing erected both sides of the accessway to dimensions as shown in Drawing No PK65.This shall consist of galvanised steel fencing to allow full visibility and prevent graffiti. Fences shall be built on the adjoining owners land along the edge of the pedestrian accessway. The fence will become the property of the adjoining owner who will be responsible for its maintenance (see Fencing Act and Local Government Act).

3.7.4.4 Lighting

All pedestrian accessways in a lit environment (ie start and end, both have lit streets) should be provided with adequate lighting. The pedestrian accessway shall be lit at each end and within the accessway at lengths not exceeding 25m. The lighting shall be such that it does not glare into adjacent residential properties, but still effectively illuminates the accessway. Refer to Clause 3.15 of this document and Clause 3.23 – Exterior Lighting for details.

3.7.4.5 Pedestrian Bridges/Subways

Pedestrian bridges and subways require a building consent and specific approval from the Transport Asset Manager. Approval in principle shall be obtained before detailed design is commenced.

3.7.5 Footpath Construction

Footpaths shall be of concrete construction unless otherwise approved by the Transport Asset Manager and shall comply with Drawing TRS 8 or as required by the “Albany Centre Streetscape and Planting Guidelines”.

Footpaths in residential areas shall be constructed with 25 MPa concrete from a registered manufacturing plant, and at least 125mm thick with a 2% crossfall. It shall be laid on a 30mm layer of GAP 20 compacted to 95% of optimum. This applies to footpath repairs as well as new footpaths. Any non-standard concrete or paving on driveways etc. shall stop at the back of the footpath. All concrete shall be membrane or water cured for 5 days prior to usage. The footpath shall be protected from vehicular wheel loads during this initial 28-day period.

In non-residential areas the footpaths shall be at least 150 mm thick.

Footpaths in residential areas shall be at least 125 mm thick with a 2% crossfall.

Transverse gradients in excess of 2% may be required in areas of poor drainage, or where the topography or floor levels of adjacent buildings dictate the design.

The crossfall should be towards the roadside kerb, except where alternative stormwater drainage collection is provided.

A maximum transverse gradient of 6% shall be used at any point (including at vehicle crossings).

Construction joints shall be between 2m and 5m apart, in line with joints in the kerb.

Where footpaths are to be replaced or repaired, a minimum length of footpath equal to twice the footpath width shall be removed and reconstructed. These sections should be constructed to the same standard of the surrounding footpaths in terms of material type and texture of surface in order to minimise impact on visual impression. Footpaths shall be geometrically designed to facilitate easy access for prams, wheelchairs, mobility scooters etc, particularly at road crossing – reference “Design for Access and Mobility – Buildings and Associated Facilities” – NZS 4121:2001.

3.7.5.1 Sub Divider's Bond for Footpaths

Subdivisions being built by a single developer may bond for footpaths to be constructed once building is complete.

3.8 Vehicle Crossings

3.8.1 Standards

Each property is required to have a formed and sealed access from the edge of the carriageway to the property boundary. This will generally be a concrete crossing.

Pedestrians using the footpath shall have priority right of way over traffic using vehicle crossing.

Vehicle crossings are normally constructed at development stage rather than subdivision stage. All design must consider the location of future vehicle crossings and avoid future conflicts with stormwater catchpits, street lighting etc by careful consideration of future crossing locations. However vehicle crossings for private way accesses or lots including panhandle access strips must be formed at sub divisional stage.

A free boardof 200mm (i.e. height above the channel) is required to contain stormwater within the road unless it can be shown to the satisfaction of the Transport Asset Manager that such a condition is unpractical and stormwater will not enter driveways as a result.

For particular cases including upgrading works where a such condition is unpractical, an adequate design shall be provided to the satisfaction of the Transport Asset Manager. The design must prevent the vehicle scraping and the stormwater entering in the driveway.

Road Opening Notices, subject to bonding assessment and inspection, shall be obtained prior to construction. The works shall be carried out having due regard for stormwater containment during the construction process.

Developers will be required to remove all redundant vehicle crossings and reinstate the kerb and channel, footpath and berm.

Kerb outlets for property stormwater runoff, where approved, shall be at least 1 meter and preferably 2 meters away from the edge of the vehicle crossing.

Kerb outlets also require a Road Opening Notice and must be constructed by an approved stormwater kerb outlet contractor.

3.8.2 Design Requirements

a Where footpaths cross vehicle crossings the geometry of the footpath shall not be significantly altered and construction material of the footpath shall remain unchanged unless it can be demonstrated to the satisfaction of the Transport Asset Manager that this requirement is not practicable.

b Vehicle crossings shall comply with Drawings TRS 5, TRS 6 and TRS 7.

c Where there is proposed future widening of the carriageway, particularly in existing rural areas with no kerb and channel, the designer shall allow for this widening, including a footpath, when calculating the driveway gradients.

d The changes in gradient (rollover) between the roadway and the driveway shall be specifically designed to ensure that water remains in the channel.

e Kerbs shall be crossed by a formed cut-down kerb crossing.

f Entrances to industrial / commercial properties should not be a continuation of the road pavement, but shall be formed in 175mm thick, mesh reinforced, concrete.

g Vehicle crossings shall not compromise the design criteria for footpaths, either existing or proposed. Consideration shall also be given to the grade of the driveway to help prevent vehicles scraping and stormwater entering in the driveway. Drawing TRS 9 gives a template that might be used to ensure most but not necessarily all vehicles will be able to use a crossing safely.

h Where grassed swales or Bio filtration strips are used for stormwater control in the road, grated channels or pipe culverts may be constructed across the driveways to cross Swales/Bio filtration strips. The TRS 26 in this document shows typical details of these crossing arrangements that may be used as a guide. The driveway crossing shall have edge protection to prevent drivers from going over the edge of the channel/ culvert. A concrete edging shall be provided on the edge of seal and an appropriate surface to allow all weather access to the property. Minimum width of grated channel and the minimum diameter of the pipe shall be 150mm and 200mm respectively. Site specific design for the crossing of Swale / Biofiltration strips and driveway should be provided considering storm water management issues and site conditions.

i Retaining walls supporting driveways or vehicle crossings within the road reserve are not permitted. In exceptional cases permission may be sought from the Transport Asset Manager.

j For pedestrian and traffic safety reasons, all vehicles entering a property should be able to turn around within that property and exit facing forward. This applies to new developments. Where this in not practicable an alternate design shall be submitted for the approval of the Transport Asset Manager.

k Where a vehicle crossing crosses an existing footpath, the footpath must be reconstructed with the material depths specified for vehicle crossings.

l Footpaths shall have a continuous overlay when crossing driveways. E.g. a footpath crossing a driveway should not significantly alter in its geometry or its material when crossing a driveway. Where a hotmix footpath crosses a concrete driveway the minimum thickness of hotmix laid in or on top of the concrete shall be 25mm of mix 10. This will require a 25mm recess to be laid in the concrete drive.

m Construction of concrete vehicle crossings shall use 25MPa grade concrete from a registered production facility and shall be membrane cured for 7 days prior to use.

n On high speed or high traffic volume roads the vehicle crossing is to be designed in accordance with Drawing TRS 7.

3.9 Pavement Design

3.9.1 Types of Pavement

Generally pavements shall be flexible designs with use of other types of pavements require the Transport Asset Managers approval prior to detailed design being carried out.

Flexible Pavement

A flexible pavement will be one, which contains either all unbound or modified layers, or one or more cemented layers. A flexible pavement relies on reduction in stresses with depth, which may include development of substantial tensile stresses in bound materials.

Concrete Pavement

A rigid pavement obtains its load spreading ability predominantly by continuously supported slab action and basically behaves in an elastic manner.

Permeable Pavement

Permeable pavement is an option for privateways/driveways, parking bays and similar areas but not within the road carriageway unless approved on a trial basis. Where it is used it shall be laid in accordance with the requirement of Section 4 - Stormwater Management and the manufacturer's recommendations for the relevant loading and subgrade conditions.

Interlocking Blocks
Pavements with interlocking blocks would include a flexible pavement design and constructed in accordance with the manufacturer's instructions.

Structural Asphalt
Structural asphalt may be used as an alternative to flexible or concrete pavement.

3.9.2 Design of Pavements

1 Pavement Design
Design of the pavement is required for all roads. Pavements shall be designed in accordance with the following manuals with a design life of 25 years:

AUSTROADS: Pavement Design: A guide to the structural design of the road pavements and the relevant New Zealand supplements.

While roads shall be designed using the above guides, ultimately, all roads must not exceed the maximum permitted deflection requirements on the basecourse or seal as provided under Clause 3.10.6 - Pavement of this manual. Where there is a failure or non-conformance, remedial works shall be approved by the Transport Asset Manager before implementation.

Test results shall be supplied to the Transport Asset Manager for approval

2 Subgrade Improvement Layers

These may be included as a method of reducing the granular pavement thickness and may involve:

- Lime, cement or KOBM stabilisation
- Use of geotextile fabrics and/or grids
- Undercutting of unsuitable material and replacing with a well graded material with a soaked CBR > 7
- Drying and recompaction of material
- Sand contained by geotextile (to avoid clogging up the under channel drains)

- Drainage improvements

  Supporting calculations shall be submitted and approved by the Transportation Asset Manager prior to construction.

  For all roads, the pavement layers shall extend under any kerb and channel and have a standard under channel drain, refer to Drawing TRS 13.

3 Drainage of Subgrade

Additional subgrade drainage will be required wherever the natural water table is high or wet soils exist. Specific consideration will be required in each case and requirements may include transverse subsoil drains, collector drains for springs or drainage layers.

Geotextile fabrics maybe required to prevent movement of particles from subgrade to pavement layers.

3.9.3 Testing Requirements

As part of the design process investigations will be required. All field testing shall be undertaken by appropriately experienced personnel in accordance with current New Zealand standards and practices, using an IANZ (or similar) registered laboratory.

The extent of testing required will be determined by the designer, but as a minimum, sufficient testing to determine the pavement characteristics shall be undertaken and to provide enough information to establish the subgrade CBR. This information shall be included with any designs submitted to Council.

Any natural sub grade where a CBR exceeding 3 is adopted for design purposes shall be confirmed by soaked CBR test results.

3.9.4 Field Testing for Pavement Design

Shall include where appropriate, the following:

a Subgrade soaked CBR (lab test) at intervals of one test per 100 meters per lane or every change of subgrade to determine subgrade CBR supplemented by scala penetrometer tests on the alignment, starting at the top of the subgrade and carried to a minimum depth of 1 m. This applies to most works.

The use of unsoaked or insitu CBR tests will only be approved where the Transport Asset Manager considers it to be appropriate.

- General rate of 1 scala penetrometer test per 50-100m length of roadway on each side is suggested as a guide.

b Pavement test pits to log existing pavement material depths (where applicable), to the top of subgrade (minimum). This particularly applies to existing carriageways

- General rate of 1 test pit per 50-100m length of roadway on each side is suggested as a guide.

c Pavement samples from each test pit for use in future laboratory tests.

- *General rate of 1 sample per test pit.*

d Subgrade samples from each test pit for use in future laboratory tests.

- *General rate of 1 sample per test pit*.

e Hand auger 2m below the surface. This is needed where there may be potential long-term risk of carriageway failure.

f Benkelman beam tests to determine the deflection of the existing pavement.

- *General rate of 1 beam test per 20m in each lane.*

g Falling weight deflectometer to determine the deflection of the pavement

- *Minimum rate of 20 falling weight deflector tests per lane.*

It is important that designers use their engineering judgement in determining what the appropriate tests are for given circumstances.

Extra testing may be required where the site conditions show there may be problems with berms, embankment stability etc. associated with the roadway. The Transport Asset Manager will determine any extra testing requirements in consultation with the designer.

3.9.5 Pavement Materials

3.9.5.1 Basecourse

Basecourse material should meet TNZ M/4 standards or be a suitable substitute in accordance with Council's GAP40 specifications.

Any proposed alternatives including the use of recycled materials must be submitted with appropriate supporting documentation and approved by the Transport Asset Manager for use prior to construction. The long-term strength of the alternative method shall be a prime consideration in acceptance.

The minimum thickness of basecourse shall be 150mm for collector roads and above.

3.9.5.2 Subbase

Subbase shall be GAP65 complying with the grading curve shown on Drawing TRS 2 (wet sieve analysis) or GAP40 complying with the Drawing TRS 3. The minimum depth with GAP65 subbase shall be 150mm.

GAP 65 sub-basecourse shall consist of clean crushed rock all passing 65 mm standard sieve.

The minimum crushing resistance shall be not less than 130 KN when the aggregate is tested according to NZS 3111:1980, Section 14 'Method of Determining Crushing Resistance of Course Aggregate'.

An aggregate will be considered to have met this criteria if the sample produces less than 10% fines when loaded so that the specified peak load is reached in 10 minutes. In this case the test shall follow the standard method in all other respects.

The aggregate shall have a quality index of AA, AB, AC, BA, BB or CA when tested according to NZS 4407: 1991, Test 3.11 Weathering Quality Index Test.

Subject to the written approval of the Transport asset Manager, recycled materials may be used for subbase construction. Proposals to use recycled material must be submitted to the Transport Asset Manager with appropriate supporting documentation.

3.9.5.3 Subgrade

Where the designer wishes to use stabilisation as a method of design or where the existing subgrade is of a low bearing value and the designer wishes to strengthen it, it may be advantageous to stabilise the subgrade or the subbase, or a combination of both with Cement, Lime, or KOBM.

Protective curing and/or running courses shall be applied as required by the Transport Asset Manager.

3.9.6 Design of Surfacing

All roads shall be surfaced with an approved impermeable membrane seal beneath a resilient wearing course to Transit New Zealand standards unless otherwise approved by the Transport Asset Manager.

Refer to: Bituminous Sealing Manual - Transit New Zealand.

Prior to sealing an approved weed spray shall be used to spray the prepared surface.

All new local roads shall be surfaced with a first coat chipseal followed by a 25mm layer of Mix 10 asphaltic concrete.

All new primary, secondary and industrial roads shall be surfaced with 35mm of Mix 14 asphaltic concrete. Alternative material of mix design may also be required for high stress and wear areas such as intersections, heavily trafficked roads and industrial routes. Stone mastic asphalt (SMA) would typically be an acceptable alternative to Mix 14.

The first coat seal or membrane seal shall have a minimum of 1 l/m^2 of residual penetration grade bitumen.

The use of bitumen emulsion is also allowed for membrane seals. The residual bitumen for emulsions shall be greater than 0.7 l/m^2.

The chip size for membrane seals shall be:

- Grade 4 for mix 10 with thickness of asphalt concrete of 25 mm or similar.
- Grade 3 for mix 14 or approved alternative.

Where interlocking block surfacing is approved (including permeable) the surface shall comply with the manufacturer's instructions.

All aggregates used for paving shall have a PSV complying with TNZ T/10 to provide sufficient skid resistance.

3.10 Construction

3.10.1 General

All construction within the city will be undertaken in accordance with best practice techniques where specific Council details are not provided.

A publicity sign in accordance with Drawing TRS 17 is to be erected on all road works sites.

3.10.2 Quality Assurance

All construction should be monitored in accordance with Council's Environmental Services Quality Assurance Manual. If there are any questions or points of clarification required, then these should be referred to the Transport Asset Manager.

Generally fill materials, subgrade soils, roading aggregates and pavement testing shall include as a minimum the following tests and sample rates from NZS 4402 and 4407 (road aggregates).

If the section of road fails to achieve the required standard of deflection, the owner shall carry out additional tests on the subbase and basecourse and confirm that:

- The actual thickness of pavement agrees with the design thickness.
- The grading and quality parameters of metal conforms to Council requirements.
- The pavement is of the required density.
- Report FWD (Falling Weight Deflectometer) data at 50m intervals for each lane for roads with Design Volume at 25 years exceeding 3000 vpd.

3.10.3 Road Reserve Protection During Construction

The safety and convenience of pedestrians, mobility scooter operators and others using the footpaths shall be fully taken into account in the design of all footpath protection.

Due care should also be taken to protect other assets from damage including street furniture, trees, street lights and particularly access covers to underground services such as junctions boxes, valves, hydrants, etc.

Where it is necessary for heavy vehicles to cross existing kerbs, footpaths, etc during construction, the footpath shall be protected against damage and remain in service with minimal disruption for users. This includes allowing stormwater to pass freely in the kerb and channel. Protection should also be provided for the services in the berm, without obstructing any access points, etc such as access chambers of hydrants.

A common method of protecting the services in the berm is laying 17MPa concrete no thinner than 150mm at any point, on a 1 mm polythene sheet over the kerb, berm and footpath. A 100mm diameter pipe laid on the channel invert would normally allow sufficient stormwater to pass.

Typical means of protection is shown in Drawing TRS 21.

The contractor shall establish suitable means for protecting all other services.

3.10.4 Fill Material

The Soils Engineer shall provide an adequate level of inspection and testing, in order to enable proper evaluation of the general quality of the finished work, and to enable a report to be furnished as to the compliance of the work with the specifications. This is not to be construed as a guarantee or warranty but rather a record of a professional opinion based on reasonable care.

Visual inspection shall be made by the soils engineer or a competent inspector acting on their behalf at least at the following times:

After any part of the existing ground has been finally stripped and prepared and before the placing of any fill on that ground.

After any drain has been installed and before the drain is covered by fill.

At such other times as the soils engineer considers necessary to enable the assessment of the general standard of earthworks and to be reasonably satisfied that:

- Fill is not placed over soft or organic material;
- All areas of existing ground showing seepage or potential seepage emission have relief drains provided;
- Compaction operations are systematic, the water content of fill material appears on visual inspection to be suitable and the degree of compaction appears to be consistently satisfactory.

3.10.4.1 Fill Material Testing Procedures : General

During the construction of earth fills some or all of the following quantitative control tests should be made on the fill material:

Tests to determine whether the water content is within design tolerances;

In situ density tests to determine whether the degree of compaction is up to the specified minimum;

Tests to determine the maximum dry density

Such other tests as may be specified by the soils engineer for control testing of fills or particular soil types, providing that the soil property tested shall be related to in situ density or water content of the fill by a laboratory investigation. Such tests include shear strength tests, cone penetrometer tests, and Proctor needle tests.

3.10.4.2 Fill Material Testing Procedures : Frequency

Once the filling work is progressing as a steady operation with uniform construction methods, and provided that:

- Adequate construction effort is being maintained;
- Adequate visual inspection is being maintained;
- The specification requirements are being met;

The minimum frequency of control testing shall generally be one in situ density test (or equivalent) for each 2,000m^3 or 0.5m lift of fill. Testing shall be more frequent than specified above, under any of the following circumstances:

During the first 4,000m^3 of filling carried out on the project (one test per 1000m^3).

On the final layer of not less than 1.0m depth.

When soil type or conditions are variable.

When the soils engineer or inspector is in any doubt about the adequacy of construction methods or soil properties.

When a decision to reject work based on the judgment of the soils engineer or inspector is disputed, and;

When relatively small quantities of fill are concentrated in localised areas or placed discontinuously over a long period of time.

3.10.4.3 Fill Material Test Pit Locations

The locations of tests shall be decided by the soils engineer or inspector, who should select them so as to test material likely to be furthest from the specified quality. In addition, a proportion of tests should be taken at random locations to check the average standard being obtained.

3.10.4.4 Fill Material Field and Laboratory Test Data

All field and laboratory test data should be recorded in a systematic manner that will allow the results to be identified and allow the calculations to be checked at a later date, if necessary. All control test results should have recorded the time, date, location and elevation. Test results relating to sections of fill that have been subsequently removed or reworked and recompacted should be noted accordingly.

3.10.5 Subgrade

The following testing programme will be required at the intervals outlined in Table 3.2 to ensure that the design parameters have been met:

Moisture content test NZS 4402.

Density and voids (nuclear densometer) test NZS 4402.

CBR and scala penetrometer tests. (Batters to have a CBR = 5 minimum).

Clegg hammer test in-house standards as advised by the engineer.

Undrained shear strength test as measured by hand held field vane BS 1377:1995 as adopted by NZS 4402.

Benkelman beam test TNZ T/1 prior to sealing, unless otherwise specified. This is normally required when relying on strong subgrades.

CCTV report for all sections of under channel drains completed.

CBR tests should be taken on soaked roads where the road formation is not stabilised, particularly where the road is likely to be wet e.g. under verticals. A minimum requirement for CBR testing is one test per 100 meters.

Thickness of trimmed stabilized layers should be confirmed at 100m spacing for each lane by Scala testing.

It should be recognised that many of the above tests are corroborating tools used to determine problem areas and are generally indicative of CBR results.

Proof rolling to find soft spots is expected on most works.

All test results shall be supplied to the Engineer along with a summary of results and identification of any remedial measures.

Table 3.2 : Minimum Testing Programme

Road Category	*Length (m)*	*Test Spacing*(m)*	*Number of Lanes to be tested*
Local Roads	<100	10	2
	>100	20	2
Collector	<100	10	2
	>100	20	2
Secondary, Primary and National	<100	10	4
	>100	20	4

Where any reading exceeds maximum allowable value, testing shall be carried out at 5m intervals either side to identify the extent of the weak area.

3.10.6 Pavement

The following testing programme will be carried out at the above intervals in all wheel tracks, as directed by the Transport Asset Manager, either prior to sealing or on the completed seal.

Benkelman beam test TNZ T/1 with maximum deflections as outlined in Table 3.3.

Table 3.3 : Benkelman Beam Deflection Standards

(Top of basecourse layer, prior to sealing)

Category	Maximum Design Deflection (mm)
Primary/Regional Arterials	1.0
Secondary/District Arterials	1.0
Collector Routes and Industrial Roads	1.0
Local Roads – Residential	2.0

No single test shall exceed the maximum design deflection for that category.

3.10.7 Surfacing

3.10.7.1 Asphaltic Concrete (AC)

All asphaltic concrete construction shall comply with TNZ M/10 and Q2 Standards with the finished level to be between 3mm and 7mm proud of the lip of the channel. The compacted thickness of asphalt concrete shall comply with the specified requirements. The use of recycled material for surfacing will require Transport Asset Manager's written approval and proposals shall be submitted to Transport Aset Manager.

Except in the case of bitumen emulsion membrane seals a 10-day gap must be left after the membrane seal is laid before the Asphaltic Concrete can be laid.

3.10.7.2 Chipseal

This shall consist of a two coat seal to TNZ Q/1 and M/6 Standards with reference to TNZ Bituminous Sealing Manual with Council approving the binder composition and application rate before sealing commences.

All channels must be protected by paper prior to spraying of bitumen.

Approval to seal will be given after inspection and approval of the basecourse by the Engineer.

3.10.7.3 Slurry Seals

These may be used for rehabilitation works, only if Council approval is gained prior to commencement of design.

Refer to TNZ M/1, BS434, polymer modified with a minimum composition of 2% polymer.

Slurry seals shall consist of bituminous emulsion graded aggregate, water and additives proportioned, mixed and uniformly spread so as to produce a homogenous layer which adheres securely to the existing surface.

Aggregates shall be supplied from a source known to be suitable for use with the bituminous emulsion binders used in slurry seal application. Where a proposed applicator has not had experience with the laying of slurry using the particular aggregate proposed, Council will require trial applications to be laid to prove the suitability of the material and mix proposed.

Mineral fillers and additives may be added as part of the mix design, to adjust the workability of the slurry and/or setting and curing characteristics of the mix. The design mix shall be prepared and certified by an accredited laboratory which has suitable experience in the design of emulsified bitumen slurry seal.

Prior to commencing, detail of the design mix shall be submitted to Council for information, complete with a schedule outlining:

- Locations where the same slurry mixes have been used.
- Date when the applications were laid.
- Name of client contact within organisations for whom slurry has been laid (for use by Council in obtaining service and suitability references).

3.11 Resealing Policy for Existing Roads

All existing roads shall be resurfaced in accordance with the Council's resealing policy, which is summarised below:

Hot mix road surfacing is to be used on:

- Arterials, principal and collector roads carrying high volume of traffic greater than 10,000 vehicles per day
- Cul-de-sac heads
- Intersections subject to high wear and tear
- Short sections of road if two adjacent hot mix areas exist
- Streets within commercial centres and adjacent to beach fronts
- Roads where hot mix is appropriate due to engineering reasons

Chip seal resurfacing shall be used on all other roads.

3.12 Stormwater Disposal For Roadways

Cross Reference

This section is to be read in conjunction with Section 4 - Stormwater Management.

3.12.1 Design Requirements

3.12.1.1 Calculations

Stormwater run-off from the carriageway, footpath and berm areas shall be calculated in accordance with Section 4 - Stormwater Management and Council's Stormwater Design Code.

Operation of the stormwater system may be tested by flooding of the carriageway.

3.12.1.2 Maximum Catchpit Spacing

The location of catchpits shall be determined by calculation of the appropriate catchment areas. If required these calculations shall be submitted to Council. Allowances shall be made for stormwater from land adjacent to the road reserve discharging into the road either by kerb outlets or overland flows.

In no circumstances however shall the run of water in any channel exceed 80 meters unless subject to specific low impact design.

3.12.1.3 Pipe Size & Gradient

The minimum pipe size for roading works is 300mm nominal internal diameter for catchpit leads. 150mm leads from smaller catchpits may be permitted on privateways. For minimum gradients and connection details refer to Section 4 - Stormwater Management

3.12.1.4 Pipe Materials

These are to comply with Section 4 - Stormwater Management

3.12.1.5Splay Catchpits

Splay catchpits as shown on Drawing No’s SW 23 and SW 24, are the preferred catchpit. They should be placed uniformly throughout the catchment to ensure that the runoff is intercepted at regular intervals. Where gradients are in excess of 5%, double cachpits, single splay catchpits, superpits or similar should be considered.

For all catchpits, the lead in shall be designed with regard to the longitudinal gradient of the road. This shall be designed to ensure that water enters the catchpit, rather than continuing down the channel.

Alternatives to splay catchpits must be approved in writing by the Transport Asset Manager and supporting technical documentation need to be provided for the consideration of Council.

3.12.1.6 Concrete Surrounds To Catchpits

Designers will allow for reinforcing or similar to minimise cracking of the concrete entry or surround of the catchpit.

3.12.2 Kerb & Channels

Kerbs shall be provided for all carriageways in accordance with Drawings TRS 12A and TRS 12B with the appropriate profile used for a particular application.

Mountable kerbs are not allowed without specific approval from the Transport Asset Manager, except for use on traffic islands.

Kerb and channel shall be used on the uphill side of all roads with single crossfall to collect runoff from footpaths and berms. (See Section 3.3.2.5 for single cross fall road design).

Kerbs shall be constructed of the same materials as the existing kerbs of the area, especially in heritage areas. Where there is a change in kerbing material from an original kerbing material (e.g. Bluestone), the original material shall be extended to the start of the new road.

3.12.3 Berms, Footpaths, Pram Crossings and Vehicle Crossings

Measures shall be taken to regulate run-off and to minimise the effect of stormwater on the environment, property and people. This will be achieved by shedding water away from impervious surfaces, and collecting and discharging it into an approved stormwater drainage system.

Channel flow shall be maintained past all vehicle and pram crossings.

Refer to clause 3.8.1 regarding the minimum height of vehicle crossing above channel for stormwater control.

3.12.4 Stormwater Crossings Through Footpath

Stormwater crossings through footpaths shall comply with Drawing TRS15 and clause 4.5.5 - Stormwater. They shall not discharge within 1 metre (preferably 2 metres) of the outer edge of a vehicle crossing.

3.12.5 Catchpit Positions

Where possible catchpits should be located at regular intervals to keep the flow to an acceptable level. Catchpits are also required at changes in gradient or direction where water may leave the channel e.g. kerbline tangent points at intersections.

The following requirements also apply at specific locations.

- At pedestrian crossing locations the flow in channel to be kept to a minimum amount by proper location of Catchpits
- Catchpits not to be placed in the direct path of pedestrian or cycle movements
- Catchpits not to be placed in the wheel path of buses or near bus stops
- Catchpits not to be placed in the normal or likely wheel path of vehicles (e.g. at bends near roundabouts)

3.12.6 Swales and Bio filtration devices

Swales, Bio filtration strips or other appropriate storm water mitigation measures are to be provided in new local road development for treatment of storm water from the roads. Where this is not appropriate (eg steep gradient roads) alternative treatment will be considered, however it will require written approval from the Transport Asset Manager.

Where swales are used, the road edge shall have a flush concrete edge to continue the carriageway formation. This flush edge shall be 300mm wide, 200mm deep and 25MPa concrete from a registered concrete manufacturer. The top surface of the edge beam should match with the cross fall of the carriageway.

Swales and filter strips are vegetated channels that collect and retard the flow rate of run-off water, typically from local roads and car park areas. They can also offer significant water quality treatment benefits.

The Drawing TRS 24 shows a typical berm cross section with Swales and Bio filtration strips. Typical swale and Bio filtration strip designs are also shown in ARC publication TP 10 - Stormwater Management Devices: Design Guidelines Manual - May 2003.

The installation of ‘check dams’ to reduce flow velocities should be installed across the swale if the gradient exceeds 5%. Refer to ARC TP 10 document, Chapter 9 for guidelines.

Council has developed sample designs for stormwater treatment from roads and is working to share its knowledge with developers, making satisfactory stormwater management systems. Some possible arrangements are shown in the ***Long Bay Practice Notes*** (http://www.northshorecity.govt.nz/?src=/our_environment/long_bay/introduction.htm) published on NSCC web site. (see A-Z catalogue) Contact should be made with the Transport Asset Manager for further details.

3.12.7 Sub Divider's Bond for Swales and Biofitraton or any other storm water treatment structures

Subdivisions being built by a single developer may bond for storm water treatment system to be constructed and maintained to fulfil all requirements of the design once building is complete. For intensive urban areas also refer to the “Albany Centre Streetscape and Planting Guidelines”.

3.13 Landscaping / Trees / Street furniture

3.13.1 General Design Issues

The primary purpose of the road reserve is to provide safe and efficient movement of vehicles, mobility scooters, pedestrians and cyclists in accordance with NZS4121 with provision for underground services in the berm areas. While there is opportunity for beautification through landscaping, this must not compromise the safety of road users or underground services.

Landscaping designers should consider the following aspects before commencing design of planting and street furniture:

a Driver's visibility of other vehicles, pedestrians and obstacles must not be restricted. This is particularly important at intersections and exits from private property.

b Roads and footpaths are susceptible to damage from tree roots or water escaping at pressure from undrained planters, causing ongoing maintenance problems. Underground services can also be adversely affected. Careful design of planted areas is required to minimise maintenance problems.

c Shadows from large trees/hedges planted on the side of the road can hide vehicles from approaching drivers, potentially leading to accidents.

d Fallen leaves can block drainage channels and catchpits leading to flooding of roads and property. This is a particular problem near a low point in the road or where the land slopes away from the road.

e Many areas are not easily accessible for maintenance of the planting, particularly islands, roundabouts, narrow berms and alongside busy roads. Safety of staff maintaining planting must be considered along with the amount of maintenance required.

Once these features have been considered, the designer shall refer to the Council Tree Planting Manual for further information on landscaping and for Albany Centre, refer to the “Albany Centre Streetscape and Planting Guidelines”.

To prevent damage and to enhance pedestrians/cyclists safety, the minimum clearance from the kerb face to all streetscape elements should be kept as given in clause 3.7.1.1.

All proposed landscaping shall be shown on the engineering drawings submitted for approval."

3.13.2 Batters

Batters preferably should not be any steeper than 1V:5H. This is a comfortable slope to maintain with a lawnmower. Batter slopes of up to 1V:3H may be acceptable but approval must be obtained from the Transport Asset Manager before detailed design is completed.

Where circumstances dictate a steeper slope, a geotechnical assessment of the slope shall be provided together with specific designs. Consideration shall be given to the future maintenance of the slope.

The top edge of every fill batter shall be level for at least 750mm beyond the outside edge of the footpath while the toe of every cut batter shall be level for at least 500mm beyond the outside edge of the footpath.

Where there is no footpath this dimension shall be measured from the back of the kerb or the outside edge of the trafficable shoulder as applicable.

3.13.3 Berms

Berms shall have a minimum crossfall of 2% falling towards the kerbline so that stormwater can be contained within the road reserve and not be allowed to escape down driveways or across berms in a concentrated manner. A freeboard of not less than 200 mm is required to contain stormwater within the road unless it can be shown to the satisfaction of the Transport Asset Manager that such a condition is unpractical and stormwater will not enter private properties as a result.

The first 2.7m of berm should slope towards the kerbline.

A minimum depth of 100mm compacted topsoil is required. Grassed or planted areas shall have a minimum width of 700mm.

No planting on the berm is allowed without the prior approval of Council. Planting proposals must be submitted for any part of the road berm which may be steeper than 1V:5H. The TRS 23 shows a typical berm cross section with layout of services. For minimum space for planting on the berm, refer to ”Albany Centre Streetscape & Planting Guidelines” and clause 7.9.2.1 of this manual. No tree should be planted closer than 650mm from face of kerb, in order to provide the minimum clearance of 600mm between the trunk and the face of kerb.

Vegetation clearance envelope requirements for carriageways, cycleways and footpaths are shown in the Drawing TRS 31 of this manual.

3.13.4 Street Furniture

For Albany Centre, all street furniture shall comply with the “Albany Centre Streetscape and Planting Guidelines”.

3.13.4.1 Seats

Seats shall be provided in accordance with Council's policy.

3.13.4.2 Litter Bins

Litter Bins shall be provided at bus shelter locations and at commercial/business centres and shall comply with Council's policy.

3.13.4.3 Bicycle Support Rail

Bicycle support rails shall be provided in accordance with Council's policy complying to Drawing no TRS25.

3.13.4.4 Cycleway Handrails

Cycleway handrails complying with the Drawing no TRS 30 of this manual shall be installed to facilitate waiting cyclists at intersections as appropriate.

3.14 Bridges, Culverts And Retaining Walls

3.14.1 Bridge and Culvert Design

All bridges shall be designed in accordance with the

Transit New Zealand Bridge Manual

For culvert design, refer to Section 4 - Stormwater Management. The footbridges will require specific designs.

3.14.1.1 Widths/Lengths

All bridges and culverts should be designed to carry the roadway width including berms and any batter slopes created.

3.14.1.2 Edge Barriers

Approved standard galvanised steel W Section guardrails or concrete barriers shall be used at all bridges and culverts. Adequate clearance between the traffic lane and barrier shall be provided

Refer to the following guidelines:

Transit New Zealand Bridge Design Manual

AS/NZS 3845:1999

RTS 11 - Urban Roadside Barriers and Alternative Treatments, LTNZ

3.14.1.3 Batter Slope Protection

All culverts shall have a wingwall and anti scour structure to protect batter-slopes, berms and carriageway.

Initial designs should be discussed with the Transport Asset Manager before detailed design is carried out.

3.14.2 Retaining Walls

Where retaining walls are needed for a road or footpath, specific design is required. Initial designs should be discussed with the Transport Asset Manager before detailed design is carried out. The following are general criteria for retaining walls.

Retaining walls shall be designed of permanent materials and have an expected life in excess of 100 years. They should also be aesthetically designed to be compatible with the future appearance of the area.

Walls shall be designed of appropriate material so as not to increase noise levels as a consequence of reflected sound. The Transport Asset Manager may request an acoustic report to be provided for some materials.

The safety of the public shall be considered in the design of the wall. Appropriate safety fencing must be installed where drops in excess of 1 meter from road/footpath level exist.

A building consent is required when there is a surcharge weight on the upper side of a retaining wall, or if the retaining wall is over 1500mm in height.

Retaining walls shall be constructed within private property as close as possible to the road boundary and shall become the responsibility of the future landowner.

The approval of the Transport Asset Manager is required for any works or structures on the road reserve. Approval will only be given where the Transport Asset Manager is satisfied that no practical alternative exists to installing the structure on the road carriageway.

All walls shall be designed by a Chartered Professional Engineer in accordance with the NZ Building Code 1991 and obtain a building consent. The design should make allowances for future services being laid in open trenches, in the road carriageway, at its foot at depths of up to 2 meters within 0.5 meters of the boundary.

Retaining walls below the road carriageway shall be designed to allow for future vehicle surcharging against the wall.

The design shall consider future maintenance requirements including drainage maintenance. This includes allowance for mowing by installing mowing strips.

All walls near the boundary should provide mowing strips on the roadside at the berm level, may be at top or toe of the wall.

Retaining walls near road boundaries shall have mowing strips at the road berm level.

In case the fence or the mowing strip is less than 700mm away from the footpath, concrete footpath should be extended to the fence or wall.

3.15 Street Lighting

The design, installation and maintenance of street lighting shall comply with the North Shore City Council's Design Standards for Exterior Lighting and in Albany Centre shall comply with the "Albany Centre Streetscape and Planting Guidelines". Private accessways should also be provided with adequate street lighting.

For Street Lighting Column Locations, refer to Clause 3.23.4.2.7 – Exterior Lighting and the Drawings TRS 23 and TRS 24 of this standard.

3.16 Utility Services

3.16.1 Designer's Responsibilities

3.16.1.1 Liaison

Designers must liaise with all utility service providers including emergency service authorities. This should include provision for any future service upgrading to minimise later disruption to footpaths and carriageways.

3.16.1.2 Location of Existing Services

All existing services must be located and plotted on design plans including underground services.

Most utility services provide a location service for location of these underground services.

3.16.2 Design

3.16.2.1 Layout of New Services

Services should generally be located under the grassed berm. It is essential that the location of all services be to predictable lines to allow for laying new services and upgrading existing services.

To minimise service trenches in the footpath, it is generally recommended that services be located under grassed berms and in a common service trench. However this should be considered against other factors such as terrain and proximity to trees as well as possible future tree planting. All utility services shall comply with the requirements of Drawings TRS 23 and/or TRS 24.

3.16.2.2 Minimum Cover Over Services

The minimum cover over services in the footpath, grassed berms and private property shall be 900mm, provided that no other requirements are specified under Section 4 – Clause 4.7.4.7 or Section 5 – Clause 5.11 or Section 6 – Clause 6.7.2.3 or any other requirements specified by the utility's owner.

The minimum cover for services in the carriageway and vehicular crossings (other than catchpit leads) shall be 900mm, provided that no other requirements are specified under Section 4 – Clause 4.7.4.7 or Section 5 – Clause 5.11 or Section 6 – Clause 6.7.2.3 or any other requirements specified by the utility's owner.

For Albany Centre, refer to the "Albany Centre Streetscape and Planting Guidelines".

The minimum cover specified is in reference to the existing surface level or to the final construction level if the surface is to be re-worked.

3.16.2.3Finished Level Position

All service boxes, covers, manholes shall end up being flush with the finished surface level of the carriageway/berm or footpath.

3.17 Trench Reinstatement

All reinstatement of trenches shall comply with the requirements of the Code of Practice for Working in the Road (Auckland Region) published by the Auckland Utility Operators Group (AUOG).

3.18 Road Safety Audits

3.18.1 Request for Audit

Council may request that a Road Safety Audit be carried out at any stage of a project. The auditors shall be independent of the design team and will be required to use the following procedures:

Road Safety Audit - Procedures for Projects - Transfund New Zealand

The completion of Road Safety Audits is a mandatory requirement in order to obtain Land Transport NZ subsidy for any new or improvement project. The designers should be aware of this requirement when completing Land Transport NZ subsidised projects.

The designer needs to address any issues that are raised by the audit.

3.18.2 Objectives of an Audit

An audit will be requested for the following reasons:

- To identify potential safety problems for road users and others affected by a road project; and
- To ensure that measures to eliminate or reduce the problems are considered fully

3.18.3 Stages of an Audit

Stage 1: Feasibility (PRF Analysis)

Stage 2: Scheme Assessment (at the completion of project evaluation)

Stage 3: Final Design Stage (at the completion of the design)

Stage 4: Pre-Opening Stage (immediately before the substantial completion of the construction and prior to

removal of temporary traffic control).

3.19 Defects Liability Period

For all subdivisional roads, this period shall be one year following practical completion of construction a to the satisfaction of the Engineer and comply to the stated terms and conditions as outlined in the contract documents. Benkelman beam tests may be required to be repeated at the end of this defects liability period, and must comply with the maximum deflection standards provided in this document.

3.20 Supply of As-Built Information

As-built information shall be supplied to Council on the completion of all roading construction projects. Practical completion certificates shall not be issued unless As-Builts are received.

The As-Built drawings and roading asset data requirements shall be prepared in accordance with Council's ADS Manual (Asset Data Standards Manual). For this work the Developer/Contractor shall employ a competent surveyor to carry out detailed surveys of the construction, including all service installation and relocation.

3.21 Over dimension route maps

The route maps indicating roads that are recommended for over dimension loads within the North Shore City may be obtained from the Transport Asset Manager. These maps will be helpful to transport operators handling oversize loads to determine the most appropriate routes.

3.22 Street Name Blade Signs

3.22.1 Introduction

This standard sets out requirements for fingerboard signs in North Shore City Council road reserves and service lanes. The aim of this document is to create consistent signage throughout the city.

As this document is to be reviewed periodically, any comments should be forwarded to the Transport Asset Manager for consideration.

3.22.2 Sign Location

Street name signs shall be installed at the locations shown in Sheets S12 to S19 except that::

a No centre-mounted sign shall be installed opposite a no exit road. For other T intersections: if a utility pole is available directly opposite the vehicle path (generally within the intersection) of the vertical of the T, then use the pole for fixing a centre-mounted sign instead of installing a tubular steel post.

b A no exit sign shall be installed where no other road exists along the road where the sign will point unless the cul-de-sac shorter than 60m.

c Use may be made of appropriate traffic signal or utility poles.

d In drawing S19 the signs at position 1 shall point to the left only.

Where required, destination and facility signs shall be mounted on the same post as the street name signs.

In this standard arterials are Primary and Secondary roads as shown in hierachy maps. Minor streets are the rest.

3.22.3 Sign Stacking

Signs in the same stack shall be the same length. The hierarchy is shown on the drawing S1 “Sign Stacking Detail”.

3.22.4 Posts

Posts shall be powder-coated, white, 60.3mm diameter steel poles (2mm wall thickness) with a plastic cap on top and twist easily.

Mounting height to the underside of the street name sign shall be 3m. Generally foundations shall be as drawing S2.

3.22.5 Sign Material

Blades for fingerboard signs shall be constructed from “I” section aluminium extrusion of T6 temper with a minimum thickness of 2.5mm. Such extrusion shall be compliant with TNZ/RSMA Standard for the “Manufacture and Maintenance of Traffic Signs, Posts and Fittings”.

The depth of the reflectorised background shall be a minimum of 200mm for the “200mm blade” and 243mm for the “250mm” blade.

Blades will be installed using approved adjustable brackets manufactured from structural alloy or Stainless Steel. The brackets shall be specifically designed to form an integrated matching system with the street name blade extrusion. Brackets must be installed as per manufacturer’s specification.

3.22.6 Mounting of signs

Centre-mounted signs shall be mounted centrally on the post.

3.22.7 Spelling

Street name spelling shall be taken from the list provided separately.

3.22.8 Labels

The following standard abbreviations for labels shall be used (other appellations shall be spelt in full):

Avenue	Ave
Close	Cl
Corner	Cnr
Crescent	Cr
Drive	Dr
Esplanade	Esp
Extension	Extn
Highway	Hwy
Parade	Pde
Place, Plaza	Pl
Road	Rd
Square	Sq
Street	St
Terrace	Tce

3.22.9 Pohutukawa symbol

The symbol incorporates three colours on a white background. Details of the Pohutukawa Graphic Device are available from the Communications Manager of North Shore City Council.

3.22.10 Definitions

A facility sign indicates a facility such as Library, Tennis Club, School. A destination sign indicates a locality.

3.22.11 Categories of signs

End-mounted:

- Street name plain
- Street name NO EXIT
- Private Road
- Destination
- Facility

Walkway

Walkway to Beach

Centre-mounted:

Without numbers

With numbers

3.22.12 End- mounted signs (Double-sided)

a Street name plain (see drawing S3)

Lettering shall be in both upper and lower case. Transport Medium 100% shall be used. Where 100% tile width is unachievable, the width may be reduced as far as 60% tile width. For spacing between words use a space equal to the width of lower case "s". Length of sign is 1200mm.

Retroreflective sheeting of the specified class shall be used to create the silver legend of the sign and become the retroreflective medium for the background colour upon the application of Electronic Cuttable (EC) Colour Overlay film. This colour overlay film shall form part of a Matched Component System to ensure that it is fully compatible with the retroreflective sheeting. It shall be included in the sheeting manufacturer's ten (10) year warranty where responsibility for its performance will rest with the reflective sheeting manufacturer.

The sign blade extrusion shall allow the entire specified depth to be retroreflective.
Apart from the Pohutukawa symbol colours are:
Band: silver
Chevron: silver
Lettering: silver
Background: green
Reflectorisation: all WOA (Wide Observation Angle)

b Street name NO EXIT (see drawing S6)
Other details as (a) above.

c Private Road (see drawing S22)
Other details as (a) above.

d Destination (see drawing S9)

Lettering shall be in both upper and lower case. Transport Medium 100% shall be used. Where 100% tile width is unachievable, the width may be reduced as far as 60% tile width. For spacing between words use a space equal to the width of lower case "s". There is no Pohutukawa symbol. Length of sign is 1200mm.

Retroreflective sheeting of the specified class shall be used to create the silver legend of the sign and become the retroreflective medium for the background colour upon the application of Electronic Cuttable (EC) Colour Overlay film. This colour overlay film shall form part of a Matched Component System to ensure that it is fully compatible with the retroreflective sheeting. It shall be included in the sheeting manufacturer's ten (10) year warranty where responsibility for its performance will rest with the reflective sheeting manufacturer.

The sign blade extrusion shall allow the entire specified depth to be retroreflective.

Colours are:
Band: silver
Chevron: silver
Lettering: silver
Background: blue

Reflectorisation: all WOA. (Wide Observation Angle)

e Facility (see drawing S10)

Lettering shall be in both upper and lower case. Transport Medium 100% shall be used. Where 100% tile width is unachievable, the width may be reduced as far as 60% tile width. For spacing between words use a space equal to the width of lower case "s". There is no Pohutukawa symbol. Length of sign is 1200mm.

Reflectorised green letters are cut out and stuck on silver reflectorised film.

Colours are:
Band: silver
Chevron: green
Lettering: green
Background: silver
Reflectorisation: all Class 2 Engineer Grade

f Walkway (see drawing S7)
Non-reflectorised green letters are cut out and stuck on a white background.

g Walkway to Beach (see drawing S8)
Non-reflectorised green letters are cut out and stuck on a white background.

3.22.13 Centre-Mounted Signs

a Without numbers (see drawing S5)

These are street name signs. No Pohutukawa symbol is included.

Lettering shall be in both upper and lower case. Transport Medium 100% shall be used. Where 100% tile width is unachievable, the width may be reduced as far as 60% tile width. For spacing between words use a space equal to the width of lower case “s”.

Retroreflective sheeting of the specified class shall be used to create the silver legend of the sign and become the retroreflective medium for the background colour upon the application of Electronic Cuttable (EC) Colour Overlay film. This colour overlay film shall form part of a Matched Component System to ensure that it is fully compatible with the retroreflective sheeting. It shall be included in the sheeting manufacturer’s ten (10) year warranty where responsibility for its performance will rest with the reflective sheeting manufacturer.

The sign blade extrusion shall allow the entire specified depth to be retroreflective.

Low mounted chevrons (S11) also should be provided with all centre-mounted signs unless approved by the Transport Asset Manager.

Colours are:

Band:	silver	
Chevron:		silver
Lettering:		silver
Background:	green	

Reflectorisation: all WOA. (Wide Observation Angle)

b With numbers (see drawing S4)

These are street name signs, which are only used at the option of the Engineer. No Pohutukawa symbol is included.

Lettering shall be in both upper and lower case. Transport Medium 100% shall be used. Where 100% tile width is unachievable, the width may be reduced as far as 60% tile width. For spacing between words use a space equal to the width of lower case "s".

Retroreflective sheeting of the specified class shall be used to create the silver legend of the sign and become the retroreflective medium for the background colour upon the application of Electronic Cuttable (EC) Colour Overlay film. This colour overlay film shall form part of a Matched Component System to ensure that it is fully compatible with the retroreflective sheeting. It shall be included in the sheeting manufacturer's ten (10) year warranty where responsibility for its performance will rest with the reflective sheeting manufacturer.

The sign blade extrusion shall allow the entire specified depth to be retroreflective.

Low mounted chevrons (S11) also should be provided with all centre-mounted signs unless approved by the Transport Asset Manager.

Colours are:

Band:	silver	
Chevron:		silver
Lettering:		silver
Background:	green	

Reflectorisation: all WOA. (Wide Observation Angle)

3.22.14 Harmonisation

When a smaller sign is replaced by a larger sign, all signs in the stack shall be harmonised in length and depth.

3.22.15 List of Drawings (as included in Section 8 - Standard Drawings)

S1 – SIGN STACKING DETAIL

S2 – SIGNPOST INSTALLATION DETAILS

S3 – END MOUNTED SIGN – STREET NAME PLAIN

S4 – CENTRE MOUNTED SIGN WITH NUMBERS

S5 – CENTRE MOUNTED SIGN WITHOUT NUMBERS

S6 – END MOUNTED SIGN – STREET NAME NO EXIT

S7 – END MOUNTED SIGN - WALKWAY

S8 – END MOUNTED SIGN – WALKWAY TO BEACH

S9 – END MOUNTED SIGN – DESTINATION SIGN

S10 – END MOUNTED SIGN – FACILITY SIGN

S11 – CHEVRON SIGHT BOARD

S12 – INTERSECTION OF MINOR STREET WITH MINOR STREET

S13 – 'T' INTERSECTION OF MINOR STREETS WITH MINOR STREETS OR MINOR STREETS WITH UNDIVIDED ARTERIALS

S14 – CROSS INTERSECTION OF MINOR STREET WITH UNDIVIDED ARTERIALS AND CROSS INTERSECTION OF UNDIVIDED ARTERIALS

S15 – CROSS INTERSECTIONS OF DIVIDED ARTERIALS WITH OTHER STREETS

S16 – 'T' INTERSECTIONS OF DIVIDED ARTERIALS WITH OTHER STREETS

S17 – CROSS INTERSECTION OF TWO DIVIDED ARTERIALS

S18 –'T' INTERSECTION OF TWO DIVIDED ARTERIALS

S19 – ROUNDABOUTS

S20 – PAY & DISPLAY PARKING SIGN DETAIL

S21 – PAY & DISPLAY PARKING SIGN EXCEPTION DETAIL

S22 – END-MOUNTED SIGN STREET NAME PRIVATE ROAD

S23 – PLEASE PAY HERE SIGN

3.23 Exterior Lighting

CHAPTER 2

3.23.1 Introduction

The intent of this document is to set suitable benchmarks for materials, systems and workmanship for lighting systems intended for use in North Shore City.

This should in turn ensure that these installations are attractive, robust, easy to maintain, cost effective, suitable in relation to performance and minimise obtrusive effects. Good design principles are expected, including:

- Minimise obtrusive effects (to neighbours, traffic and sky glow).
- Design vehicular route lighting for vehicle and pedestrian safety.
- Design pedestrian lighting to minimise crime and enhance the environment.
- Design equipment construction and finishes to retain serviceability and a good standard of appearance for the service life of the equipment.

The document is generally prescriptive, but designed to allow for the wide range of equipment currently available. It also outlines the related procedures required by North Shore City Council (NSCC). It applies to all lighting installations that will be designed and constructed by parties other than NSCC, but that will be maintained by NSCC.

This will *include* but not be limited to:

- Roads.
- Pedestrian Crossings.
- Pedestrian and Cycle Paths.
- Parks and Reserves.
- Public Precincts (eg. Shopping Precincts)
- Outdoor Carparks.
- Steps, Stairs, Ramps, Subways and Footbridges.

It will *exclude*:

- Building Interiors.
- Building Facades.
- Signs.

Where clauses differ from existing standards, the requirements of this document shall apply.

In using this Document, the category of road shall be determined by the Traffic and Roading Planning Manager, North Shore City Council according to the Standard(s) for the type of road, applicable at the time.

The document will be subject to periodic review. Comments from interested parties relating to this document are welcome. Please send comments in writing to:

Transport Asset Manager,

North Shore City Council,

Private Bag 93 500, Takapuna

NORTH SHORE CITY

In This Chapter

3.23.1.1 The Process

The process will typically be as follows:

1 Request roading classification from NSCC.

2 Design, prepare all details as specified, complete the checklist and review form(s) – submit to NSCC.

3 Provide any supplemental information requested by NSCC or their representatives to clarify the submission.

4 NSCC will advise whether the submission is accepted and if so, under what conditions.

5 If the conditions of acceptance affect the plans as submitted, then modify and resubmit as required until accepted.

6 Fabrication of the equipment may proceed once NSCC final approval of the design is received (and not before).

7 Supply warranties to NSCC, prior to installation.

8 Proceed with the installation. Advise NSCC when the installation is due to commence to arrange inspections.

9 NSCC will inspect the works in progress and on completion. Attend to any remedial works as required.

10 Upon completion, supply as-built drawings & NAS data to NSCC & United Networks. This may require amendment & re-submission if incomplete or of unsatisfactory quality.

3.23.1.2 Roading Classifications

Table given in drawing TRS1 of Infrastructure Design Standard Manual: Section 3 – Transportation, provides a broad description of the function and usage of roads in accordance with the District Plan.

While the roading classifications shall be determined by NSCC, the following table provides an informative guide of the typical classifications philosophy. NSCC may elect to depart from this guide at their total discretion. This table should be read in conjunction with AS/NZS1158.

Table 1-1: Classifications

AS/NZS 1158 Cat.	NOMINAL ROAD CATEGORY (as defined in the NSCC District Plan)	GENERAL APPLICATION GUIDE	SPECIFIC CRITERIA (ADT = Average Daily Traffic Count) (NTOR = Night time occupancy rates)	
			Arterial / Distributor Road (/Criteria for areas other than roads)	Collector Road

V1		ROADS: Rarely used in North Shore – NSCC discretion. Only for very high mixed pedestrian & vehicle movements.		
V2	Primary Arterial	ROADS: Busy Arterial, mixed vehicles & pedestrians	ADT>15,000	
V3	Secondary Arterial	ROADS: Arterial / Motorway	2,000<ADT<15,000	
V4		ROADS: Distributor	ADT<2,000	
V5		Not used in NZ		
P1		ROADS & PATHS: Pedestrian / cycle way with high risk of crime		
P2		ROADS & PATHS: Pedestrian / cycle way with medium risk of crime &/or high night time activity levels		ADT>6,000
P3	Collector	ROADS & PATHS: Typical for new subdivision Collector Road		2,000<ADT<6,000
P3R	Collector	ROADS: Existing area Collector Road – using power poles		2,000<ADT<6,000
P4	Local	ROADS & PATHS: Typical for minor roads in new subdivisions & pedestrian walkways		ADT<2,000
P4R	Local	ROADS: Existing area minor roads – using power poles (Note 2)		ADT<2,000
P5		ROADS & PATHS: Typical for private access ways and private roads (Note 1) – NSCC discretion (Generally longer than 100m		

		& / or with bend(s))		
P6		PUBLIC ACTIVITY AREAS: High risk of crime / high night time activity level		
P7		PUBLIC ACTIVITY AREAS: Medium risk of crime / medium night time activity level		
P8		PUBLIC ACTIVITY AREAS: Low risk of crime / low night time activity level		
P9		STEPS, STAIRWAYS, RAMPS FOOTBRIDGES & PEDESTRIAN WAYS		
P10		SUBWAYS, INCLUDING ASSOCIATED RAMPS OR STAIRWAYS		
P11a		OUTDOOR CARPARKS: – High risk of crime / high night time activity level	NTOR>75%	
P11b		OUTDOOR CARPARKS: – Medium risk of crime / medium night time activity level	25%<NTOR<75%	
P11c		OUTDOOR CARPARKS: – Low risk of crime / low night time activity level	NTOR<25%	
P12		OUTDOOR CARPARKS – SPACES FOR PEOPLE WITH DISABILITIES		

NOTE: 1. Where it is determined that a Private Access Way is to be lit, the lighting shall be supplied from a common metered switchboard (ie. Not from multiple residences).

NOTE: 2. For minor rural roads refer to Clause 3.23.4.2.5 of this standard.

3.23.2 General

In This Chapter

3.23.2.1 Definitions

For the purpose of this Standard the definitions listed below apply. The definitions are the same as those used in AS/NZS 1158.

Arrangement (lighting arrangement) – the pattern according to which luminaires are sited in plan, e.g. single sided, staggered, opposite or central.

Average Illuminance (E_{ave}) – the mean illuminance in a horizontal plane at ground level over a specified area, derived in a specified manner.

Azimuth or C-angle – the angle, in azimuth, between the vertical plane containing the direction of a particular value of intensity and the vertical plane parallel to the axis of the road. See figure 2, AS/NZS1158.0:, for details of the CIE *C*, γ angle co-ordinate system, which is used for the photometry of road lighting luminaires.

Carriageway – that portion of the road devoted particularly to the use of motor vehicles, inclusive of shoulders and auxiliary lanes.

Carriageway lighting design width (W_k) – The width of carriageway which is used for the calculation or assessment of road lighting performance.

Disability glare – glare that impairs the visibility of objects without necessarily causing discomfort.

Discomfort glare – glare that causes discomfort without necessarily impairing the visibility of objects.

Footpath (pathway) – a public way reserved for the movement of pedestrians and non-motorised vehicles.

Glare – condition of vision in which there is discomfort or a reduction in ability to see, or both, caused by an unsuitable distribution or range of luminance, or to extreme contrasts in the field of vision.

Illumination – a general expression for the quantity of light arriving at a surface. The physical measure of illumination is illuminance.

Illuminance (E) - the luminous flux arriving at a surface divided by the area of the illuminated surface. Unit: lux (lx); 1 lx = 1 lumen/m^2.

Illuminance uniformity - the ratio of the maximum illuminance to the average illuminance within a specified area of the road reserve. Symbol: U_E.

Initial light output (of a discharge lamp) - the total luminous flux emitted by a lamp after 100 hours of operation.

Intersection – a place at which two or more roads cross at grade or with grade separation.

Junction – a place where two or more roads meet.

Kerb – a raised border of rigid material formed at the edge of the carriageway.

Lamp – a generic term for a man-made source of light.

Lighting column – a vertical structure of any appropriate material, which is designed to support luminaires either directly or by the use of outreach arms or mounting frames.

Light output – the total luminous flux emitted by a lamp or luminaire, as appropriate.

Light output distribution – the distribution of luminous intensity from a luminaire in various directions in space.

Luminaire (lantern) – apparatus which distributes, filters or transforms light transmitted from one or more lamps and which includes, except for the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electrical supply.

Luminance (L) – the physical quantity corresponding to the brightness of a surface (e.g. a lamp, luminaire, sky or reflecting material) in a specified direction. It is the luminous intensity of the surface divided by that area. Unit: candela per square metre (cd/m^2).

Luminous flux (∅) – the measure of the quantity of light. For a lamp or luminaire it normally refers to the total light emitted irrespective of the directions in which it is distributed. Unit: lumen (lm). Note: Values of luminous flux in this Standard refer to new lamps, viz. Initial 100-hour values.

Luminous intensity (I) – the concentration of luminous flux emitted in a specified direction. Unit: candela (cd).

Maintenance factor (light loss factor) – a factor applied to lighting design calculations, to take account of the light losses resulting from the depreciation in the lamp lumen output due to ageing and the accumulation of dirt on the optical surfaces of the luminaire, during the interval between scheduled maintenance of the lighting system.

Minimum illuminance (E_{min}) – the lowest value of illuminance in a horizontal plane at ground level, within a specified area.

Mounting height (H) – the vertical distance between the centre of a luminaire and the surface which is to be illuminated, e.g. the road surface.

Outreach – The distance, measured horizontally, from the photometric centre of a luminaire, to-

a) *for lighting columns with outreach arms* – the centre of the vertical section of the column,

or

b) *for bracket arms* – the mounting plate by means of which the bracket arm is secured to the column, wall or other supporting surface.

Peak intensity – the highest value of luminous intensity from a given luminaire.

Property line – the boundary between a road reserve and the adjacent land.

Road reserve width (W) - the width of the entire way, between property lines, devoted to public travel.

Roundabout – an intersection where all traffic travels in one direction around a central island.

Spacing – the distance between successive luminaires in a road lighting installation measured along the centre-line of the carriageway. This applies irrespective of whether the carriageway is straight or curved. Note: in a staggered installation, the distance is measured along the centre-line of the carriageway, between the luminaire on one side of the carriageway and the next luminaire on the other side of the carriageway.

Threshold increment (TI) – the measure of disability glare expressed as the percentage increase in contrast required between an object and it's background for it to be seen equally well with the source of glare present.

Upcast angle; tilt angle – the angle by which the axis of the fixing spigot entry is tilted above the horizontal when the luminaire is installed.

Upward waste light ratio (UWLR) – the proportion of luminous flux emitted by the luminaire above the horizontal, when mounted as installed. Note: For conventional road lighting luminaires-

$UWLR = ULOR \div LOR$

Where

ULOR = upward light output ratio of the luminaire

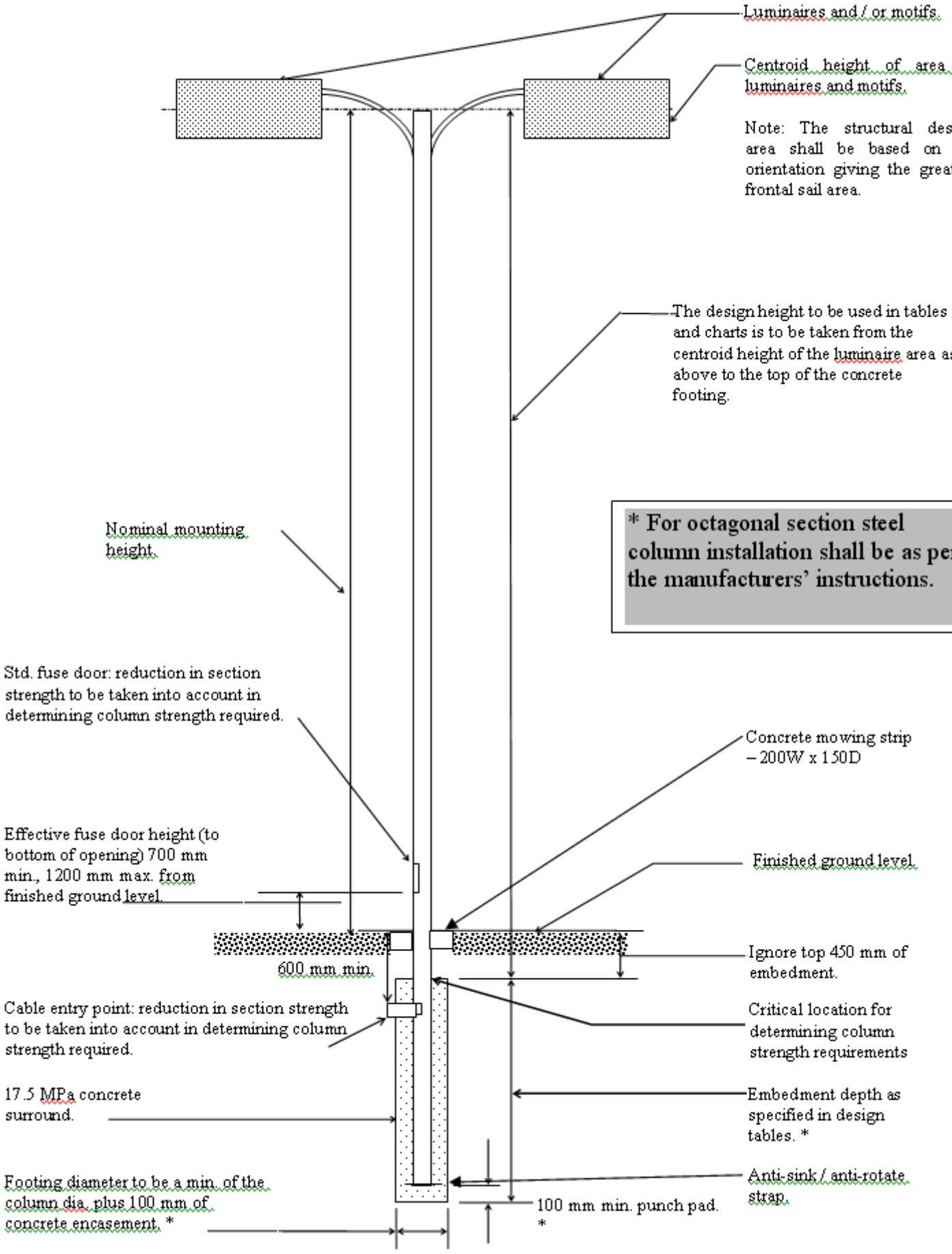
LOR = total light output ratio of the luminaire

However the degree of upcast, if any, should be taken into account in assessing compliance with the specified *UWLR*.

3.23.2.2 Typical Column Terminology

Fig. 2.1: Terminology

Schematic only – do not scale


Luminaires and / or motifs.
Centroid height of area luminaires and motifs.
Note: The structural des area shall be based on orientation giving the great frontal sail area.
The design height to be used in tables and charts is to be taken from the centroid height of the luminaire area as above to the top of the concrete footing.
* For octagonal section steel column installation shall be as pe the manufacturers' instructions.
Nominal mounting height.
Std. fuse door: reduction in section strength to be taken into account in determining column strength required.
Concrete mowing strip – 200W x 150D
Effective fuse door height (to bottom of opening) 700 mm min., 1200 mm max. from finished ground level.
Finished ground level.
600 mm min.
Ignore top 450 mm of embedment.
Cable entry point: reduction in section strength to be taken into account in determining column strength required.
Critical location for determining column strength requirements
17.5 MPa concrete surround.
Embedment depth as specified in design tables. *
Anti-sink / anti-rotate strap.
Footing diameter to be a min. of the column dia. plus 100 mm of concrete encasement. *
100 mm min. punch pad. *

3.23.2.3 Procedure

Two copies of the plans and two copies of isolux plots & written submissions shall be submitted to the appropriate section of North Shore City Council:

Two copies of the plans and two copies of isolux plots & written submissions shall be submitted to the appropriate section of North Shore City Council:

Sub Division Engineer or, Asset Management Engineer or, Manager
Subdivisions Section Transport Parks & Reserves
Environmental Services

North Shore City Council
PO Box 93500, Takapuna
NORTH SHORE CITY

Allow approximately 3 weeks for processing fully completed submissions. To assist in this process, applicants are encouraged to complete the form and checklist contained in Appendix C of this document and forward with their submission. Where data supplied is not complete, additional time will be required to process the submission. All of the time required to review the submission will be charged to the applicant. Hence, it is in the applicant's best interests to provide a fully completed submission in the first instance. In many cases full roading design information (refer IDS Section 1, 1.6.3 (v)) may have been previously provided to Council by other parties, if not, additional information may be needed such as longitudinal sections and road markings. In subdivisional projects, the head consultant acting for the Consentholder must countersign the drawings prior to submission, or alternatively submissions may be routed via the head consultant.

Where the review indicates that design changes are required, adjust the documents and resubmit until approval is obtained.

No installation work shall be carried out until written approval is received from Council.

A representative of the North Shore City Council will undertake a site inspection to verify completeness of the commissioned work. The contractor shall employ an independent qualified examiner acceptable to Council to undertake an installation audit in accordance with AS/NZS 1158, Part 1.3, Section 12.2. The portion of wiring beyond the incoming street supply is considered an electrical installation within each column and as such, the earthing and the electrical installation shall be in accordance with AS/NZS 3000. In particular, a non-conductive mounting plate shall be fixed within the pole containing a circuit breaker for the lantern, separate earth and neutral copper bars, a MEN link and earth and neutral terminal bolts. The pole shall be suitably earthed and tested for compliance and resistance to earth (if necessary, use a separate earth stake for each column with a labelled connection). The installation shall be installed, tested and certified (Electrical Certificate of Compliance). A copy of the Certificate of Compliance in respect of the street lighting, signed by the electrician and an inspector, must be provided with the completion documentation. A statement shall also be also be supplied confirming that all streetlights have been commissioned and are illuminated during hours of darkness.

Council may require a handover formality with council's street lighting maintenance contractor.

A "S224C" certificate will not be issued until all lights are installed and working correctly, and a Certificate of Compliance, NAS data and as-built documents are received by Council.

3.23.2.4 Documentation required

1. Where applicable, all documentation required in Appendix D of AS/NZS 1158.1.1, and Appendix E of AS/NZS 1158.3.1, that is not listed below shall also be provided.
2. Certification confirming that the Embedment Depth, Base Moments and Column Strengths comply with the requirements of the Structural section of this specification.
3. Detailed installation and maintenance instructions for the lantern and column combination including handling, transport and storage instructions as well as minimum foundation details as above.
4. A detailed written warranty, minimum 10 years, stating the extent and any conditions of the warranty and the remedial action proposed in the event of a claim.
5. Copies of photometric test reports for the proposed luminaires, from an accredited Testing Laboratory in hard copy and, on request, in IES or CIE electronic format.
6. Relevant Luminance and Illuminance information calculated by approved methods, e.g. computer software, and based on the appropriate photometric information provided above.
7. A site plan showing the proposed locations of all luminaires, supporting structures and foundations included in the project. Where the project is a continuation of, or intersects an existing lighting system, the columns affecting or contributing to the proposed system shall also be shown and clearly marked as existing.
8. On completion of commissioning and prior to hand-over to Council, "As-built" drawings of the completed works and completed NAS data shall be supplied to the North Shore City Council, for approval before acceptance of the hand-over. This includes full working drawings for manufacture made available to the Maintenance department so that replacement installations can be the same as the original.
9. Prior to hand-over to Council, where the columns have been painted, the paint supplier's 10 year warranty shall be provided. This will necessitate that the paint supplier has witnessed and approved the painting applicator's work in process & on completion.
10. "As-built" drawings, to United Networks standards, shall be supplied to United Networks for all underground and overhead power supply and pilot cables.

3.23.2.4.1 As-built Drawings

The drawings shall be in accordance with the North Shore City Council Infrastructure Design & Asset Data Standards.

3.23.2.4.2 NAS Data

Data previously supplied on SLIM forms is now to be submitted as part of the digital NAS data attached to signed As Built prints which are required as set out in the Asset Data Standards manuals of Council.

3.23.2.5 Codes, Regulations and Standards

This Exterior Lighting Standard is a means of compliance with requirements of the District Plan and Infrastructure Design Standard (for example clauses 3.4.1.6, 3.7.4.4 and 3.15 from Section 3 , Transportation)

The codes, regulations and standards referenced in this document shall be the latest version complete with all amendments.

All works shall be carried out in accordance with all relevant statutes, bylaws, regulations and in particular:

a The Electricity Act 1992, Electricity Regulations 1997, the relevant Electrical Codes of Practice (ECP) referred to in this, and relevant Standards referenced in ECP3.

b New Zealand Radio Interference Notices 1958 and 1985 and Radio (Television) interference notice 1961.

c Health and Safety in Employment Act 1992.

d Relevant Statutory Acts, Regulations and Bylaws.

e The requirements of Network Supplier's Health and Safety Standards (NHSS)

3.23.2.6 Workmanship

All work shall be performed in accordance with best trade practice utilising good quality new materials.

Specific items:

- Avoid damage to materials during transport and installation.
- Ensure columns are weatherproof.
- Do not use ceramic fuses or fuse holders.

3.23.2.7 Weatherproofing

The equipment shall comply with the following parameters in relation to AS 1939 or IEC 529.

Table 2-1: IP Ratings

ITEM	MOUNTING HEIGHT	MINIMUM IP RATING
Luminaire Optical Chamber	> 3 m	IP65 (Note 1)
	<=3 m	IP56
Luminaire Control Gear Chamber	> 3 m	IP24
	<=3 m	IP56

Column Gear/Fuse Door	-	IP43
Remainder of Column	-	IP24
Switchboard	-	IP56
In-ground equipment	-	IP68

Note: 1 A separate optical chamber with a minimum rating of IP66 is preferred. It is presently envisaged that this may become mandatory when the next update of this document is produced.

Columns shall be equipped with any necessary drain holes, vent holes, glands and gaskets to comply with the above requirements. Any vent holes shall be arranged to prevent rain entry. Any drain or vent holes shall be arranged to prevent vermin entry. Ensure that the design of the column intrinsically prevents the occurrence of water filling the base of the pole.

Outreaches for top-suspended lanterns shall be detached from the main column in such a manner as to prevent the possibility of condensation / capillary action transferring moisture from the main column to the outreach. The cable access path into the lantern shall be sealed to prevent moisture & debris entering the lantern.

3.23.2.8 Materials

The steel materials and fasteners shall be as given in NZS 3404.1 or AS 4100. The minimum thickness of steel plate used in any structural column element shall not be less than 1.6 mm.

Dissimilar metals shall not be used in contact with one another. Where this is unavoidable the components shall be plated with a metal of intermediate potential to prevent any electrochemical reaction. In the case of screw fastenings the fastener is to be captive and the system is to be corrosion resistant for the service life of the equipment, i.e. 20 years.

Where cast aluminium is used, the grade shall be LM6 or better with a copper content not exceeding 0.10%.

CHAPTER 4

3.23.3 Lighting columns

In This Chapter

3.23.3.1 Design

3.23.3.1.1 Introduction

The design requirements for columns shall be in accordance with the Australian/New Zealand Standard AS/NZS 4676: “Structural design requirements for utility services poles” - in particular Sections 2.4.1 & 5.3 and Appendices C & D.

See Appendices A (Clause 3.23.8) & B (Clause 3.23.9) of this document for details of calculating minimum requirements for column strength and ground embedment. Gooseneck outreaches may not be integral with the column.

Charts that set out basic minimum requirements for the design of street light columns to meet the requirements of the New Zealand Building Code (NZBC) with respect to street light column strength are contained in Appendix A (Clause 3.23.8). Also Australian/New Zealand Standard AS/NZS 4676: “Structural design requirements for utility services poles” has been used as a guideline.

Design of components for strength will be subject to specific design by the suppliers.

Interpolation between charts is permitted for intermediate values. Extrapolation outside the scope of the charts is not permitted without further input by a registered engineer.

All construction is to comply with the NZBC and the appropriate New Zealand Standards.

3.23.3.1.2 Column Types

The design charts provided are based on constant diameter – uniform wall thickness columns.

Where tapered or variable wall thickness columns are proposed, provide specific design details and calculations to prove that equivalent structural performance will be achieved.

3.23.3.1.3 Wind loadings

Wind Zones are to NZS3604 and shall be determined for the specific locations as per wind zone maps prepared for the North Shore by CLC Consultants and held by the North Shore City Council (NSCC) and Airey Consultants Limited.

Wind Pressures are based on design wind speeds for each wind zone as per NZS3604 and are calculated in accordance with NZS4203 as tabulated in table A1.1 in Appendix A (Clause 3.23.8).

The drag coefficient is taken as for a smooth round shape (cd = 1.2). Other shapes will require modification with the appropriate modification factor.

The frontal area of luminaires shall be taken from the orientation that results in the greatest wind exposed surface and the force on these is assumed to act at the top of the column. The frontal area shall include all other attachments, motifs etc., which are not part of the main street light column structure.

The height of the column used in the charts is to be taken as the height from the centroid of the frontal area of the luminaires and attachments as above, to the top of the concrete foundation. Table A1.1 in Appendix A(Clause 3.23.8) shows wind zone values in kPa.

3.23.3.1.4 Minimum Column Strengths

Concrete column strengths are based on the requirements of NZS3101 for ultimate limit state design. Steel Column Strengths are based on the requirements of NZS3404 (Structural Steel) and AS/NZS4600 (Cold-Formed Steel Structures).

Steel sections strength requirements apply to the base of the column (at the top of the concrete footing) i.e., not necessarily at the ground surface.

Minimum section modulus requirements must take into account any service opening near the critical location at the base. Locations of openings other than at the base should also be considered.

Steel strengths other than G250 and G350 (f_y =250 MPa and f_y = 350MPa respectively) will require the required strength to be modified by the ratio of F_{ytable}/F_{yused}.

Aluminium section requirements are based on 6061-T5 alloy. Other alloys will require a minimum Z value obtained by multiplying the tabulated value by the ratio of F_{ytable}/F_{yused}.

For modification factors for minimum column strengths, refer to Appendix A (Clause 3.23.8).

3.23.3.1.5 Deflection & Vibration

The complete assembly (eg. column, outreach & luminaire) shall be designed to minimise deflection and vibration. Specific design requirements include:

- The luminaire manufacturer shall, upon request, provide a guarantee that the service life of 20 years for the luminaire and the lamp manufacturer's stated service life for the lamp will not be compromised by the support systems.
- The axis of the main light beam shall remain fixed under the design wind conditions to ± 2°.

3.23.3.1.6 Dynamic Response Check

a. Translational Response

Dynamic response of a light standard may subject the structure and fixtures to excessive acceleration and forces. The loadings Standard, NZS 4203:1992; 5.2.2.2 requires a dynamic analysis of wind sensitive structures where the period of the structure is greater than one second.

The dynamic response of a light standard may be in a number of vibrational modes, including fundamental translational (lateral) cross wind and along and response as well as torsional response, particularly where the fixtures are eccentric and have high mass.

The dynamic analysis of a wind sensitive structure is outside the scope of this document and specialist design will be required where the structure is deemed to be wind sensitive.

We have included a simple check for dynamic response below which should not be taken as a rigorous assessment, however, it can be used to quantitatively assess whether dynamic response might be a problem.

Determine the total mass of the fixtures and other top attachments, including outreach arms etc. and include the mass of the top half of the post = M (kg).

The minimum section inertia of the post, I_{min}, is then obtained from:

$I_{min} = k_m 65.83 M h^3$ (mm^4) (for steel posts)
$= k_m 0.006583 M h^3$ (cm^4)

where: M = lumped mass (kg) as above
h = approximate height to centre of lumped mass (m)
k_m = material modification factor

The post size chosen should meet both the strength (Z_{min}) and stiffness (I_{min}) criteria to ensure adequate performance.

Example: for M = 100kg

h = 6m

required I_{min} = 142×10^4 m^4

= $142cm^4$ for a steel post.

i.e.: a suitable minimum size would be, say, a 100NB x 3.18 API Line Pipe with I – $171cm^4$ subject to a strength check.

A modification factor for other materials must be applied where applicable by multiplying the required I_{min} by the following:

material:	Aluminium	=	k_m	=	2.857	where E = 70 x 10^3 MPa
	Timber	=	k_m	=	30.77	E = 6.5 x 10^3 MPa
	Concrete	=	k_m	=	7.782	E = 25.7 x 10^3 MPa (f_c = 30 MPa)

b. Torsional Response

The torsional response is much more difficult to predict and may be combined with the translational response. Included in Appendix E (Clause 3.23.12), is a sample spreadsheet calculation that includes a formula for the torsional period.

As with the translational response, a period in excess of one second would indicate a more rigorous dynamic analysis is required.

3.23.3.1.7 Control Gear / Fuse - Access Door

The door shall be positioned to permit safe access for maintenance, ie:

- Not facing the street.
- Not facing the property boundary behind the column (unless clearance to the property boundary is greater than one metre).
- One metre minimum clear of any fixed obstructions.
- Fixings shall be vandal & child resistant and shall require a tool to open.

The bottom of the door shall be located between 700 and 1200 mm above finished ground level.

It shall be of sufficient size for safe and easy maintenance access.

The door shall be prevented by from being opened by unauthorised persons, by the use of vandal-resistant fasteners requiring a specific tool to gain access to the fuses and terminations.

Street Lighting Cut-Out: The fuse at the base of the column shall incorporate a safety cut-out and shroud – CH New Zealand model ADSLA3D1 or equal approved.

3.23.3.1.8 Shear base columns

All shear base type columns shall incorporate a mechanism to ensure that the column does not become live following a vehicle impact or similar event.

3.23.3.2 Construction

This section details the requirements for finishes and their application, as solutions considered satisfactory by NSCC. Alternative products and processes may be submitted for approval for specific projects and / or for future incorporation in this document.

Approved coating systems are listed in Appendix D (Clause 3.23.11).

This section relates particularly to columns and column-mounted luminaires. While the spirit of this document shall also apply to other styles of luminaires and supports, proposed finishes and their application details shall be submitted for approval.

Surface preparations, coatings and repairs shall be in accordance with one of the approved systems (refer Appendix D - Clause 3.23.11), shall be performed by the companies approved for that system and shall thereby be suitable for the minimum warranty period.

Painting is optional. However, columns shall be finished in one of the following forms:

- Hot dipped galvanised mild steel – painted (externally) or unpainted.
- Stainless steel (316 grade) – painted (externally) or unpainted.
- Marine grade aluminium – painted (externally).

Surface finishes shall be smooth and free from obvious blemishes.

3.23.3.2.1 Standards

The following standards are applicable to this section

AS/NZS 2312 Corrosion.	Guide to the Protection of Iron & Steel Against Exterior Atmospheric
SSPC-SP1	Cleaning Using Liquid Solvents & Alkaline Solutions.
SSPC-SP10	Abrasive Blast Cleaning.
SSPC-PA2	Measurement of Dry Paint Thickness with Magnetic Gauges.
AS/NZS 4680	Hot-Dip Galvanised (Zinc) Coatings on Fabricated Ferrous Articles.

3.23.3.2.2 Repair of Damage To Surfaces

Welded Areas & Inorganic Zinc Surfaces.

Degrease in accordance with SSPC-SP1 to remove all visible deposits of oil, grease, dirt, dust and other contaminants.

Remove all weld spatter, radius sharp edges and grind weld seams.

Power tool clean welds etc in accordance with SSPC-SP3. Prime the prepared areas by brush within 4 hours, or before rust bloom appears. Lap the primer coat at least 25 mm over the surrounding sound paint.

Prime and paint in accordance with the NSCC approved paint manufacturer's system.

Damaged Top Coat not back to Inorganic Zinc Primer.

Sand to mechanically roughen the coating at the damaged area to ensure adhesion of the topcoat. Remove all rust and dust particles with compressed air or by vacuuming.

Paint in accordance with the NSCC approved paint manufacturer's system.

3.23.3.2.3 In-Ground Section of all Columns

All bare metal must be covered in a zinc rich coating which must then be coated with High Build Epoxy of minimum dry film thickness of 150 microns to match the above ground level specification for the type of column used.

Bare, untreated metal is not acceptable.

Where the column base could be electrically separated from earth by paint, insulation or installation methods, a separate buried earth stake shall be provided.

3.23.3.2.4 Alternatives

Where alternative materials or paint finishes are required to those described above the applicant shall submit full details of the proposed process and materials for review with the submission.

3.23.3.2.5 Warranty

Providing the coating applicator has been certified by the paint supplier as an approved provider of the proposed coating system (proof to be supplied to NSCC), a copy of the coating applicator's certification that the galvanising and/or paint has been applied in accordance with the coating manufacturer's specification to meet or exceed the Standards in Clause 3.23.3.2.1 of this manual. This certification shall be provided before installation of the columns & lanterns.

If the applicator does not possess the necessary “certified applicator” status, then the paint supplier shall monitor the work and provide the required certification.

Materials and paint finishes of columns, and luminaire bodies shall be unconditionally guaranteed against fair wear and tear for a minimum of 10 years, commencing from the date of hand-over of the installation to Council.

3.23.3.2.6 Inspection

The paint manufacturer shall be responsible for inspections as necessary, sufficient to enable the specified warranty to be provided.

3.23.3.2.7 Protection

Immediately after painting and before transporting to the site, the columns shall be individually wrapped in heavy duty bubble wrap (“Sealed Air Protector-R”) , to protect the equipment from damage. The protective wrapping shall remain in place during the delivery and site storage phases.

The wrapped columns shall be carefully handled by forklift with carpet cladding on the forks &/or HIAB type vehicles using at least 2 nylon strops.

The column wrapping shall remain until the column is stood upright in the excavation & then the wrapping shall be removed. The column shall be lifted into position with a minimum of two suitable soft surface straps (nylon or similar) to avoid damage to the finish.

Any damage caused prior to the hand over to the North Shore City Council shall be repaired as new with all warranties remaining intact. Where the damage is considered too severe the contractor shall, upon written instruction from Council, or their representative, replace the damaged equipment with new at no cost to NSCC.

3.23.3.2.8 Mowing Strip

A smooth concrete mowing strip shall be provided around the base of every column. The concrete shall be 25MPa strength with a minimum width of 200mm and depth of 150mm.

3.23.4 Luminaries

Luminaires shall be manufactured & tested in accordance with AS/NZS 1158.6:2004 and a Certificate of Compliance from an accredited, independent testing laboratory shall be provided.

The steel materials and fasteners shall be as given in NZS 3404.1 or AS 4100.

Dissimilar metals shall not be used in contact with one another. Where this is unavoidable the components shall be plated with a metal of intermediate potential to prevent any electrochemical reaction. In the case of screw fastenings the fastener shall be captive and the system shall be corrosion resistant for the service life of the equipment, i.e. 20 years.

Spigot dimensions for any approved top-entry luminaire shall be compliant with Figure 2.1 of AS/NZS 1158.6:2004.

In This Chapter

3.23.4.1 Optical Performance

The optical performance of the luminaire shall comply with the applicable standard (AS/NZS 1158) with respect to the objectives of the lighting, characteristics of the lanterns and the installation geometry parameters as described.

3.23.4.2 Lighting Design

The lighting design shall comply with the following standards as well as the additional constraints set out in this section.

- AS/NZS 1158.1.1 – For predominantly vehicular area (Category V) lighting.
- AS/NZS 1158.3.1 – For predominantly pedestrian area (Category P) lighting.
- AS 4282 – For control of the obtrusive effects of lighting (relates to carpark and accent lighting. Accent lighting is lighting provided in addition to the minimum requirement for safety and security).

Category V5 will not be used.

3.23.4.2.1 Quantities

Use the least quantity of luminaires that will satisfactorily do the job.

3.23.4.2.2 Obtrusive Light

Particular attention shall be given to AS 4282 and AS/NZS 1158.3.1, Clause 2.5.3, for limitations related to adverse environmental effects.

3.23.4.2.3 Refractors

In an effort to minimise the glare, refractors shall not be used.

3.23.4.2.4 Light Distribution

The light distribution pattern shall be asymmetric with a forward and sideways throw. Symmetrical patterns shall not be used for road lighting.

3.23.4.2.5 Rural Areas

While road lighting in Rural Areas is suitably addressed in AS/NZS 1158, other lighting will need to be addressed on a case-by-case basis.

Primarily, since the ambient light and sky glow in Rural Areas is significantly less than that in built-up areas, the impact of obtrusive light is much greater.

AS 4282 (Control of the Obtrusive Effects of Outdoor Lighting) will be used as a guide in these situations.

The following design guidelines apply:

- Keep road lighting to the minimum applicable standard at intersections and road terminations.
- Minimise lighting beyond these areas (intersections and terminations) – only provide sufficient luminaires such that a pedestrian walking along the road always has a light in view, for orientation and guidance.

3.23.4.2.6 Pedestrian Crossing Lights

Uncontrolled Pedestrian Crossings shall be lit in accordance with the Traffic Regulations, AS/NZS 1158 and North Shore City Council's Pedestrian Crossing Standards.

In summary;

- A minimum of 40 lux maintained is required across the entire crossing.
- Lamps shall be metal halide.
- Lanterns shall be purpose-designed pedestrian crossing luminaires.
- The TI (Threshold Increment) along the road shall be no greater than 20% with the pedestrian traffic lights included in the calculation as well as the adjacent street lights.
- A painted Belisha disc shall be affixed to each column.
- The column shall be designed & located in accordance with Transit NZ document TR11.

Controlled (traffic signals) Pedestrian Crossings shall be lit to a minimum of 20 lux maintained across the entire crossing. The same type of lamp used in the streetlights in the vicinity of the crossing will be suitable. Belisha discs will not be required for controlled crossings.

3.23.4.2.7 Roadway Lighting Column Locations

The column set back from face of kerb to face of column shall be no less than 1,000mm, unless otherwise directed/approved by NSCC in writing:

Columns shall generally (preferably) be located in line with property boundary separations, or mid-way between boundaries. If a lighting column cannot be placed within 0.5m of a side boundary (because of spacing issues or siting near intersections or existing street trees for example), the next preferred siting consideration is between 6 to 8m from a side boundary.

For Category V roads it is allowed for the columns to be within 3m of the kerb, but no closer than 1m.

3.23.4.2.8 Energy Efficiency

The installation shall be designed for economic use of energy, applying the following criteria:

- Electronic control gear shall be used unless the particular rating (wattage) is not manufactured at the time of design. In this situation, low loss ferro-magnetic ballasts can be used. The maximum losses for the types available when this document was prepared are given in Table 4.1.
- High power factor (>= 0.95 lagging, & < 1.0).
- High efficacy lamps.

Table 4.1: Ballast Losses

LAMP TYPE	*BALLAST (E: Electronic) (M: Magnetic)*	*LAMP WATTAGE*		*MAX. HOT LOSSES (W)*
		NOMINAL	*ACTUAL*	

High Pressure Sodium	M	50	50	10.5
	E	70	72	8
	M	100	100	14
	E	150	147	13
	M	250	250	25
Metal Halide	E	35	39	5
	E	70	72	7
	E	150	147	12
	M	250	250	20

3.23.4.2.9 Adjacent Access Routes

Where the primary area to be lit is accessed by a road, path or similar that is also required by the NSCC to be lit as part of the development conditions, the accessway shall be lit to the same standard with lighting systems of similar appearance and quality as those in the primary area.

Lighting is required if the accessway is longer than 100m and/or contains a change of direction which could prevent some sections of the accessway being visible from the intersection with the public road. The exception is considered for the “gated communities”.

3.23.4.2.10 Alternative Solutions

Design solutions utilising computer calculations based upon CIE standards are acceptable provided that clear correlation is supplied to prove equivalence with AS/NZS 1158 requirements for the specific project parameters.

3.23.4.3 Labelling

Labeling shall be in accordance with AS/NZS 1158.6. In particular, the lamp type & rating shall be indelibly marked on the luminaire body (eg. S 150 C).

3.23.4.4 Bollard Luminaires

Bollards are not preferred and will only be permitted if approved in writing by Council. A recognized possible application would be for narrow walkways between residential boundaries where the spill light limits required under the District Plan may not otherwise be achievable.

Where permitted, bollards shall be rugged commercial grade units suitable for use in vandal-prone areas. They shall possess the following features:

- A maximum of 3% upward waste light output.
- Refractors not permitted.
- Sturdy concrete foundations with 200mm wide mowing strips in grassed areas.
- Internal light baffles where required to keep spill light within District Plan limits.
- Metal halide lamps.
- Construction & finishes as per the relevant sections of this document for Columns & Luminaires.
- Electrical items as per the Electrical sections of this document.
- The maximum luminous intensity in any normal viewing direction when installed (ie. this is site specific to suit the local topography, etc), shall not exceed 500 cd/m^2.

3.23.5 Equipment & Components

Electrical equipment & components shall be manufactured to comply with the applicable New Zealand, or International Standards and shall be readily available as spare parts. These components shall be incorporated into the lantern or in the column, be protected against the ingress of moisture and be easily accessible for repair or replacement. Warranties on these components shall be the manufacturers' standard warranty, but no less than 12 months, and be applicable from the date of hand-over of the installation to Council.

Decorative equipments and components shall be subject to the Transport Asset Manager. However, a commitment from the supplier has to be provided mentioning thet they will provide single replacement in maximum 1 (one) week for a lantern and maximum 4 (four) weeks for a column.

In This Chapter

3.23.5.1 Lamps

Second generation metal halide lamps (wattages 45, 60, 90 and 140W and Colour temperature 2800K nominal) shall be used in P2, P3 and P4 roads, however with written authority of the Traffic and Roading Planning Manager, alternate lamp choices may be considered, including LED. For smaller brownfield projects involving minor changes to P2, P3 or P4 roads, selection of existing lamp types of the locality may be appropriate.

For other P categories and V categories High Pressure Sodium lamps shall be used unless otherwise directed by that Manager. Standard lamp wattages adopted by NSCC are 400, 250, 150, 100, 70 and 50W. For other areas and tasks, e.g. parks and reserves, metal halide is preferred. Details of these shall be included on the submission drawings.

Lamps shall be manufactured by BLV, Dura, Osram, Philips, Radium, Sylvania or Venture. Alternatives will not be permitted unless approved in writing by Council.

3.23.5.2 Maintenance and Serviceability

Lamp and control gear compartments shall be accessible for servicing within 60 seconds of commencement of work, without the requirement for special tools.

The luminaire control gear shall be readily maintainable without the need to dismantle significant portions of the luminaire. Where feasible, a removable gear tray shall be provided.

Removable sections of the lantern, i.e. lenses, cover glass and gear tray assemblies, shall be secured by means of a lanyard or hinge type arrangement for safety and ease of maintenance.

3.23.6 Electrical

In This Chapter

3.23.6.1 Permits & Demarcation

Make application to United Networks for permits and approvals as required to complete the work. All work shall be carried out in accordance with the Electricity Regulations 1997 and the applicable Electrical Codes of Practice. In addition work shall be in accordance with United Networks Street Lighting Standard with respect to pilot cable installation.

All underground cabling for street lighting shall be supplied & installed by one of the contractors approved to work on the United Networks / Vector network to ensure that United Networks / Vector retain responsibility for the ongoing maintenance of this asset.

The point of demarcation will be the circuit breaker / fuse in the base of the column for street lighting, or the point of supply for metered area lighting.

3.23.6.2 Power Charges

The Developer shall be responsible for notifying United Networks of when the new street lights are commissioned and for direct payment to United Networks of all line and energy charges covering the period up until the “Hand-over to Council”.

3.23.6.3 Cabling

3.23.6.3.1 Supply to lights

All supply cables shall be underground unless agreed in writing by North Shore City Council.

Cables shall be sized in accordance with AS/NZS 3008.1.2 with respect to current & thermal ratings and voltage drop with a minimum cross sectional area of 10 mm^2 in accordance with United Networks Street Lighting Standard.

Cabling for metered lighting shall be 2 core neutral screened minimum.

All cables shall be PVC or XLPE insulated with copper or aluminium conductors. All underground cables shall be PVC Neutral Screen with heavy grade 3.2mm PVC sheath, or PVC/XLPE enclosed in duct(s).

Road crossings and sealed areas shall be thrusted and ducted.

3.23.6.3.2 Identification

All cores shall be phase identified with, if necessary, a coloured PVC sleeve firmly attached to the core.

3.23.6.3.3 Routes

Search on site and on any drawings that are available for evidence of existing underground services, or factors that may affect the installation of cables and/or ducts on the proposed routes. Any services exposed or damaged during trenching shall be reported immediately and any damage caused to existing services during the course of the work shall be made good at no cost to NSCC.

3.23.6.3.4 Spacing

Minimum cable spacing from other services shall be as follows:

HV	300 mm
MV or LV	150 mm
Water or Gas	200 mm
Communications	200 mm
Fibre Optics	500 mm

3.23.6.3.5 Fuses & Circuit Breakers

Provide a 6kA circuit breaker or HRC fuse and fuse holder for and at each luminaire or column.

Fuses shall comply with AS/NZS 60269 for HRC fuse cartridges. A rated breaking capacity of 90kA/415 Volts AC shall apply using Class Q1 general fuse links for industrial purposes unless detailed otherwise.

Within road lighting columns, Council's preferred method is to use a proprietary in-line plug & socket-fuse combination (Tradeline Buchanan in-line kits or equal approved). This shall be located & fixed to the manufacturer's recommendations to ensure the best opportunity for the lower portion to remain intact following a car-column collision. Ensure there is sufficient slack in the incoming cable to enable the fuse to be pulled up to the gear door for changing.

If an in-line plug & socket fuse combination is not practical, then a Vector approved insulated circuit breaker panel may be used subject to the approval of the engineer. The panel shall be compliant with current electrical regulations and be securely fixed within the base of the column just inside the cover plate. The supply cable connection shall be made in an approved terminal block and a PVC insulated conductor shall be run from the terminal block into the circuit breaker.

Where in-line connectors are not used a proven method to restrict condensation and moisture entering the fuse holder / circuit breaker shall be provided.

3.23.6.4 Earthing

Each column & inspection cover shall be earthed. Appropriate earth tags shall be provided for this purpose inside the column & the inspection cover. Final connections shall be factory welded studs / plates / lugs prior to hot dip galvanising.

The earthing cable shall be a single 16mm^2 stranded copper cable as a minimum and shall be connected via a crimped terminal fitting. All cables shall be continuous between the terminals.

Earthing shall comply with AS/NZS 3000, the Electricity Regulations & Vector requirements.

3.23.7 Installation

Installation shall be in accordance with AS/NZS 1158.1.3, Section 12 and this document.

In This Chapter

3.23.7.1 Location

The location of each column shall be clearly marked on the drawing(s) submitted to Council for review. Ensure all underground services are located and safe before the commencement of any excavation work. Where underground services obstruct the installation of the column, seek the Engineer's approval to relocate the column.

3.23.7.2 Columns

Roadway lighting columns shall be complete with lantern mounting spigot, base mounted 10 Amp HRC fuse / circuit breaker, 2 core 2.5 mm^2 (minimum) PVC/PVC cable to lantern, terminal and control gear space and base shear flange as required with access and underground cable.

Cables shall be connected to proprietary terminals within the chamber. Tee crimp connections shall not be used. The access aperture for the fuse holder shall be no less than 120 mm wide x 240 mm high to enable safe & easy removal of the fuse holder (Structural integrity shall be maintained).

Provide an earth tag within each column, inspection cover and luminaire.

Access facilities for small diameter (low height) columns (eg. for path & area lighting) shall be designed to provide safe and easy maintenance access. Details shall be submitted for approval. As a guide, the aperture in these cases should be no less than 80 wide x 180 high.

3.23.7.3 Frangible & Shear Base Columns

Frangible or shear base columns shall be used for all major intersections and appropriate locations as per the guidelines in AS/NZS 1158, Part 1.3, Appendix B.

The selection (frangible vs. shear base), installation, alignment and fixing are critical. These shall be strictly in accordance with AS/NZS 1158, as well as the manufacturers' instructions and recommendations.

Certification shall be provided prior to practical completion that all bolts on shear base columns have been torqued to the settings recommended by the manufacturer.

3.23.7.4 Erection

The columns shall be erected:

- vertical to within +/- 1 degree
- Outreach arms within +/- 2 degrees of normal to the edge of carriageway.
- Lanterns shall be mounted within +/- 2 degrees of parallel relative to the road surface in the driving direction.
- Flange base ground stubs or foundation pads shall be neatly back filled with cast in-situ concrete and finished with a neat concrete surround and within 50 mm of final ground level.

Details of embedment depth requirements shall be calculated using the charts and tables contained in Appendix B.

3.23.8 Appendix A - Calculating Required Column Strength

Wind Loadings

Table A1.1: Wind Pressures (kPa)

WIND ZONE	L (Low)	M (Medium)	H (High)	VH (Very High)	SD (Specific Design)
Pressure, qz (kPa)	0.61	0.82	1.16	1.50	2.60

MODIFICATION FACTORS FOR MINIMUM COLUMN STRENGTHS

Table A2.1: Drag Coefficient Modification Factors for Minimum Column Strength

Section Shape	Modification
Circular Square Octagonal 12 Sided Polygon	1.00 1.33 1.17 1.08

Table A2.2 is based on the following:

- Drag coefficients for circular sections of 1.2, square sections of 1.6, Octagon sections of 1.4, and 12 sided polygons of 1.3.
- Modification Factors are the same for all wind zones and soil types.
- Minimum column strengths obtained from the corresponding charts are to be multiplied by the above factors as applicable.

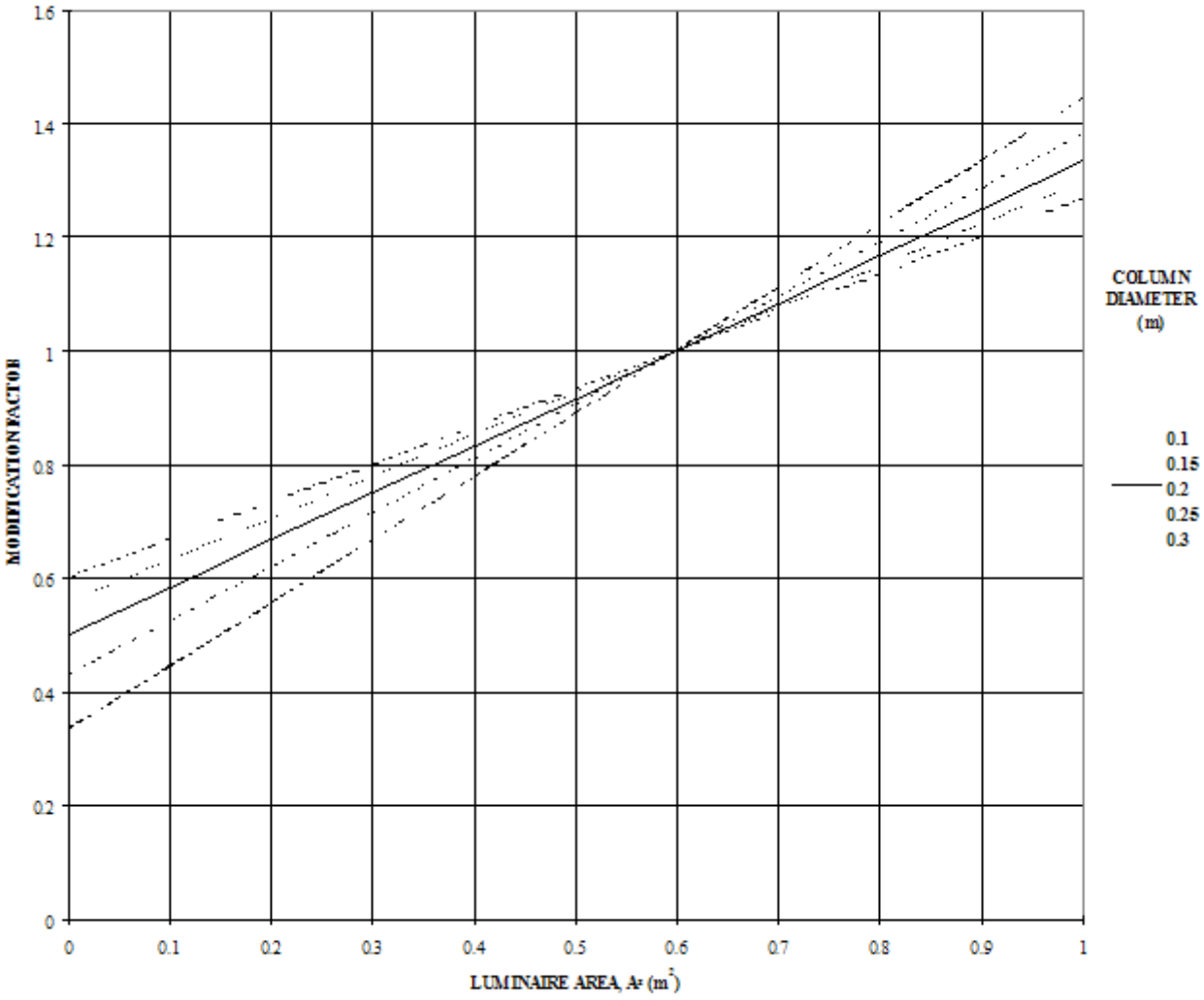
Figures A2.1, A2.2, A2.3, A2.4 and A2.5 are based on the following:

- Circular section with a drag coefficient of 1.2.
- Modification Factors are the same for all wind zones and soil types.
- Minimum column strengths obtained from the corresponding charts are to be multiplied by the above factors as applicable.

Table A2.2 : Luminaire Area Modification Factors for Minimum Column Strengths

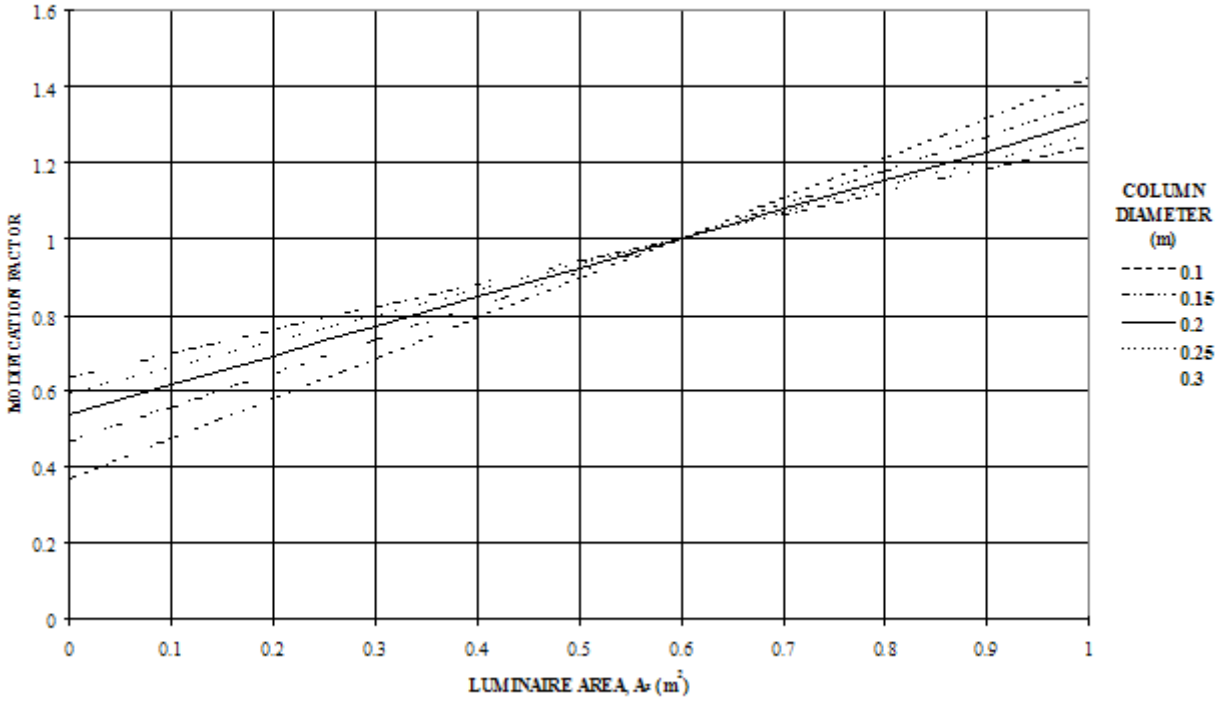
COLUMN HEIGHT (m)	COLUMN DIAMETER (m)	LUMINAIRE AREA, A_E (m^2)										
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
6.5	0.1	0.294	0.412	0.529	0.647	0.765	0.882	1	1.118	1.235	1.353	1.471
	0.15	0.385	0.487	0.59	0.692	0.795	0.897	1	1.103	1.205	1.308	1.41
	0.2	0.455	0.545	0.636	0.727	0.818	0.909	1	1.091	1.182	1.273	1.364
	0.25	0.51	0.592	0.673	0.755	0.837	0.918	1	1.082	1.163	1.245	1.327
	0.3	0.556	0.63	0.704	0.778	0.852	0.926	1	1.074	1.148	1.222	1.296
7.5	0.1	0.385	0.487	0.59	0.692	0.795	0.897	1	1.103	1.205	1.308	1.41
	0.15	0.484	0.57	0.656	0.742	0.828	0.914	1	1.086	1.172	1.258	1.344
	0.2	0.556	0.63	0.704	0.778	0.852	0.926	1	1.074	1.148	1.222	1.296
	0.25	0.61	0.675	0.74	0.805	0.87	0.935	1	1.065	1.13	1.195	1.26
	0.3	0.652	0.71	0.768	0.826	0.884	0.942	1	1.058	1.116	1.174	1.232
8.5	0.1	0.415	0.512	0.61	0.707	0.805	0.902	1	1.098	1.195	1.293	1.39
	0.15	0.515	0.596	0.677	0.758	0.838	0.919	1	1.081	1.162	1.242	1.323
	0.2	0.586	0.655	0.724	0.793	0.862	0.931	1	1.069	1.138	1.207	1.276
	0.25	0.639	0.699	0.759	0.82	0.88	0.94	1	1.06	1.12	1.18	1.241
	0.3	0.68	0.733	0.787	0.84	0.893	0.947	1	1.053	1.107	1.16	1.213
10	0.1	0.455	0.545	0.636	0.727	0.818	0.909	1	1.091	1.182	1.273	1.364
	0.15	0.556	0.63	0.704	0.778	0.852	0.926	1	1.074	1.148	1.222	1.296
	0.2	0.625	0.688	0.75	0.813	0.875	0.938	1	1.063	1.125	1.188	1.25
	0.25	0.676	0.73	0.784	0.838	0.892	0.946	1	1.054	1.108	1.162	1.216
	0.3	0.714	0.762	0.81	0.857	0.905	0.952	1	1.048	1.095	1.143	1.19
12	0.1	0.5	0.583	0.667	0.75	0.833	0.917	1	1.083	1.167	1.25	1.333
	0.15	0.6	0.667	0.733	0.8	0.867	0.933	1	1.067	1.133	1.2	1.267
	0.2	0.667	0.722	0.778	0.833	0.889	0.944	1	1.056	1.111	1.167	1.222
	0.25	0.714	0.762	0.81	0.857	0.905	0.952	1	1.048	1.095	1.143	1.19
	0.3	0.75	0.792	0.833	0.875	0.917	0.958	1	1.042	1.083	1.125	1.167

FIGURE A2.2: LUMINAIRE AREA MODIFICATION FACTORS FOR COLUMN STRENGTHS - 7.5m HIGH COLUMNS



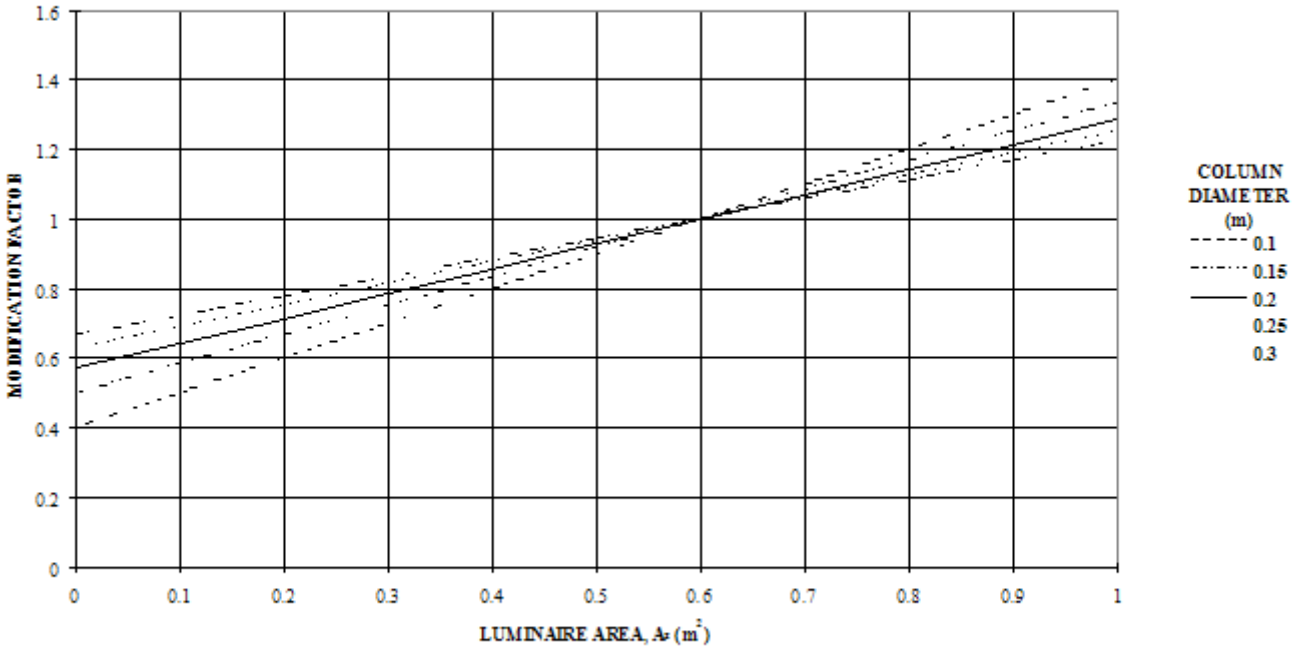
NB: Modification Factors are based on a circular section, a drag coefficient factor needs to be applied to other section shapes as well as the area factor. Luminaires Area Modification Factors apply for all wind zones.

FIGURE A2.3: LUMINAIRE AREA MODIFICATION FACTORS FOR COLUMN STRENGTHS - 8.5m HIGH COLUMNS



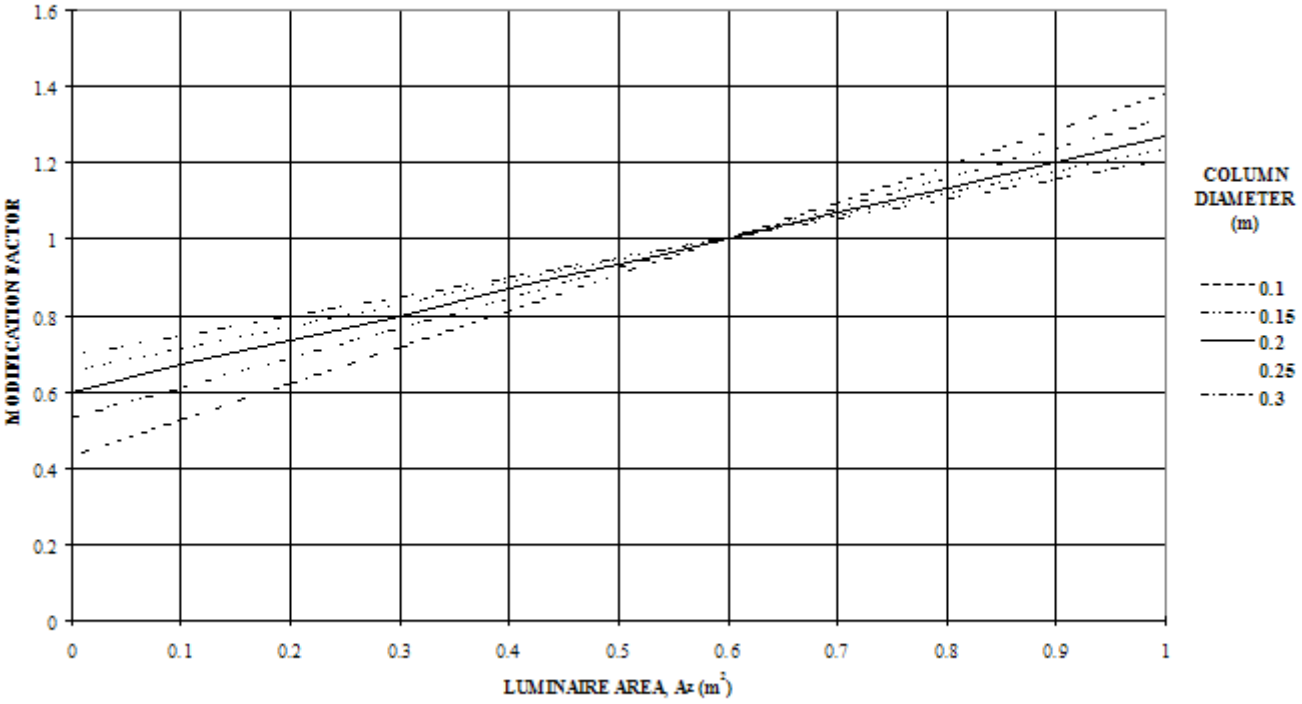
NB: Modification Factors are based on a circular section, a drag coefficient factor needs to be applied to other section shapes as well as the above factor. Luminaires Area Modification Factors apply for all wind zones.

FIGURE A2.4: LUMINAIRE AREA MODIFICATION FACTORS FOR COLUMN STRENGTHS - 10m HIGH COLUMNS



NB: Modification Factors are based on a circular section ,a drag coefficient factor needs to be applied to other section shapes as well as the area factor. Luminaires Area Modification Factors apply to all wind zones.

FIGURE A2.5: LUMINAIRE AREA MODIFICATION FACTORS FOR COLUMN STRENGTHS - 12m HIGH COLUMNS



NB: Modification Factors are based on a circular section, a drag coefficient factor needs to be applied to other section shapes as well as the area factor. Luminaires Area Modification Factors apply to all wind zones.

FIGURE A2.6: Minimum Section Modulus for G250 CIRCULAR STEEL SECTIONS

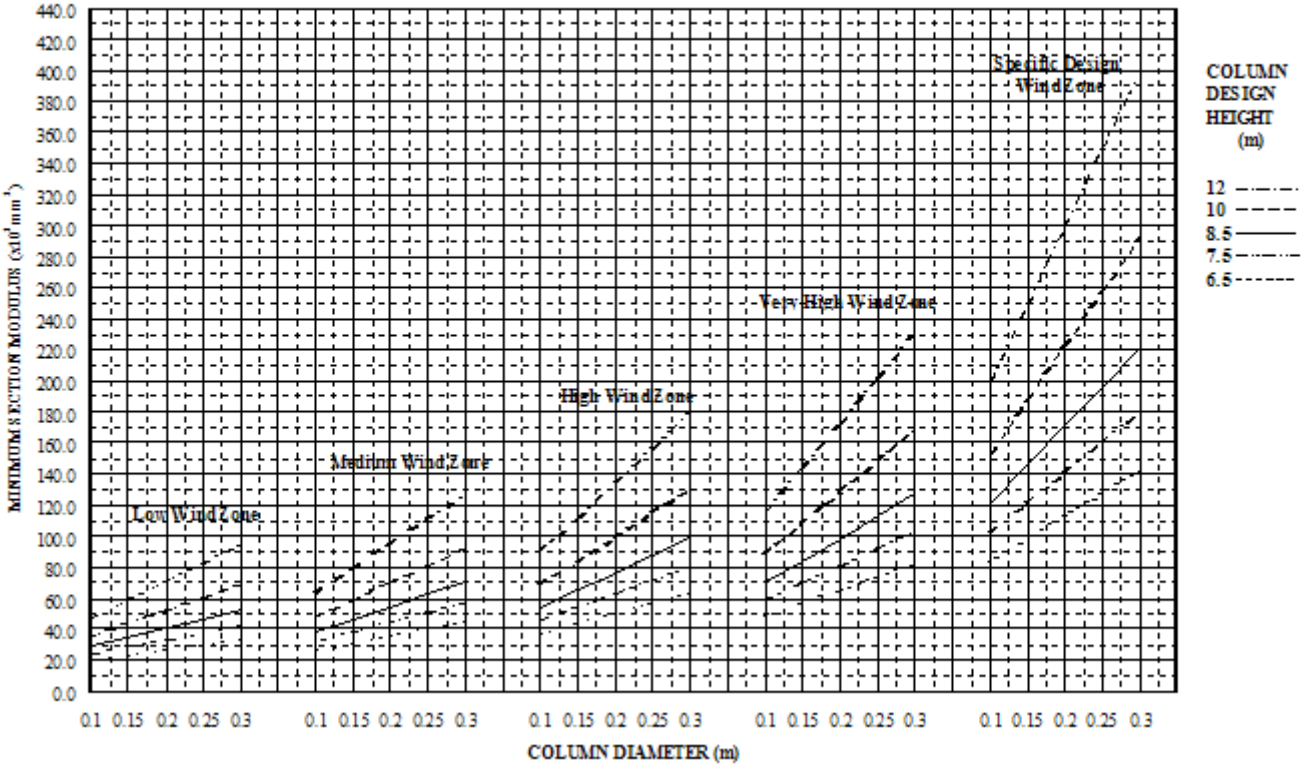
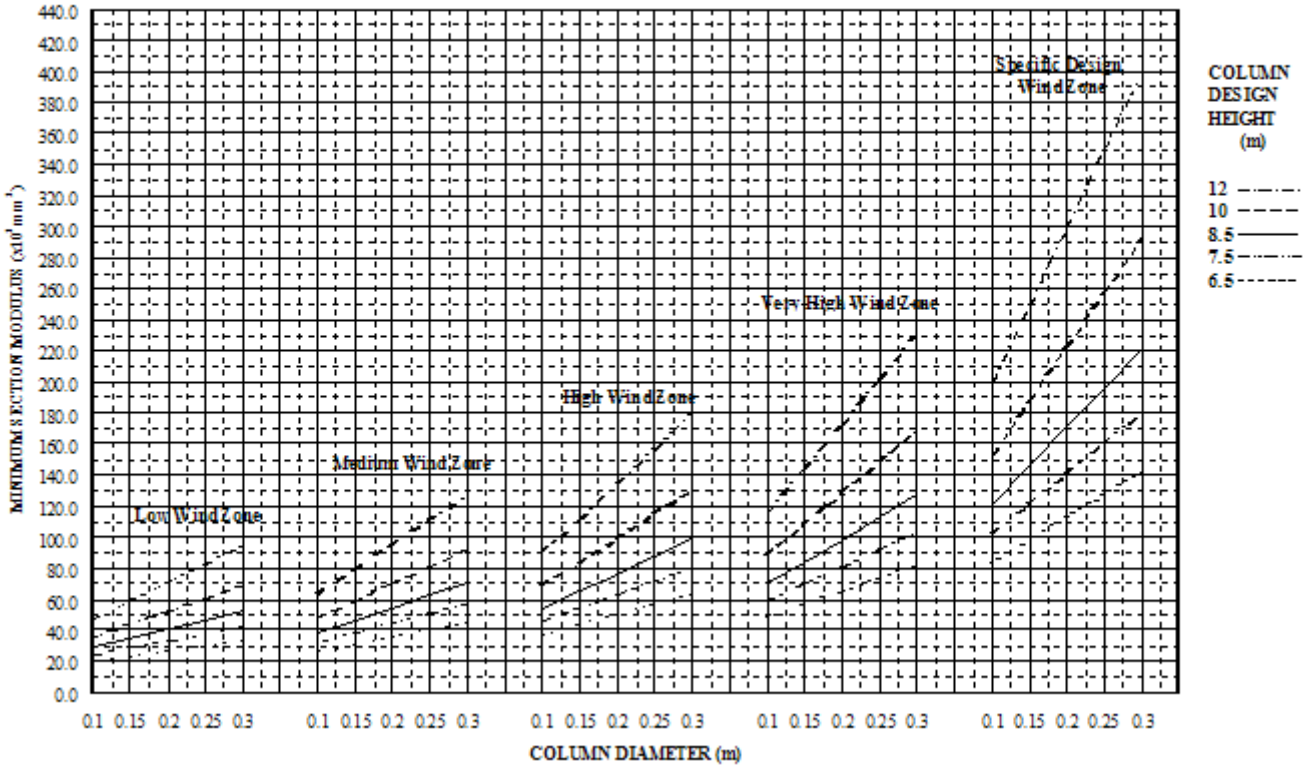


FIGURE A2.6: Minimum Section Modulus for G250 CIRCULAR STEEL SECTIONS



3.23.9 Appendix B - Calculating foundation requirements

Embedment

Soil types as per table B.1 are based on the following qualitative assessment in the field:

Table B.1: Soil Type Classification

	Soil Type	*Description*	*Su (kPa)**

1	Topsoil	Friable containing organic matter	20
2	Soft Clays	Readily squeezed through fingers	35
3	Medium Clays	Can be deformed with some effort	50
4	Hard Clays, Tuff, Rock	Difficult to deform by hand	75

Note:

- S_u is the assumed undrained shear strength used in embedment calculations.
- Soil testing may be required if any doubt exists as to the correct category to be used.
- *Embedment depths are to be taken from the top to the bottom of the concrete pile.
- Pile diameters are assumed to be the street light column diameter plus 100mm minimum.
- Larger diameters may utilise smaller embedments.
- Minimum concrete strength for piles is to be 17.5 MPa @ 28 days.
- Cover to unprotected steel to be not less than 75mm.

MODIFICATION FACTORS FOR EMBEDMENT DEPTHS

a) Shape ModificationFactors For Embedment Depths

Table B.2: Drag Coefficient Modification Factors for EMBEDMENT DEPTHS

Section Shape	*Modification Factor*
Circular	1.00
Square	1.18
Octagonal	1.09
12 Sided Polygon	1.05

Table B.2 is based on the following:

Drag coefficients for circular sections of 1.2, square sections of 1.6, Octagon sections of 1.4, and 12 sided polygons of 1.3.

- Modification Factors are the same for all wind zones and soil types.
- Embedment depths obtained from the corresponding charts are to be multiplied by the above factors as applicable.

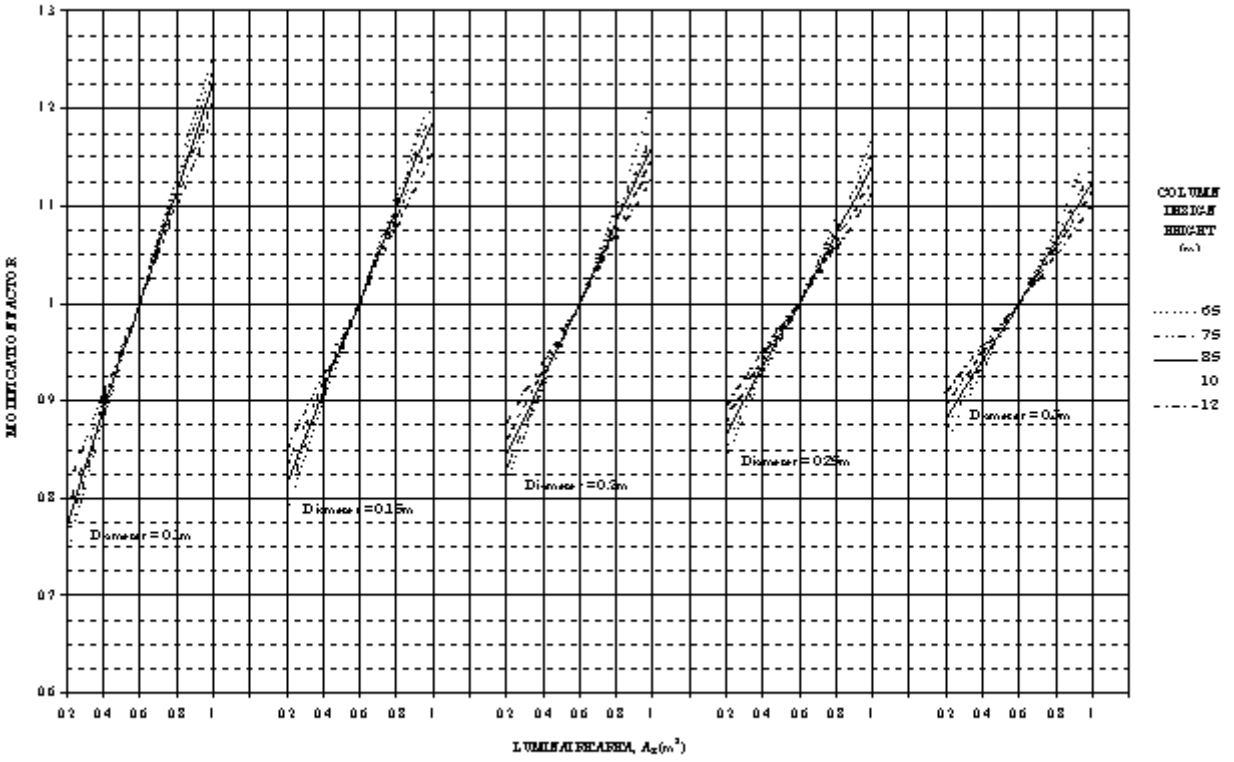
b) Luminaires Area Modification Factors for EMBEDMENT DEPTHS

Figure B1.1 shall be used to obtain a modification factor for varying frontal areas.

Figure B1.1 is based on a circular section with a drag coefficient of 1.2

Modification Factors apply for all wind zones.

FIGURE B1.1: LUMINAIRE AREA MODIFICATION FACTORS FOR COLUMN EMBEDMENT DEPTHS



NB: Modification Factors are based on a circular column, a separate factor needs to be applied for other column shapes
Luminaire Area Modification Factors apply to all wind zones

FIGURE B1.2: Embedment Depths of Columns for LOW WIND ZONES

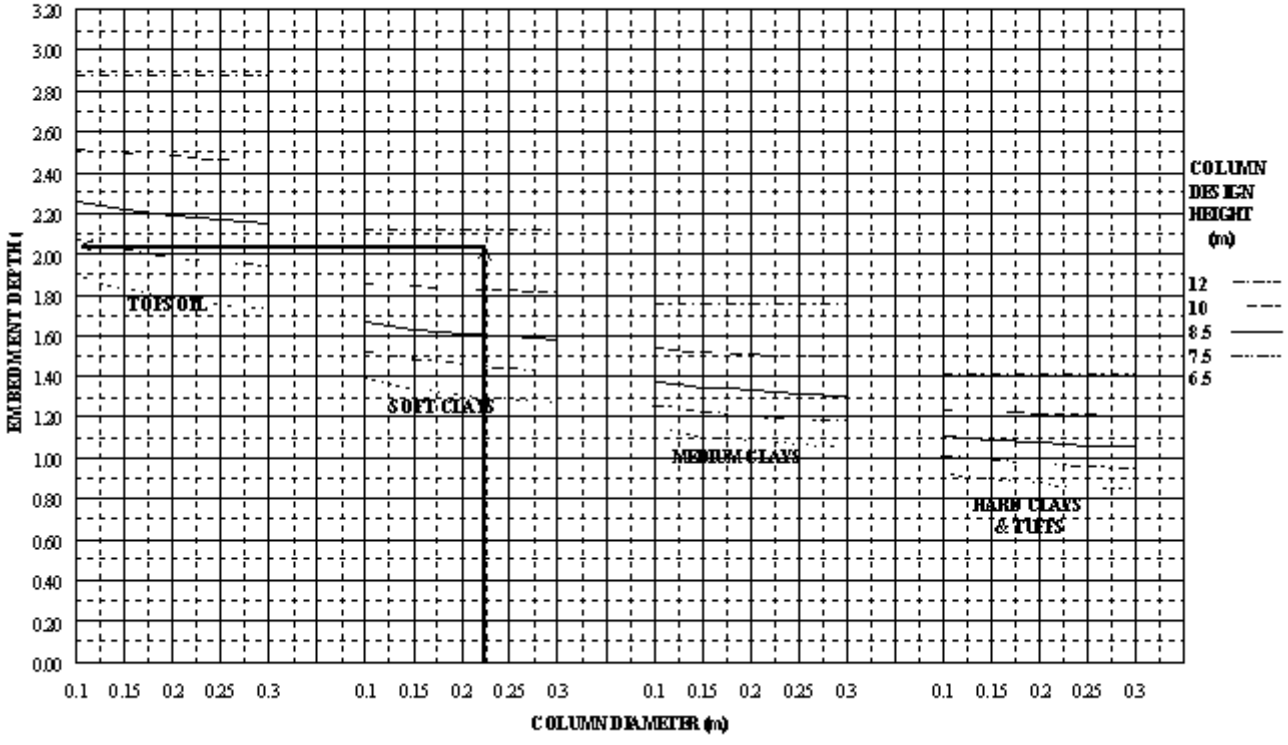


FIGURE B1.3: Embedment Depths of Columns for MEDIUM WIND ZONE

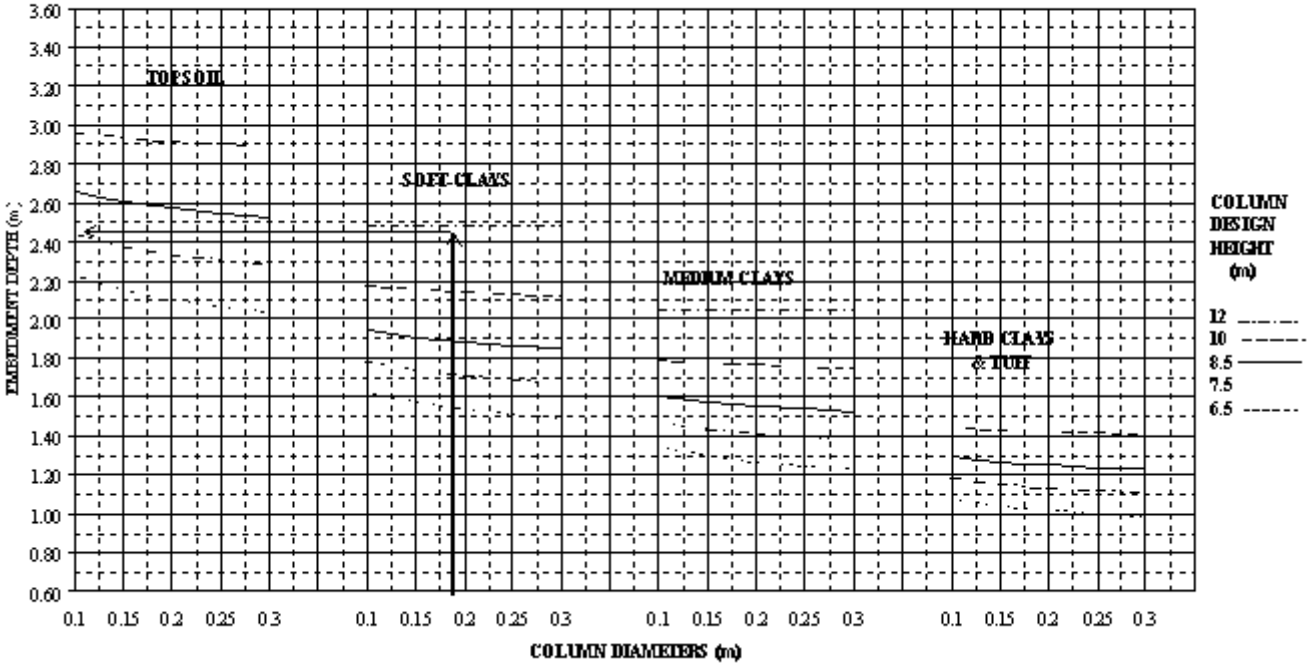


FIGURE B1.4: Embedment Depths of Columns for HIGH Wind Zones

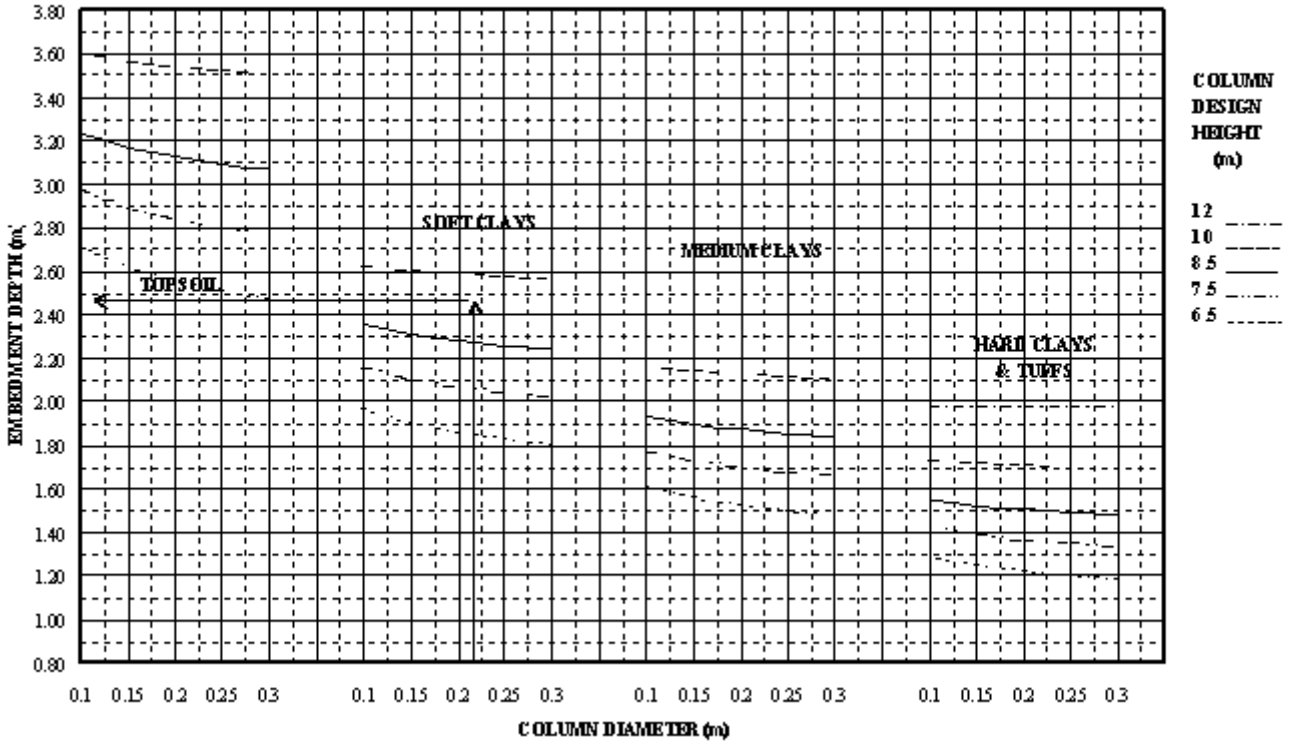


FIGURE B1.5: Embedment Depth of Columns for VERY HIGH WIND ZONE

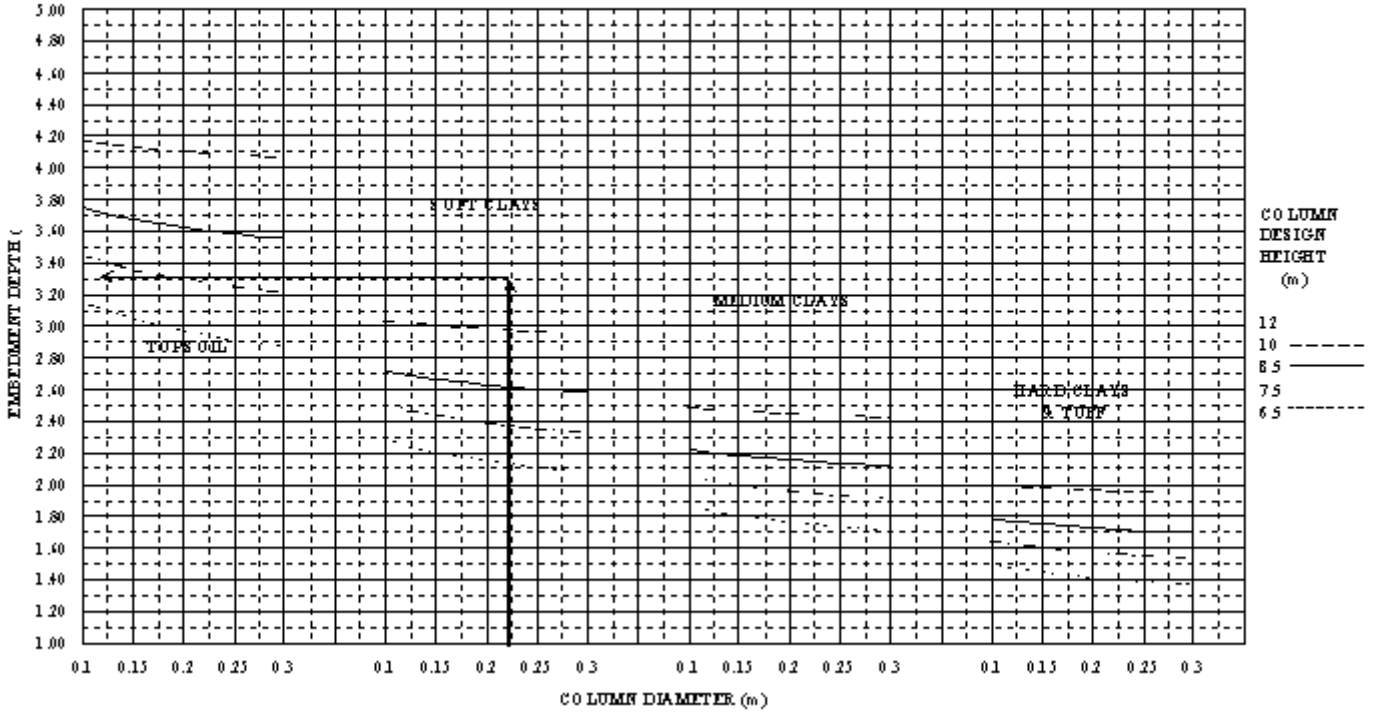
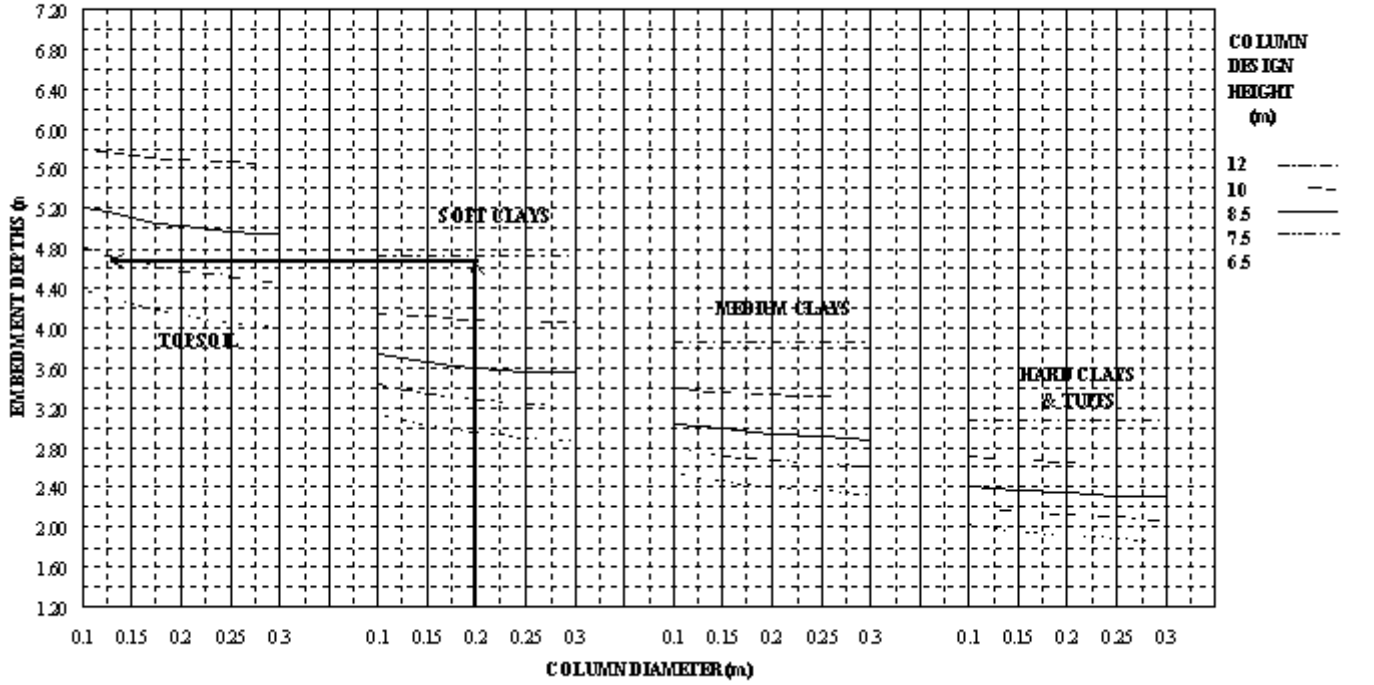


FIGURE B1.6:Embedment Depths of Columns for SPECIFIC DESIGN WIND ZONES



3.23.10 Appendix C - Guide to application and checklist

All Review Forms and the Application Checklist shall be completed and attached with each submission. Use a separate Review Form for each section of road if required.

Sub-division Streetlighting Review Form – category v roads

	Please enter the required information below:

Names and Lighting Categories (e.g. V1 - V4) of roads involved	
Name of the NSCC roading engineer who supplied the categories of the roads / areas involved	
Luminaire details Manufacturer and product name Lamp manufacturer, type and rating Initial luminous flux (Note 1) [lumens] Origin of the photometric data Hot ballast losses [W]	
Computer Design assumptions Name and source of the computer program Road surface reflectances used Maintenance factor used	
Design result – for straight or curved roads Min. average carriageway luminance [cd/m^2] Min. overall luminance uniformity [min/ave] Min. longitudinal luminance uniformity [min/max] Max. threshold increment [%] Min. surround verge illuminance [%] Max. upward waste light ratio [%]	
Design result – for intersections, junctions, and other specified locations (Isolux plots shall be provided) Min. illuminance [lux]	

Max. illuminance uniformity [max/ave] Max. upward waste light ratio	

NOTE: 1. Use standard lamp lumens for the design regardless of whether a higher output lamp is proposed. Eg. For 150 watt HPS, use 14,500 lumens & not 16,500. This is to align with anticipated maintenance practices.

category p - Streetlighting (& other areas) Review Form

	Please enter the required information below:

Names and Lighting Categories (eg. P1 – P12) of roads / areas involved	
Name of the NSCC roading engineer who supplied the categories of the roads / areas involved	
Luminaire details Manufacturer and product name Lamp manufacturer, type and rating Initial luminous flux (Note 1) [lumens] Origin of the photometric data Hot ballast losses [W]	
Computer Design assumptions Name and source of the computer program Road surface reflectance used Maintenance factor used	
Design result – for straight or curved roads Ave. horizontal illuminance [lux] Min. horizontal illuminance [lux] Horizontal illuminance uniformity [max/ave] Vertical illuminance [lux] Luminaire classification type [AS/NZS1158.3.1-Table 2.10]	
Design result – for Traffic Management Devices and other specified locations per AS/NZS1158 (Isolux plots shall be provided) Ave. horizontal illuminance [lux]	

Min. horizontal illuminance [lux] Horizontal illuminance uniformity [max/ave]	

NOTE: 1. Use standard lamp lumens for the design regardless of whether a higher output lamp is proposed. Eg. For 150 watt HPS, use 14,500 lumens & not 16,500. This is to align with anticipated maintenance practices.

Application Checklist

The following items have been included with this submission:

Tick here:

1. A covering letter identifying the project, listing the enclosures and providing full contact details (contact name, company, phone, fax & e-mail) & relevant project details.

2. A site plan showing:

   - the proposed locations of all columns included in the project, also showing all existing or proposed street trees, carriageway widths , road boundaries and locations of footpaths.

   - the make, model, lamp type, lamp wattage, mounting height, overhang, and upcast angle of each luminaire.

   - details & locations of the existing columns & luminaires, integrating with, affecting or contributing to the proposed system clearly marked as existing.

3. An isolux diagram for each intersection, junction, traffic management device or similar as required by AS/NZS1158.

4. Copies of photometric test reports for the proposed luminaires, from an accredited testing laboratory in hard copy, are available on request by Council.

5. The appropriate Appendix C Streetlighting review form shall be attached to each application. Copies of reports generated by the nominated computer program showing relevant luminance and illuminance information shall be attached.

6. Certification confirming that the Embedment Depth, Base Moment and Column Strength complies with the requirements of the Structural section (Appendices A, B and E) are available on request.

7. The following details are available on request:

   - installation instructions for the luminaire and column combination including handling, transport and storage instructions.

   - maintenance instructions for the luminaire and column combination e.g. instruction and anatomy of the lantern for the purpose of maintenance and replacement.

8. A recommended maintenance schedule (Cleaning, lamp replacement, etc) is available on request.

9. A detailed written warranty, minimum 10 years for the column and luminaire combination (excluding the lamp or control gear), stating:

- The extent and any conditions of the warranty.

- The remedial action proposed in the event of a claim.

10. A copy of the coating supplier's/applicator's certification that the galvanising and / or paint have been applied in accordance with the coating manufacturer's specifications – will be supplied.

11. The contact details of the proposed independent qualified examiner who will be responsible for the installation audit (12.2 of AS/NZS 1158.1.3 and 2.3 of NSCC Exterior Lighting standards refer)

NOTE:

The information required herein shall be provided in sufficient detail to enable completion of the review. Failure to provide the required information in full may result in a delay in processing the review.

If in doubt about what is required for any of the above, please contact Premier Consultants Ltd. Telephone (09) 414 1004.

3.23.11 Appendix D - List of Approved Coating Systems

The following list contains coating systems approved for use by NSCC for painting lighting columns, enclosures and luminaires. The list is current as at the date indicated in the footer of this document but is subject to change at the total discretion of the NSCC.

If further systems are submitted in the future and deemed satisfactory then NSCC may choose to include them on this list.

Similarly, if NSCC consider that a previously approved system is no longer satisfactory, then NSCC may choose to remove them from this list.

Manufacturer	Reference
▪ Azko Nobel Coatings	▪ Specifications dated 19/07/00.
▪ Altex	▪ Specifications dated 06/05/00.
▪ Ameron	▪ Specifications dated 05/05/00.
▪ Dulux	▪ Specifications dated 19/11/00.
▪ Resene	▪ Specifications dated 03/99.

3.23.12 Dynamic response spreadsheets

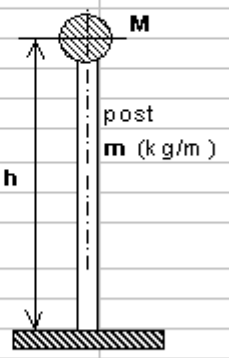
Torsional and translational period calculations:

a) Translational: Lumped mass on top of uniform mass post

Translational Period, T_ℓ = $(2\pi / 1.732)\sqrt{(M h^3 + 0.236 m h^4) / (E I)}$

M =	118.9	lumped mass (kg)
m =	1.0	uniform mass per m of post (kg/m)
h =	6.0	height to lumped mass (m)
E =	200.0	modulus of elasticity (GPa)
I =	171.00	bending inertia of post ($x10^4$ mm^4)
post =	100NB x 3.18 API line pipe	

⇒ Translational Period, T_ℓ = **1.00** second



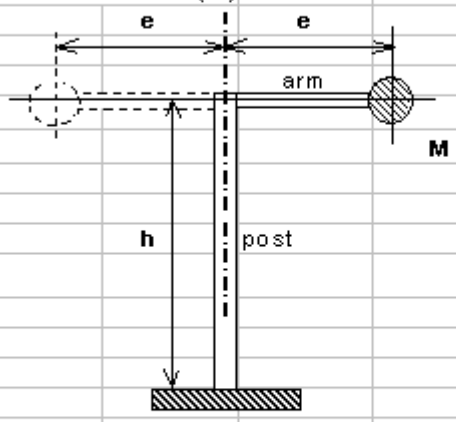
Note: Lumped mass includes all fixtures and top half of post mass.

b) Torsional: Lumped mass(es) eccentric to top of post

Torsional Period, T_t = $2\pi\sqrt{M\,((h\,e^2)/(Ip\,G) + e^3/(3\,E\,I))}$

M =	29.9	total lumped mass (kg)
e =	1.0	eccentricity of lumped mass(es) from rotational ctr. (m)
h =	5.0	height to lumped mass (m)
E =	200.0	modulus of elasticity of arm (GPa)
G =	80.0	shear modulus of post (GPa)
I_p =	3.45	polar inertia of post = J ($x10^6$ mm^4)
I =	16.33	bending inertia of arm ($x10^4$ mm^4)
post =	100NB x 3.18 API line pipe	
arm =	40 NB light PE BS 1387	

⇒ Torsional Period, T_t = **1.00** second



Note: Lumped mass includes all fixtures and arms (both sides if applicable) but ignores post mass.

Index

3

S