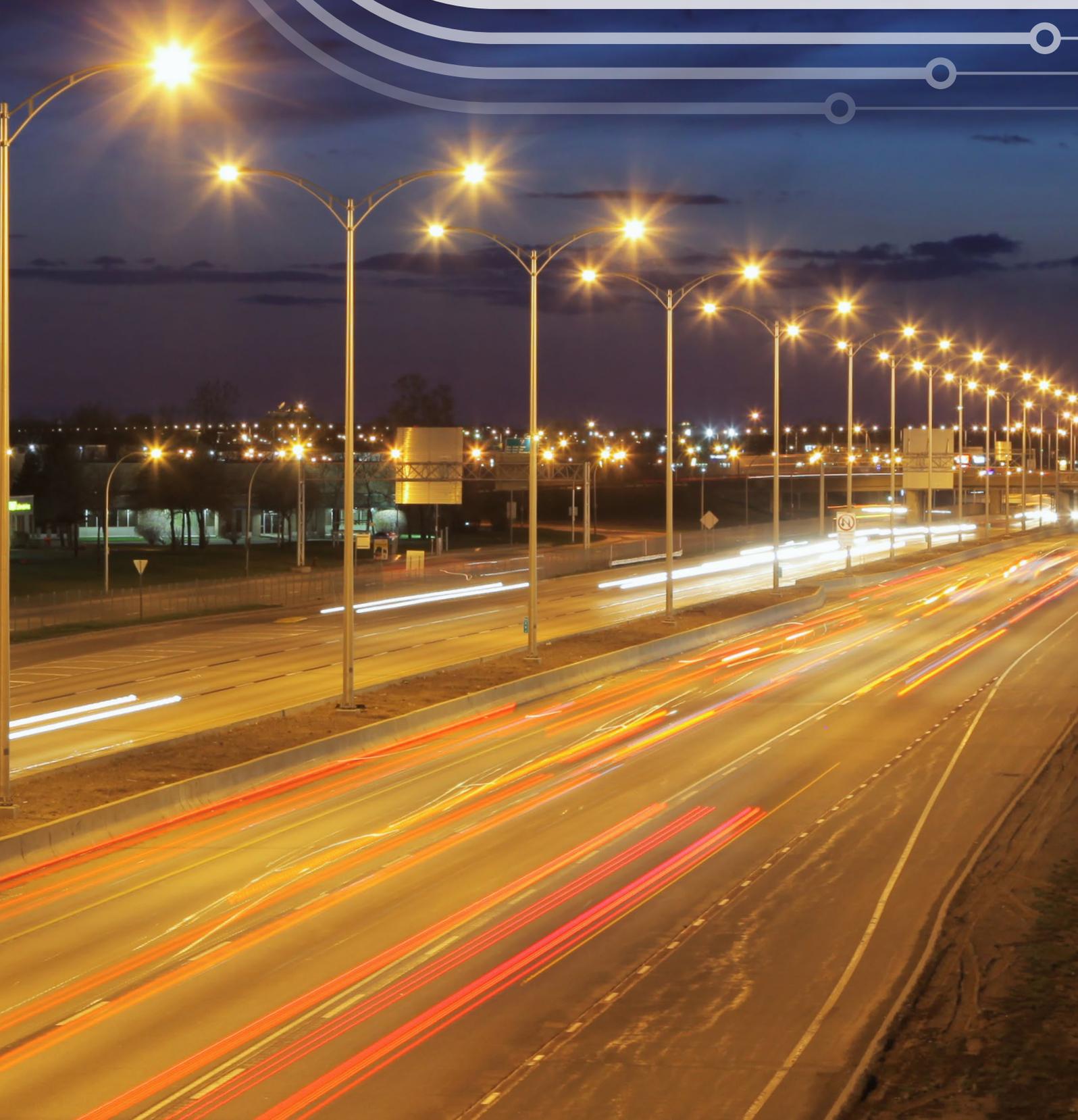


Street Lighting



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01

Introduction

PURPOSE

This document provides a guide to everyone involved in the management and design of public lighting installations on Auckland Transport routes or associated infrastructure. Its application will ensure consistent standards are maintained.

DIFFERENCES FROM STANDARDS

Where clauses in this chapter differ from the standards referred to, this document takes precedence. See Section 12.9 for a list of differences.

SCOPE

The scope of the document is outlined below.

Includes	Excludes
Outdoor car parks	Building facades
Pedestrian and cycle paths	Building interiors
Pedestrian crossings	Council parks
Public precincts, e.g. for shopping	Indoor car parks
Roads	Signs
Steps, stairs, ramps, subways and footbridges	Sports fields

PRINCIPLES OF STREET LIGHTING

Part of Auckland Transport's role is to ensure that the public lighting network is attractive, of good quality, easy to maintain, and cost effective. Public lighting is there to provide a safe environment for pedestrians and vehicles and to discourage illegal acts. At the same time, care must be taken to minimise spill light onto neighbouring properties and upward light (sky glow).

OTHER CONSENTS

Note that lighting other than street lighting in a designated public road, may require resource and building consents.

READ GOVERNING PRINCIPLES FIRST



Before reading the rest of this chapter, please read the governing principles on street lighting. It is available on: <https://at.govt.nz/media/339798/Street-Lighting-Guidelines-Feb2014.pdf>

02

DESIGN & INSTALLATION STANDARDS

Applicable standards

Street lighting must be designed and installed in accordance with all applicable standards with all current amendments, including;

- AS/NZS 1158 – Lighting for Roads and Public Spaces
- AS/NZS 3000 – Australia/New Zealand Wiring Rules
- AS/NZS 7000 – Overhead Line Design
- Auckland Transport Design Manual
- AT-ECS – Electrical Cable Specification
- AT-PS-ECS – Private Subdivision Electrical Cable Specification
- ESE 406 – Overhead Standard – Structures with street lights

All new lighting designs must use LED luminaires.

LEGAL FRAMEWORKS & REGULATORY

All works must be carried out in accordance with all relevant statutes, bylaws and regulations, with all current amendments, including:

Electrical Codes of Practice (ECP) and standards referenced therein.

- New Zealand Radio Interference Notices 1958 and 1985 and Radio (Television) Interference Notice 1961.
- Electricity Act 1992.
- Electrical (Safety) Regulations 2010.
- Health and Safety Work Act 2015
- Relevant Statutory Acts, Regulations and Bylaws.

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

REFERENCE



- AS 4282 – Control of the obtrusive effects of outdoor lighting
- NZ Transport Agency Infrastructure Design Standard (IDS) M30 Specification and Guidelines for Road Lighting Design.

03

Lighting design

All new or replacement luminaires must be LED luminaires.

3.1 Road classification

Lighting requirements are largely determined by the road classification and sub-category. The road classification and sub-category are specified by Auckland Transport, and may change over time.

The road classification and sub-category must be agreed by the Auckland Transport Team Leader Street Lights before the design process begins.

The AS/NZS 1158.1.1 and AS/NZS 1158.3.1 standards should be used to determine the appropriate lighting classification and sub-category. To assist this process, there are V and P Category Calculator Tools available in Appendix J.

ACCESS WAYS

Auckland Transport have elected to adopt higher design categories than would otherwise apply elsewhere in New Zealand due to the size of the population and traffic density present in Auckland. Hence, category P3 designs must satisfy P3 (i.e. not P3(NZ) or P3R). Similarly, P4 designs must satisfy P4 (i.e. not P4R).

Access ways must be lit to the appropriate P category as set out in the current version AS/NZS 1158 3.1. Table 2.2 of that document defines the criteria for determining the lighting subcategory. Then use the Auckland Transport P Category Calculator Tool (Appendix J2) to assist with the classification.

Luminaires must be pole top mounted, high enough to be out of reach of vandals but low enough to allow access from a ladder.

Consider the use of 4m high lighting columns to limit spill light.

OTHER SPACES

Other spaces (e.g. public precincts, transport terminals) will be classified as per AS/NZS 1158.3.1.

The lighting design must comply with requirements set out in the Transport Design Manual and including, but not limited to, the current version of:

- AS/NZS 1158 and all current parts.
- ECP 34 – Electrical Code of Practice.

CHECKLIST

The checklist below must be completed when submitting a proposed lighting design for approval.

TABLE 1 LIGHTING DESIGN SUBMISSION CHECKLIST

1	Initial considerations	a. A holistic approach to the lighting design has been considered. b. A night site visit (where applicable) has been completed, identifying features such as CCTV cameras, trees and neighbouring properties.	<input type="checkbox"/> <input type="checkbox"/>
2	Area classification	An appropriate lighting sub category classification has been agreed with Auckland Transport for all roads with the design scheme. The lighting classification/sub category for each road is:	<input type="checkbox"/>
3	Light source	Only LED luminaires are proposed.	<input type="checkbox"/>
4	Luminaire selection	Only luminaires included on the Auckland Transport LED (Appendix F) road lighting specification approved list are being used in the design scheme. Alternative luminaires may be submitted for approval on a specific project, however these will have to be assessed against the standards in Appendix B and must be approved by Auckland Transport before design begins.	<input type="checkbox"/>
5	Lighting column	Only Lighting Columns on the Auckland Transport Lighting Column (Appendix H) Specification Approved List were used in the design. Alternative lighting columns may be submitted for approval on a specific project. However these will have to be assessed against the respective standards in Appendix D and must be approved by Auckland Transport before design begins.	<input type="checkbox"/>
6	Electrical considerations	Electrical reticulation has been specified (where applicable).	<input type="checkbox"/>
7	Required information	All required information as described in section 12.8 is attached.	<input type="checkbox"/>

Checked by:

Date:

3.2 Design criteria

OPTIMISE DESIGN SPACING

The lighting design must optimise the design spacing between luminaire positions by considering the combination of the mounting height, luminaire type, lumen output and luminaire wattage.

POWER DENSITY

The straight road theoretical power density for the road reserve (P category) or carriageway (V category), with the proposed luminaire at the proposed mounting height, tilt and location, shall not exceed the following Power Density (PD) limits.

CATEGORY	P4	P3	V4	V3	V2	V1
Power density limit (w/m ²)	0.042	0.058	0.26	0.29	0.38	0.60

Power Density shall be determined using the maximum theoretical spacing in metres (S) [calculated using SAA STAN software such as Perfectlite™], the total input power in watts for the luminaire (P) and the road width in metres (W) [Reserve width for P Cat, Carriageway width for V Cat]. Note: This requirement applies to the maximum theoretical spacing only. The PD for the actual design will generally be higher due to placement constraints.

The Power Density formula is as follows;

$$PD = P/(S*W)$$

LIGHT SPILL

The lighting design must minimise glare and light spill on neighbouring properties and the environment. Designs must show horizontal illuminance isolines, including 2 and 10 lux lines with the calculation area including the complete road reserve and enough of the neighbouring properties to show the 2 lux line.

AS/NZS 1158 Lighting for Roads and Public Spaces gives requirements on the obtrusive effects of public lighting. Further guidance is provided in AS 4282 Control of the Obtrusive Effects of Lighting.

In addition:

- The maximum tilt for a luminaire must be zero degrees for P Category and 5° for V Category (zero preferred) from the horizontal unless otherwise approved by Auckland Transport.
- External screens must not be used.

LUMINOUS INTENSITY (GLARE)

P category roads - For new designs, Auckland Transport requires the luminous intensity at Gamma 80 to be limited to 400 cd and the peak intensity between 60° & 80° vertical at any horizontal angle to 1,800 cd.

THRESHOLD INCREMENT

V category roads - The Threshold Increment (TI) along the road must be no greater than 12%, with the pedestrian traffic lights as well as the adjacent street lights included in the calculation.

**COORDINATE TREES
& PLANTING****3.3 Trees and road lighting
column/luminaires**

There is no simple single solution for roads or streets with existing trees. However, the placement of lighting columns should always be coordinated with the trees to provide an acceptable urban landscape.

EXISTING TREES

For mature tree-lined roads with trees on one side, columns should be on the opposite side. If there are trees on both sides, lighting columns on each side may be required, located midway between trees, with long outreach arms to reach out under the canopy. Pruning trees as part of the design is not recommended as this is on going and can not be guaranteed.

Lighting columns should be located outside the dripline. Place street light columns where the tree root structure cannot interfere with underground cabling or other underground services, unless tree pits are used to confine the root structure.

NEW TREES

Where new trees are proposed, lighting columns must be located first to provide the correct lighting levels in accordance with AS/NZS 1158 and this Manual. Only then should trees be located to create the daytime aesthetics.

Trees must be positioned such that the expected future dripline, when the tree is mature, will provide a minimum clearance of 2 metres from the dripline. The expected future dripline of the trees when mature must be shown on the lighting design layout. Consider the potential impact of shadows from road lighting when the trees are mature. Exercise care when selecting the species of trees and positioning them in relation to street lights.

Also consider the use of 6m columns in treed subdivisions. This will result in additional lights, but will better distribute light onto the road from under the tree canopy and limit spill light.

3.4 Overhead reticulation

If there is overhead reticulation, consult with the power and telecommunications utilities. Consider supplementing the light from the other side of the road. Brackets on distribution company poles must comply with the ESE 406 joint Vector and AT standard.

Transpower assets require significant horizontal and vertical clearances, because of the long spans between supports.

3.5 Underground services

The design engineer shall obtain existing services plans from B4-U-DIG and ensure that all necessary clearances required by the utilities are maintained.

High pressure gas requires significant clearances.

04

APPENDICES D & H



NUMBERING

MINIMUM SET BACK

3.6 Maintenance factor

The design engineer shall use the method set out in the LED Road Lighting Luminaire Assessment Checklist in Appendix B to calculate Lumen Depreciation and to calculate the design Maintenance Factor (MF).

The designer shall also obtain the lighting manufacturer's lumen maintenance calculation, based upon their proprietary method of determining lumen depreciation over 85,000 hours (energised time), 25C ambient and LMF of 0.92 for a luminaire with a visor or 0.78 for a luminaire with exposed optics (unless a more stringent factor is applicable), allowing for all electronic and optical degradation factors. The LMF factors provided in BS5489 may be used in lieu of those recommended in AS/NZS1158.

The designer shall use the most conservative of the two maintenance factors for the design.

Lighting columns

4.1 Compliance

All street light columns must comply with the Street Lighting Column Specification and Assessment Methodology in Appendix D. All columns used in design must be on the approved list (Appendix H).

Each column must be individually numbered at time of manufacture, together with the month and year of manufacture. In addition to the unique column number, a QR code must be attached for easy on-site data access. These labels must be positioned above the gear door at a height of 2m above ground.

4.2 Lighting column location within the road reserve

Consider the standard proposed street cross sections shown in the Street Furniture section. The preferred location for columns is in the front grass berm. Where this does not exist, locate the column immediately behind the nominal 1.8m wide concrete footpath.

Unless otherwise agreed with Auckland Transport, the minimum column set back must be in accordance with AS/NZS 1158, clarified as follows. This shall apply equally to both V and P category roads unless stated otherwise.

1. General (from kerb face to the face of the column):

- 1m unless otherwise noted
- On V category roads – 1m where outside conflict areas (refer to AS/NZS1158.1.2 clause 8.6.1), or 3m otherwise

2. Frangible Columns (energy-absorbing or shear-base):

- If kerb present – as above
- If no kerb present – distance from road edge (painted line or edge of tar seal otherwise);
 - 1m minimum behind a rigid barrier (e.g. concrete)
 - Beyond the deflection zone of a non-rigid barrier (e.g. guard rail or wire rope)
 - 3m minimum where there is no barrier

3. Rigid columns:

- Posted speed limit 70kph or less – as for sections a) & b) above
- Posted speed limit greater than 70 kph;
 - Rigid columns are not to be used within 6m from the road edge if there is no kerb and no barrier
 - As for sections a) & b) otherwise

4. Joint use (traffic signal & lighting) columns – in accordance with traffic signal column requirement.**NEW SUBDIVISIONS**

In new subdivisions, lighting columns must be located:

- at the common boundary between adjacent property lots, or
- on the build-line, i.e. the corner of a building within the property lot (This is particularly relevant in regards to point c below), or
- within 15m of the corner if it is the first lighting column in a side street. Measure from the property boundary facing the street that vehicle has turned from. The column should be on the driver's left side.

FOOTPATHS

Street lighting columns should be clear of footpaths. Where this is not possible, place them towards the back edge of the footpath. Maintain a clear 1.5m minimum footpath space.

BUS STOPS

A lighting column shall be located within 10m on the approach side of the bus stop.

UNDER OVERHEAD POWER LINES

Where it is required to locate a lighting column under an overhead low voltage (LV [400/230V]) power line there must be a minimum of 1 metre clearance between the overhead conductor and the top of the lighting column at all times. Lighting columns must not exceed a height of 4 metres. The luminaire must not protrude beyond the front face of the kerb. The maximum upward tilt must not exceed 5°. For voltages greater than LV, ECP34 shall apply.

5.1 Requirements

STANDARDS

Luminaires must be manufactured and tested in accordance with SA/SNZ TS 1158.6, AS/NZS 60598.2.3 and NZ Transport Agency specification M30.

APPROVED LUMINAIRES

All roadway luminaires must comply with Auckland Transport LED Road Lighting Specification (Appendix B) and be included on the approved list (appendix F).

Auckland Transport requires all new luminaires to be LED type. The approval process for roadway LED luminaires is set out in Appendix B.

APPROVED LIST

All new lighting designs must use luminaires from the appropriate approved list.

APPENDICES F & G



The current approved lists are shown in:

Appendix F, Road Lighting LED Approved Luminaire List (AT-LALL)

Appendix G, Amenity Lighting LED Approved Luminaire List (AT-ALAL)

NEMA RECEPTACLE

Roadway luminaires must be fitted with either a 5 or 7 contact NEMA receptacle, compliant with ANSI C136.41:2013.

LED DRIVER

The driver shall be DALI dimmable constant current driver

IN-GROUND UP-LIGHTS

In-ground up-lights must not present a tripping or slip hazard. Internal anti-glare attachments must be positioned to limit the upward light. In addition, these lights must:

- meet AS/NZS 60598.1
- have impact resistance of IK10
- have ingress protection of IP67 or IP68 (preferred).

BOLLARD LUMINAIRES

The use of bollard luminaires must be pre-approved by Auckland Transport. The construction and finishes of bollard luminaires must be consistent with the requirements for columns and luminaires. The maximum luminous intensity in any normal viewing direction must not exceed 500cd/m².

IN-FILL LUMINAIRES

Infill luminaires must be LED type unless specifically agreed otherwise with Auckland Transport.

LABELLING

Labelling must be in accordance with the current version of SA/SNZ TS 1158.6.

5.2 Light source

LED ROAD LIGHTING

Only LED luminaires meeting the LED Road Lighting Luminaire Specification (Appendix B) and included on the Auckland Transport approved list (Appendix F) or the NZ Transport Agency M30 approved list may be used for Category V and Category P lighting designs. All new or replacement luminaires must be LED luminaires.

LAMP REPLACEMENTS

HID lamp replacements must utilise the minimum rated lumens defined in Appendix A, HID Road Lighting Specification.

06

Road lighting in specific areas

STANDARDS

Road lighting in rural areas is addressed in AS/NZS 1158.1.1 clause 3.5. Since the ambient light and sky glow in rural areas is significantly less than in built-up areas, take special care to limit spill light and glare.

In addition:

- Keep road lighting to the minimum applicable standard at intersections and road terminations.
- Minimise lighting beyond these areas. Only provide sufficient lights so that a pedestrian walking along the road always has a light in view.
- Give priority to roads that are designated for traffic detours from main highways.

6.2 Safety and security lighting

A principle of Crime Prevention through Environmental Design (CPTED), is that lighting can reduce the risk of crime and improve safety levels on local roads and public spaces. See also AS/NZS 1158.3.1

6.3 Pedestrian crossing lighting

STANDARDS

Pedestrian crossings must be lit in accordance with the current version of AS/NZS 1158.4. Luminaires shall have a photometric distribution specifically designed to suit pedestrian crossings. Use LED luminaires.

UNSIGNALISED

The design criteria in AS/NZS 1158.4 shall apply at unsignalised crossings.

At an un-signalised pedestrian crossing, AS/NZS 1158.4 allows the use of a Belisha disc or a flashing Belisha beacon. Auckland Transport will specify which is appropriate for the specific crossing.

SIGNALISED

No specific requirements.

6.4 Traffic Calming Devices - shift following sections down

CATEGORY P LIT ROADS

At local area traffic management devices, including roundabouts, speed tables, speed humps, pedestrian refuges, etc intended to:

- Slow traffic on category P roads: Achieve 3.5 lux horizontal point illuminance in accordance with AS/NZS1158.3.1 on the approach faces of the device. This is not additional to road lighting.
- Deter traffic on category P roads: Install reflective devices as per the Manual of Traffic Signs and Markings. (MOTSAM)

Auckland Transport will determine whether local area traffic management devices are slowing or deterring traffic. This should be agreed before design begins.

Refer to AS/NZS 1158.1.1 for lighting of traffic management devices on V category roads.

6.5 Adjacent access routes

Where the primary area to be lit is accessed by a road or path that also has to be lit, the access way must be lit to the same standard with lighting systems of similar appearance as those in the primary area

6.6 Isolated Intersection

NZTA - M30 provides guidance in this area.

07

Electrical

7.1 Equipment & components

Electrical equipment and components must be manufactured to comply with the applicable New Zealand or international standards and must be readily available as spare parts. These components must be incorporated into the luminaire or column, be protected against the ingress of dust and moisture to the appropriate ingress protection (IP) level and be easily accessible for repair or replacement.

Warranties on these components must be the manufacturers' standard warranty and be applicable from the date of handover of the installation to Auckland Transport for at least another 10 years.

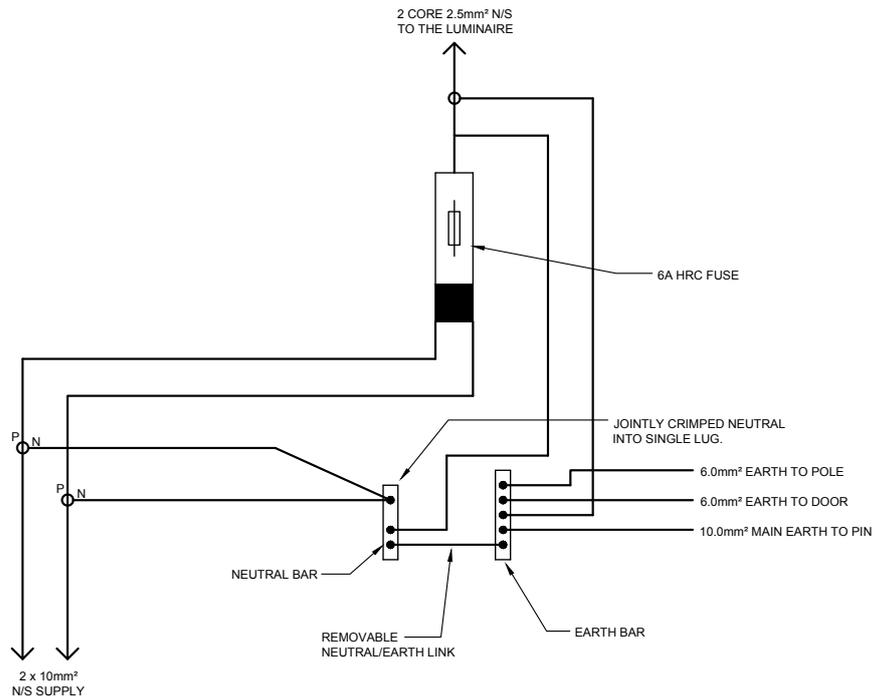
The installation must be designed for economic use of energy.

Electronic ballasts for HID lamps, are more efficient than magnetic ballasts and prolong the life of the lamp by regulating the lamp voltage to within close tolerances.

Auckland Transport will be installing adaptive lighting in selected areas. This reduces spill light and sky glow, as well as energy consumption at times of reduced traffic volumes. The Central Management System (CMS) can be further extended through traffic sensors to be fully interactive, adjusting the light levels. In addition, allowance can be made for weather conditions. Each luminaire must be supplied with either a 5 or 7-contact NEMA receptacle, compliant with ANSI C136.41.

Each street light position is an installation as defined in AS/NZS 3000. All work must be carried out in accordance with this standard, as well as Electricity (Safety) Regulations 2010 and the applicable electrical codes of practice. Refer Figure 1.

Figure 1 Standard streetlighting pole electrical connections



CONNECTION

Each street light must be connected directly to the distribution company network, providing continuous supply. In some sections of road, it may be cost effective to connect more than one light to a single connection from the low-voltage network.

The number of lights connected to a single circuit should be limited to four in any one direction from the supply point. Where more than one light is fed from a single distribution company connection, a 10mm² N/S single core cable must be looped in and out of each column. Breach joints are not allowed as part of a new design.

The boundary between the network company and the street light network is the load side of the fuse connected to the common LV network.

NO NETWORK

Where there is no established distribution company network and many lights have to be supplied from a single network connection, install two separate cables, with each cable looping into every second street light column. This means that, if a circuit fault occurs, only every second light will be out. This system is most used along long cycle routes. Please agree details of the cabling configuration with Auckland Transport before design begins.

At the base of each column, between 600 and 900mm above ground level, a fuse board must be installed inside the column to meet the requirements of AS/NZS 3000, with a neutral and earth bar to comply with the requirements of an installation. A 6 amp type C HRC fuse link must connect the light to the incoming supply. **Miniature circuit breakers (MCBs) are not permitted.** See Figure 1.

SLIM COLUMNS

Slim columns approved for use on the network may use Transnet

SHEAR BASE COLUMNS

Amerace 65U in line fuse connectors (IP68) or equivalent. The neutral and earth bar arrangement must still comply with AS/NZS3000.

Shear base columns shall be used where the posted speed limit is ≥ 70 kph, unless the column is located behind a barrier, beyond the deflection zone.

All shear base type columns must incorporate IP68 plug and socket connections to ensure that the column disconnects from the live supply in the event of vehicle impact or similar occurrence (Transnet Amerace 65U or equivalent).

LUMINAIRES ON DISTRIBUTION COMPANY POLES

In areas where a distribution company's network is overhead and Auckland Transport has installed luminaires on distribution company poles, each luminaire must be connected directly to the distribution company supply using an HRC fuse in the live conductor. The fuse carrier must be a 20 amp Michaud K223. The HRC fuse link must be 6 amps with fusing characteristic type C. Each luminaire along the street must be connected to alternate phases to keep the load on the low-voltage network balanced.

Luminaires attached to Vector poles must comply with the Vector standard ESE406.

The boundary between the street light network and the network company is the load side of the fuse.

LUMINAIRE CONTROL

Auckland Transport is in the process of changing the control of all road lights to a Central Management System (CMS). During the changeover, a mix of several controls will co-exist. Auckland Transport will advise the control type to be used in any particular area at time of briefing.

INTERNAL WIRING

The cable from the fuse board at the base of the column to the luminaire must be two-core 2.5mm² neutral screen. The screen must be earthed.

EARTHING

Each column must be earthed by means of 10mm² copper insulated wire, exothermically welded to a driven earth electrode (16mm diameter copper-bonded steel earth rod), located 300mm from the column base. Sherlock connectors are approved for burying. The connector must be buried 300mm below the pavement surface. AS/NZS 3000 applies. See Figure 2.

Where it is not possible to install a driven earth electrode due to rock for example, the following horizontal earth electrode is acceptable;

A six metre (6m) length of 35 mm² (19/16) bare (uninsulated) copper conductor buried to a depth of 600mm below the surface. The conductor must be embedded in Bentonite slurry or Ground Enhancement Material (GEM). The buried conductor should be placed with 3m either side of the lighting column. The horizontal earth electrode to column connection shall be the same as described above for the driven earth electrode.

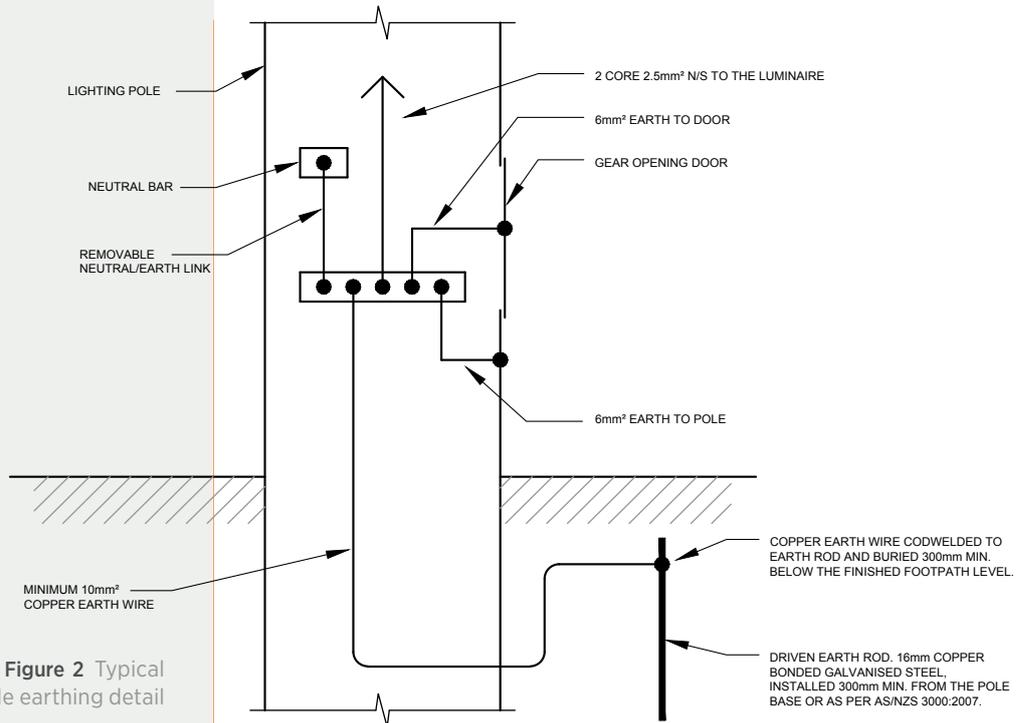


Figure 2 Typical pole earthing detail

CONNECTION AT TRAFFIC CONTROL CABINETS

For connection at traffic control cabinets, see Figure 3.

THIRD PARTY CONNECTIONS

Third party connections to street light circuits is at the sole discretion of Auckland Transport. The street light pole is not suitable for many connections to other devices. Please contract the team leader street lights for further details.

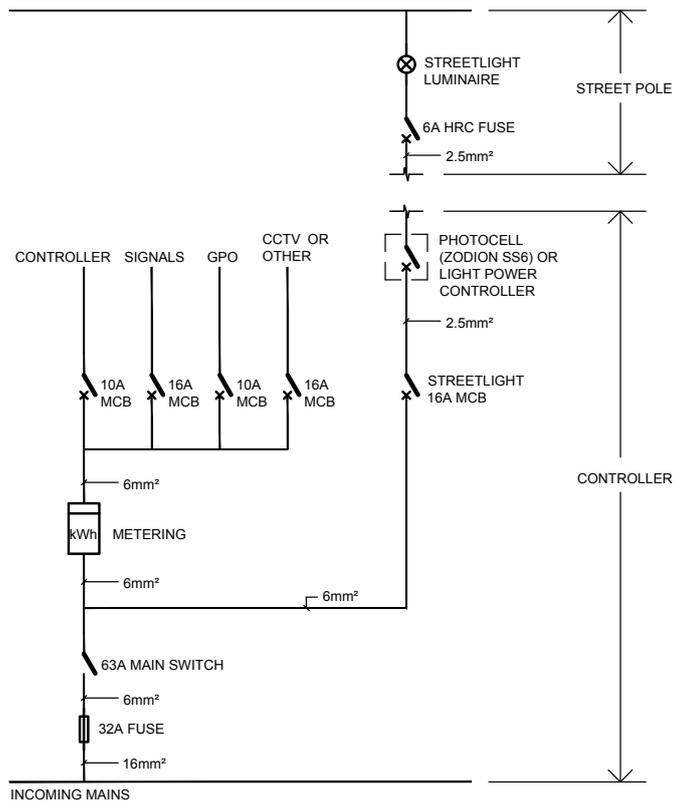


Figure 3

OPEN PRIVATE NETWORKS

Private networks, that allow embedded customers (embedded network) to purchase energy on the open market, must comply with the following:

- The AT owned street lights will be Time of Use (TOU) metered on dedicated circuits. The cabling and connections to be in accordance with Design Manual section 12.7.1
- The cables, columns and luminaires must be installed by an approved AT contractor to work on the street light network.
- AT will own and maintain the cables from the fuse connecting the cables to the private network.
- The network owner will use the same rates (for network charges) as published by the neighbouring Lines Company. These charges will be invoiced to the nominated Electricity Retailer supplying AT.
- Columns and luminaires must be on the appropriate AT Approved List

CLOSED PRIVATE NETWORKS

Private networks, who's customers are captured behind the bulk meter (customer network), must comply with the following:

- The AT owned street lights will be directly connected to the Vector network in accordance with the AT Design Manual section 12.7.1
- Details of the connection to the Vector network must be agreed with Auckland Transport and Vector prior to installation.
- Cabling must be in accordance with the Private subdivisions Cable Specification (AT-PS-ECS)
- The cables, columns and luminaires must be installed by an AT contractor approved to work on the street light network.
- Columns and luminaires must be on the appropriate AT Approved List.

UNDERGROUND CABLE SPECIFICATION

AT has two underground cable specifications:

- Electrical Cable Specification – AT-ECS
- Private Subdivisions Cable Specification – AT-PS-ECS

These specifications must be used when installing cables that will be owned by AT in public roads.

OVERHEAD CABLE CONNECTION

If neutral screen cable is used between the luminaire and the overhead line point of connection, where the cable sheath is stripped back to expose the 2 insulated conductors, a custom heat shrink sleeve designed to individually seal around each of the two conductors shall be used to ensure a water tight seal, such that water cannot track within the outer sheath into the luminaire.

SAFE WORKING DISTANCES

Safe distance from electric lines and cables must be maintained at all times. ECP 34 and the Safety Manual parts 2 and 3 – Electrical Industry (SM-EI) set out the minimum approach distances for approved qualified staff with current Work Type Competencies (WTC).

PERSONAL PROTECTIVE EQUIPMENT

All personnel working on the Auckland Transport lighting network must wear the appropriate PPE on all sites at all times.

WORK ON OR NEAR DISTRIBUTION COMPANY NETWORK

All work on or near a lines company network must be carried out in accordance with health and safety requirements set out in ECP 34 and the Safety Manual – Electrical Industry (SM-EI). All workers must have the appropriate Work Type Competency (WTC). All aspects of the contract Health and Safety Management Plan must be adhered to at all times.

08

Approvals

APPROVAL NEEDED

All proposed changes or additions to the public lighting network must be approved before construction. All designs will undergo a peer review by an AT approved reviewer.

ALTERNATIVE STANDARDS

Alternative road lighting design solutions utilising computer calculations based upon CIE standards are acceptable, provided that clear correlation is supplied to prove equivalence with the current version of AS/NZS 1158 for the specific project parameters.

REQUIRED INFORMATION

The following information is required for the review:

- A lighting design report and lighting design plan(s) scaled to 1:500.
- The lighting design layout shall include all relevant topographic information – property boundaries, driveway crossovers, kerb line, footpath, landscaping, overhead power lines and any other elements relevant to lighting design constraints.
- Electronic copy of the lighting design plan, showing luminaire positions.
- Documentation in accordance with the relevant part(s) of AS/NZS1158 to show compliance.
- Lighting sub-category used in the design, e.g. V2, P4. These must be recorded on each lighting plan.
- For category V roads: Luminance calculations from Perfectlite together with Isolux plots from AGI32, illustrating relevant contours for the lighting sub-category with illuminance and point illuminance values necessary to demonstrate compliance. Also include a 10 lux horizontal isolux line.
- For Category P roads: Illuminance diagrams from AGI32 illustrating relevant contours for the lighting sub-category with illuminance and point illuminance values necessary to demonstrate compliance.
- Information as per tables 3 and 4 below.
- Include 2 and 10 lux isolux lines for the complete road reserve plus a further nominal 10m into the adjacent properties for both P & V category designs.

TABLE 2 INFORMATION REQUIREMENTS FOR CATEGORY P ROADS

Parameter	Symbol	Notes
Average horizontal illuminance	Eh	
Point horizontal illuminance	Eph	
Illuminance (horizontal) uniformity	UE2	
Point vertical illuminance	Epv	
Luminous intensity at Gamma 80	IG80	For maximum luminaire watts in the design
Peak luminous intensity	IPEAK	For maximum luminaire watts in the design
Perfectlite maximum spacing		Straight sections

TABLE 3 INFORMATION REQUIREMENTS FOR CATEGORY V ROAD

Parameter	Symbol	Notes
Average carriageway luminance	L	Straight sections
Overall uniformity	Uo	Straight sections
Longitudinal uniformity	UL	Straight sections
Threshold increment %	TI	Straight sections
Surround (verge) illumination ratio	Es	Straight sections
Perfectlite maximum spacing		Straight sections
Maximum spacing at bends		Bends – Summarise reduced spacing values, showing the bend radius (m), reduction factor and reduced spacing (m).
Point illuminance	Eph	Intersections, pedestrian crossings, pedestrian refuges and defined pedestrian crossing routes at signalised crossing
Illuminance (horizontal) uniformity	UE1	Intersections and pedestrian refuges only
Vertical illuminance	EPV	Pedestrian crossing

09

TRANSPORT DESIGN MANUAL TAKES PRECEDENCE

Differences between the Transport Design Manual and the standards

Where there are differences between the Transport Design Manual and the standards, this manual takes precedence. The following are instances where Auckland Transport's requirements vary from the standards:

- The maximum tilt for a luminaire must be zero degrees for P Category and 5° for V Category (zero preferred) from the horizontal unless otherwise approved by Auckland Transport. See Section 12.3.2.
- The Threshold Increment (TI) along the road must not be greater than 12%. See Section 12.3.2.

- Category P roads: Illuminance diagrams from AGI32 illustrating relevant contours for the lighting sub-category with illuminance and point illuminance values are necessary to demonstrate compliance. See Section 12.8.
- Category P roads: Record maximum luminous intensity at Gamma 80 on the drawings. It should not exceed 400cd. See Section 12.3.2. Similarly, the peak luminous intensity should not exceed 1800cd.
- For category P roads the maximum luminaire power shall not exceed 28 Watts unless agreed with the AT Team Leader Street Lights.
- Auckland Transport have elected to adopt higher design categories than would otherwise apply elsewhere in New Zealand due to the size of the population and traffic density present in Auckland. Hence, category P3 designs must satisfy P3 (i.e. not P3(NZ) or P3R). Similarly, P4 designs must satisfy P4 (i.e. not P4R).

Appendices

- APPENDIX A HID Road Lighting Specification
- APPENDIX B LED Road Lighting Luminaire Specification and Assessment Checklist
 - B1 - LED Road Lighting Luminaire Specification
 - B2 - LED Road Lighting Luminaire Assessment Checklist
- APPENDIX C LED Amenity Lighting Luminaire Specification and Assessment Checklist
 - C1 - LED Amenity Lighting Luminaire Specification
 - C2 - LED Amenity Lighting Luminaire Assessment Checklist
- APPENDIX D Road Lighting Column Specification, Assessment Methodology and Checklists
 - D1 - Road Lighting Column Specification
 - D2 - Road Lighting Column Assessment Checklist
 - D3 - Road Lighting Column Evaluation Checklist
- APPENDIX E Lighting Design Submission Checklist
- APPENDIX F Road Lighting LED Approved Luminaire List (AT-LALL)
- APPENDIX G Amenity Lighting Approved Luminaire List (AT-ALAL)
- APPENDIX H Road Lighting Column Approved List (AT-LCAL)
- APPENDIX J V and P Category Calculator Tools for Road Classification
 - J1 - V Category Calculator Tool
 - J2 - P Category Calculator Tool
- APPENDIX K Standard drawings
 - K1 - Street lighting electrical connections
 - K2 - Street lighting earthing details
 - K3 - Traffic Signal - Street lighting combination electrical schematic
 - K4 - Typical shear base detail