NORTHLAND TRANSPORTATION ALLIANCE

DESIGN MANUAL

STREET LIGHTING

Document Version History

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Document Quality Control

Action	Name	Signed	Date
Prepared by	John Mckensey		15/10/2020
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Approved by	John Mckensey		15/10/2020
on behalf of	Dean Coleman – Managing Director		

CONTENTS

1 Introduction

1.1 Purpose

This document provides a guide to everyone involved in the management and design of public lighting installations owned by the Road Controlling Authorities (**RCA's**) in the Northland Region. Its application will ensure consistent standards are maintained.

The Northland Transportation Alliance **(NTA)** is responsible for public lighting for areas north of Auckland and comprises;

- Far North District Council
- Kaipara District Council
- Whangarei District Council

1.2 Acknowledgement

NTA wish to thank Auckland Transport for allowing NTA to use their Transport Design Manual – Street Lighting section and Appendices as the basis for the NTA Design Manual **(DM).**

1.3 Differences from standards

Where clauses in this document differ from AS/NZS1158, this document takes precedence. See Section 9 for a list of significant differences.

1.4 Updating

This document will be reviewed and updated from time to time. Please make sure you use the most up to date version.

1.5 Scope

The scope of the document is outlined below.

Table 1: Scope

Includes	Excludes
Outdoor carparks, within RCA owned and/or managed areas	Building facades
Pedestrian and cycle paths, within the road reserve or within other RCA owned and/or managed areas	Building interiors

Pedestrian crossings, within RCA owned and/or managed areas	Council parks and reserves
Public precincts, within RCA owned and/or managed areas, e.g. plazas and squares	Indoor car parks
Roads and access ways, within RCA owned and/or managed areas	Signs
Connecting elements, within RCA owned and/or managed areas, e.g. Steps, stairs, ramps, subways and footbridges	Sports fields

1.6 Principles of street lighting

Part of Northland Transportation Alliance'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).

1.7 Other consents

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

1.8 Lighting equipment approval

The NTA does not have a lighting equipment approval process and instead refer to Auckland Transport approved lists.

Luminaires and columns must be Auckland Transport approved. Auckland Transport maintains 3 lists of approved equipment;

- AT-LALL: LED Roadway Lighting – Approved Luminaire List
- AT-ALAL: LED Amenity Lighting – Approved Luminaire List
- AT-LCAL: Roadway Lighting – Approved Column List

Luminaires listed on AT-LALL may also be used for Amenity applications where appropriate.

Luminaires selected from the Auckland Transport approved list may only be used in the Northland Region RCA's assets if the whole of life cost analysis undertaken by the proposer can demonstrate a value for money for the RCA.

At the time of preparation of the DM, AT were anticipating that the above lists would become publicly available to view on their website (www.at.govt.nz). This should provide the most up to date version of the lists.

1.9 Design approval

All outdoor lighting that will be vested to Northland RCA's must adhere to the following design approval process:

- Once the road design has been determined, request a lighting design brief from Northland Transportation Alliance. Details of the proposed development will be required sufficient for NTA to determine the expected use of the roads and ancillary spaces.
- Unless exempted, a Traffic Impact Assessment and a copy of the Council Resource Consent decision must be supplied to NTA to ensure that the brief is correctly informed. NTA recommends that this be supplied prior to the creation of the brief in order to minimise the risk of later changes to the brief. Regardless, it must be supplied prior to the design review.
- **Refer DM Section 8 – Required Information in addition to the NTA brief for design requirements.**
- NTA recommends that the lighting designer engage with the design reviewer as early as possible in the design process.
- Undertake the lighting design in accordance with the brief and submit to NTA for approval.
- The lighting design must be undertaken prior to the landscape design. The landscape design must be supplied with the lighting design when the lighting design is submitted for approval.
- When planning the space, the developer should be mindful that the ideal location for a lighting column is in line with common property boundaries. When they are placed in front of residential properties complaints frequently arise. They must also be placed at least 1m from a driveway, 1m back from the kerb and clear of trees as described in the "New trees" Section of the DM.
- The number of lighting columns should be kept to a minimum consistent with these requirements, so the developer should allow suitable space for lighting columns at separations close to the maximum spacing calculated by the lighting designer.
- Higher density subdivisions can be prone to conflicts precluding full compliance with these requirements. Therefore, if there is clearly no reasonable alternative, NTA may, at its absolute discretion, permit some variance from these requirements. Infringement of the minimum setback from the kerb is unlikely to be permitted.
- The applicant is encouraged to discuss any concerns in this regard with NTA or their appointed agent while developing the subdivision design. It would also be prudent for the developer to obtain the maximum luminaire spacing from their lighting designer prior to detailed design, to assist in the subdivision hard and soft landscape design.

- Construction of the lighting installation may not commence until the design is approved.
- ***Current DM version:*** The design shall satisfy the version of the DM current at the time the design is submitted for approval.
- ***Sunset Clause:*** The approval will remain current for 12 months from the date of approval. If the lighting has not been installed in that time, the design must be updated as necessary to comply with the current DM, DM Appendices and Standards and resubmitted for approval. NTA recommend that the lighting equipment (luminaires and columns) should not be purchased until it is known that the installation can be completed within the available time.

1.10 Installation approval

All lighting installations must adhere to the following installation approval process:

- **All lights must be entered into the RAMM database before they are livened.**
- The installation must be in accordance with the approved lighting design documents and the road and landscape design that the lighting design is based upon.
- **Lighting Designer Certification:** Once the installation has been completed, the lighting designer must provide a letter to NTA certifying that the installation has been installed in accordance with the NTA approved design (i.e. lighting and related road and landscape design).
- NTA will check the installation prior to accepting the assets.
- Any defects advised by NTA must be remedied to the satisfaction of NTA before acceptance of the assets.
- The developer will be responsible for all lines company and energy provider charges until the date that the asset is vested to NTA.

2 Applicable standards

2.1 Design & installation standards

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

- Northland Transportation Alliance – Design Manual
- AS/NZS 1158 – Lighting for Roads and Public Spaces
- AS/NZS 3000 – Australia/New Zealand Wiring Rules
- AS/NZS 4282 – Control of the obtrusive effects of outdoor lighting

- AS/NZS 7000 – Overhead Line Design

2.2 Legal frameworks & regulatory

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

- New Zealand 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 at Work Act 2015 (in particular – the preparation of a Safety in Design register)
- Relevant Statutory Acts, Regulations and Bylaws
- The requirements of Network Supplier's Health and Safety Standards (NHSS)
- Operative Far North District Plan
- Operative Kaipara District Plan
- Operative Whangarei District Plan

2.3 Reference

NZ Transport Agency Infrastructure Design Standard (IDS) M30 *Specification and Guidelines for Road Lighting Design*

3 Lighting design

All new lighting designs or replacement luminaires must be LED.

3.1 Lighting Designer

Lighting design shall be completed by a lighting design company utilising individual experienced Lighting Designers that have the following pre-requisites:

a) Be a suitably qualified and a competent person. A competent lighting designer is a person, who has acquired, through training, qualification, experience or a combination of these, the knowledge and skill enabling that person to perform the required task correctly.

b) Be conversant with Australian/New Zealand Standards and local practices concerning lighting design for public outdoor areas (preferably with a minimum of 3 years' experience).

c) Have an established track record of competent road lighting design from similar projects.

d) An appropriate level of membership from the IESANZ is encouraged. (Note: A list of MIES and RLP qualified members and their specific lighting design discipline is held on the IESANZ website).

3.2 Design Principles

3.2.1 Road Classification

Lighting requirements are largely determined by the road classification and sub-category. These are specified by Northland Transportation Alliance, and may change over time and must be agreed by the Northland Transportation Alliance 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 F.

3.2.2 Pedestrian access ways

Pedestrian 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 Northland Transportation Alliance P Category Calculator Tool (Appendix F2) to assist with the classification.

The minimum category shall be PP3.

Luminaires must be pole top mounted at a height suitable to allow access by ladder.

The use of 4m high lighting columns is recommended wherever practical within narrow walkways to limit spill light, minimise the risk of vandalism and for ease of maintenance access.

Where spill light may unavoidably exceed District Plan limits, discuss with the NTA during design and agree how to proceed.

3.2.3 Verandas

Within public road reserves, lighting outside daylight hours shall be provided under verandas to a minimum of sub-category PA2 of AS/NZS1158.3.1. For lighting that will not be vested to the Council, a separate metered power supply is required. In addition, refer to the relevant District Plan.

3.2.4 Private access ways

Lighting to AS/NZS1158.3.1 sub-category PR4 is required where there are 10 or more parking spaces which are likely to be used during the hours of darkness. The parking and manoeuvring areas and associated pedestrian routes must be adequately lit during use in a manner that complies with the District Plan.

The lighting will not be vested in Council, so it will require a separate metered power supply.

3.2.5 Other spaces

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

3.2.6 Lighting Design

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

- AS/NZS 1158 – all parts
- AS/NZS 4282
- ECP 34

The design arrangement referenced in Perfectlite as “5S” (i.e. a Staggered arrangement in a dual carriageway road) shall not be used.

NTA do not consider a painted median to constitute a dual carriageway. Any such situation shall be treated as a single carriageway.

Within a V category road, where parking areas are defined by solid barriers (i.e. landscaped islands or similar) such that those spaces cannot reasonably be used as driving lanes, the V category calculation shall be undertaken from the road side of the defined parking area (Refer figure 1). Consideration should be given to ensure that the footpath is adequately lit if the design is not undertaken from kerb to kerb. In such situations, the minimum preferred design category for the first 3m of the berm from the kerb is PP3 (horizontal illuminance) [“3m berm zone”]. Otherwise, the roadway design area shall be kerb to kerb.

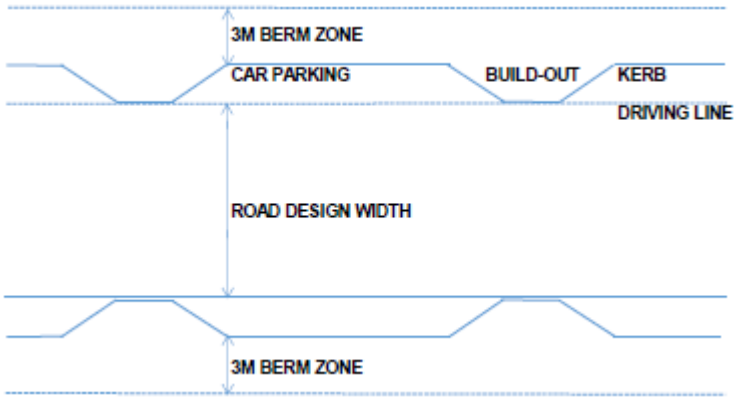

Figure 1: V category design width if hard parking build-outs present

Parking areas beside roads, whether parallel or angled, shall be considered part of the road reserve. They should not be treated as carparks as defined in AS/NZS 1158.3.1.

The minimum design standard for pedestrian pathways / cycle ways shall be PP3.

3.2.7 Safety in design

The lighting designer must prepare a Safety in Design (SiD) register and supply as part of the design when presented for review.

The SiD register integrates hazard identification and risk assessment methods in the design process. It must demonstrate how to eliminate, isolate or minimise the risk of death, injury and ill health to those who will construct, operate and maintain.

The Lighting Designer is responsible for these inputs in relation to lighting. Consequently, the SiD register shall be submitted as part of any review process instructed by NTA Streetlights and referenced on the design drawings.

Note: *This is a legal requirement under the Health and Safety at Work Act 2015. The designer cannot devolve responsibility for this aspect of the submission to a third party.*

3.3 Design criteria

3.3.1 Equipment selection

The luminaires and columns used in the design must be selected from the Northland Transportation Alliance approved lists. In addition, the following requirements apply;

1. The luminaire options stated in the Approved List are those that were reviewed at the supplier's request and determined to satisfy the performance requirements for a series of representative test cases. Any optic available for the Approved make and model of luminaire, may be considered for site specific design,

provided that all of the applicable performance requirements in the NTA-DM and any project-specific additional requirements of the NTA are satisfied.

The luminaire wattage must not exceed the maximum values stated in the Approved List as the luminaire has not been reviewed for the increased heat that would result from a higher wattage. The design Maintenance Factor* and projected luminaire life could be affected.

Proof of compliance for any such alternative proposed shall be provided to NTA.

***Note: The NTA Maintenance Factor calculation utilises a different methodology to that outlined in AS/NZS 1158.**

2. The luminaire must be suitable for the proposed use. If a design is offered with significantly reduced spacing compared with that achievable with another luminaire in the Approved List, NTA may reject the luminaire selection and the design.
3. AS/NZS1158.4 defines the lighting design requirements for un-signalised pedestrian crossings. The luminaire models on the Roadway Lighting Approved Luminaire List (Appendix C) that may have suitable optics are stated in the introductory notes to the list.
4. Ensure the weight of the luminaire is considered in regard to lighting column design. Standard lighting columns installed prior to 2012 were typically designed for a maximum luminaire weight of 9kg up to 8m high, and 12kg if higher. Current approved columns for new installations are designed for a maximum luminaire weight of 9kg if 4m, 6m or 8m high, 13kg if 10m high and 15kg if 12m or 14m high.
5. Luminaires on the Roadway Lighting Approved Luminaire List (Appendix C) may be used for Roadway and Amenity lighting applications. Luminaires on the Amenity Lighting Approved Luminaire List (Appendix D) may only be used for Amenity lighting applications.

3.3.2 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.

Note: Commence with a column height and setback appropriate for the location, then determine the lowest wattage luminaire option that will achieve the agreed design parameters, for the minimum number of lighting column locations.

3.3.3 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.

Table 2: Power density limits	
Category	**Power Density Limit (W/m^2)**
PR5	0.042
PR4	0.050
PR3	0.058
V4	0.32
V3	0.35
V2	0.46
V1	0.73

Power Density shall be determined using the maximum theoretical spacing in metres (S) [calculated using SAA STAN software such as Perfect Lite™], 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:

1. This requirement applies to the maximum theoretical spacing only.
2. The V Cat power density limits are based on the revised road reflectance specified in AS/NZS 1158.2:2020. Perfectlite calculations must be based on the revised reflectance value.

The Power Density formula is as follows;

- For an 'opposite' arrangement;

  PD = (2*P)/(S*W)

- For all other arrangements;

  PD = P/(S*W)

3.3.4 Power

Refer to the earlier Section "Equipment Selection".

In the immediate vicinity of an intersection, roundabout, LATM or the like, the luminaire wattage may be increased, from that used for other parts of the road, by a maximum of 25%, only if required in order to achieve compliance.

3.3.5 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 lux 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. Vertical illuminance calculations must also be provided as described below.

The relevant District Plan **(DP)** spill light limits shall apply. However, in addition to those limits, the spill light limits in AS/NZS 4282:2019 shall also apply as clarified below. The most stringent requirement (i.e. DM vs DP) will apply in the event of conflict.

The spill light limits for residential buildings **(building)** are stated below. For the purpose of this document, residential buildings include residential dwellings (e.g. house/apartment), commercial accommodation (e.g. motel/hotel) and residential/therapeutic care (e.g. rest home/hospital).

In accordance with AS/NZS 4282:2019 (Control of the obtrusive effects of outdoor lighting), where the locations of building windows are known, the following limits shall apply, measured in the vertical plane at the window. Refer to AS/NZS 4282:2019 for further details.

1. On V-Cat roads: Zone V: 4 lux
2. On P-Cat roads (where lit to the relevant section of AS/NZS 1158):
   a. Zone R1: if boundary >10m from window: 1 lux
   b. Zone R2: if boundary <10m from window: 2 lux
   c. Zone R3: as for ‘b’, but lighting a LATM/ roundabout: 4 lux
   d. Zone RX: as for ‘c’, but lighting a pedestrian crossing: 4 lux

This must be calculated as a vertical plane at each residence with the measurement perpendicular to the plane and with;

- Minimum height 1.5m
- Maximum height equal to top of highest window

  (Alternatively, equal to luminaire height where there is no building at present)
- Horizontal and vertical spacing 2m

[NOTE: This can be calculated as a worst case single plane along a complete street or section of street, at a common distance back from the front property boundary, equal to the minimum setback of any house in the street (rather than an individual calculation plane at each house)].

Alternatively, **only** where there is no building and the expected location of a possible building is unknown, a limit of 10 lux shall apply, at the boundary, measured in the horizontal plane and at ground level.

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

In addition:

- Luminaires for all new designs must be set to zero tilt.
- NTA will accept tilt up to 5 degrees on V-Cat roads only, but only if absolutely necessary. Confirm with NTA prior to design.
- External screens must not be used.

3.3.6 Luminous intensity (glare)

For new P-category designs, Northland Transportation Alliance requires the luminous intensity to be no greater than the limits in the following table. This differs from the requirements in AS/NZS1158. The values apply at any horizontal angle. Gamma 80 refers to the luminous intensity at 80 degrees vertical and Gamma 60-80 refers to the peak luminous intensity between 60 and 80 degrees vertical.

This can be relaxed to the AS/NZS1158 requirements at an intersection, roundabout, LATM or the like, but only where it has been proven necessary to increase the luminaire power to achieve the required lighting performance. Refer to Section 3.2, sub-section 'Power'.

Table 3: Luminous intensity limits

Sub-category	Gamma80 limit (cd)	Gamma 60-80 limit (cd)
PR1-2	Luminous intensity limits as per AS/NZS1158.3.1	
PP1-5		
PR3-6	400	1800
PA1-3	Luminous intensity limits as per AS/NZS1158.3.1	
PE1		
PE2-3	Per chosen sub-category (See AS/NZS1158.3.1 Tables 2.4 & 3.6)	
PC1-3	Luminous intensity limits as per AS/NZS1158.3.1	
PCD		
PCX		

X category Pedestrian Crossings – The following luminous intensity limits shall apply at vertical angles of 70 degrees and above, and at azimuth angles of 330 to 30 degrees (through 0 degrees) and 150 to 210 degrees (through 180 degrees) for pedestrian crossing luminaires;

- Up to 6,000 lumen output: 2,000 candelas
- Over 6,000 lumen output: 4,000 candelas

3.3.7 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.

3.4 Trees and road lighting column / luminaires

3.4.1 Coordinate trees and planting

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.

The final decision of acceptability rests with the RCA.

3.4.2 Existing trees

Tree trunks in a legal road or other legal road reserves shall be at least 8m away from lighting columns or 5m from the drip line of a mature tree and more clearance may be necessary for some tree species or if the tree is protected.

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 ongoing and cannot be guaranteed.

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. Consider the RCA's requirement for working near existing trees when locating lighting columns.

3.4.3 New trees

Where new trees are proposed, lighting columns should 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 should be positioned such that the expected future dripline, when the tree is mature, will provide a minimum clearance of 5 metres from the lighting column. 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.

In urban landscapes where there are tall trees with a wide canopy, mount the luminaires below the canopy and maintain the lower canopy to approximately 1m above the luminaires to avoid shadowing on the carriageway and the verges. In all cases, good engineering practise shall be used and the same shall be approved by the RCA's. This will result in additional lights, but will better distribute light onto the road from under the tree canopy and limit spill light.

3.5 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 Lines Company poles must comply with the Lines Company and NTA requirements.

Clearances (during installation, once installed and for ongoing maintenance purposes) must also comply with NZ ECP 34 (Electrical Code of Practice for Electrical Safe Distances).

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

3.6 Underground services

The design engineer shall obtain existing services plans from Utility Service providers or the beforeUdig online portal and ensure that all necessary clearances required by the utilities are maintained.

High pressure gas requires significant clearances.

3.7 Maintenance factor

The design engineer shall use the method set out in the LED Road Lighting Luminaire Maintenance Factor calculator in Appendix B1 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 BS 5489 may be used in lieu of those recommended in AS/NZS 1158.

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

4 Lighting columns

4.1 Compliance

All street light columns must comply with the *Roadway Lighting Column Specification* in Appendix A. All columns used in design must be on the Lighting Column Approved List (Appendix E).

4.1.1 Column Numbering

Each column must be individually numbered at time of installation, together with the month and year of manufacture. These labels must be positioned above the gear door at a height of 2m above ground.

The numbering system, to facilitate rapid asset identification in the field for lighting columns, will be provided by the RCA.

4.2 Lighting column location within the road reserve

4.2.1 Minimum set back

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 NTA, the minimum column set back must be 1m (from kerb face to the face of the column). This shall apply equally to both V and P category roads and all parts of the kerb (e.g. including side and end clearances in parking bays).

Columns must be placed at least 1m from the side of a driveway.

Exceptions:

1. Where the location is on the boundary and protected by a structure, it may be located between the two driveways with less than 1.0m clearance.
2. Where the driveway splays out from the boundary (encouraging the motorist to enter/leave at an angle), 2.0m clearance is required.

Avoid locating columns within the paved area of the footpath, especially near the centre. If the footpath cannot be avoided, NTA approval is required for the preferred location.

4.2.2 Existing areas

Where replacement columns are proposed as part of an upgrade to an existing arrangement, the locations shall be as per the NTA approved lighting upgrade design. Where new locations are necessary, they must be located as per the ‘new subdivisions’ requirements. Any location changes and additions proposed must be agreed with the NTA.

When undertaking lighting design for Overhead to Underground (OHUG) projects, the following requirements apply;

- Locate new lighting columns in locations as close as practical to the existing power pole positions [to minimise potential concerns for neighbours]
- Where additional lighting column locations are required, proceed as for 'new subdivisions' (e.g. The first column in a side street must be located within 15m of the corner).

4.2.3 Tolerances

The following column placement and luminaire height tolerances may be applied to suit services and other obstructions discovered on site. However, unless the installer can prove the necessity for such adjustments, the location must be as per the approved design.

Tolerances;

- Along the road: ±1.0m
- Kerb setback: ±0.5m
  (but no less than 1m from kerb face unless agreed with NTA)
- Luminaire height: ±0.2m

Any modifications beyond these tolerances must be agreed with the lighting designer and NTA.

All of the other placement requirements in the DM must also be satisfied unless otherwise agreed with NTA.

4.2.4 General requirements

Columns must be placed fully within and with the luminaire perpendicular to the main street alignment. Corner locations or the like with luminaires aimed at other angles are not permitted unless otherwise agreed with NTA.

4.2.5 New subdivisions

In new subdivisions, lighting columns must be located:

a) Either at the common boundary between adjacent property lots, or

b) On the build-line, i.e. the corner of a building within the property lot.

The first column in a side street must be located within 15m of the corner. Measure from the property boundary facing the street that vehicle has turned from. The column should be on the driver's left side unless locating on the other side would avoid a boundary spill light exceedance.

NOTE: If a lighting column is positioned in front of a property that is Commercial, Open Space, or similar (i.e. not residential), then these requirements do not apply.

4.2.6 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.

4.2.7 Bus stops

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

4.2.8 Under overhead power lines

The installation of street light columns under Lines Company overhead lines should be avoided and alternative design solutions considered. They are expensive to install and there are often ongoing maintenance costs for both the Lines Company and NTA maintaining clearances.

NZ Electrical Code of Practice 34 (ECP 34) sets out the clearances between overhead lines and columns both during installation and the final clearance from the structure to the overhead line. The NTA Design Manual requires that the final clearance between the overhead line and the column is a minimum of 1 metre.

Columns erected under overhead lines must be installed on a flange base. This is to allow the column to be slid into position in a controlled way to avoid the arc while standing the column up.

In the case of lighting for pedestrian crossings, there are a number of checks that the design engineer must make as part of the design process:

1. Is it possible to locate the pedestrian crossing adjacent to an existing power pole so the pole can support the light? Low cost option.
2. AS/NZS 1158 standard allows crossings “not to be lit”. The NTA in consultation with the Road Controlling Authority will need to agree that the pedestrian crossing does not need to be lit.
3. If the pedestrian crossing must be lit, then the design engineer must investigate all options to light it without installing a column under an overhead line (for example - lighting the crossing from one side only, or installing a column on a centre island and lighting from that position).
4. The design engineer is responsible for investigating the proposed column position under a line and specifying the column height and position from the kerb and crossing. The column height is usually limited to 4 metres under an LV line.

Under ECP 34 the Lines Company (as owner of the overhead line) is the only organisation that can approve the installation of a lighting column under their line, which in this case is Northpower or Top Energy. The approval to install the column

and the installation of the column is part of the installation process. It is not part of the design process, although it does come under the Safety in Design register.

For installations where a column is required under an overhead line the contract should allow a PC sum of $12,000 for the approval and installation of the column and light. The final costs should be based on actual costs.

4.2.9 Swales

A lighting column may only be located within a swale, if a specific design is approved by the NTA.

4.2.10 Joint use columns

At signalised intersections, joint use columns are preferred to minimise clutter. These may be either a Joint Use Mast Arm (JUMA) [i.e. a traffic signal column where the traffic signal lights (i.e. 'aspects') are partially or totally on extended outreach mast arms], or a Joint Use Service Pole (JUSP) [i.e. a traffic signal column where there are no traffic signal outreach mast arms].

Where a JUMA or JUSP is proposed, liaise with Northland Transportation Alliance. The RCA shall approve the method of power connection. The most common form of connection is shown in appendix G3. Reference shall also be made to P43 specifications for traffic signals and the RCA's regional special conditions for more information.

4.2.11 Shear base columns

Except as noted below, shear base columns shall only be used where the posted speed limit is ≥ 70 kph, unless the column is located behind a barrier, beyond the deflection zone.

AS/NZS 1158.1.2 Appendix B provides additional guidance. Shear base columns must not be used in high pedestrian activity areas. They are not permitted within 1m from either the kerb or the edge of a un-kerbed road, unless located behind guard fencing.

Ensure that the column is installed in strict adherence with the supplier's recommendations to ensure safe and proper operation (e.g. base height, base orientation, slip bolt torque settings, slip washers, etc).

Do not use shear base columns in the centre of a dual carriageway (They are designed to work for traffic in one direction only).

5 Luminaires

5.1 Requirements

5.1.1 Standards

Luminaires must be manufactured and tested in accordance with SA/SNZ TS 1158.6 and AS/NZS 60598.2.3.

5.1.2 Approved list

Luminaires must only be those included on the appropriate approved list.

The current approved lists are shown in:

- Appendix C, Road Lighting LED Approved Luminaire List
- Appendix D, Amenity Lighting LED Approved Luminaire List

5.1.3 NEMA receptacle

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

5.1.4 LED driver

The driver shall be DALI dimmable constant current driver.

5.1.5 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 obtrusive light. In addition, in-ground up-lights must:

- meet AS/NZS 60598.1,
- have impact resistance of IK10,
- have ingress protection of IP67 or IP68 (preferred), and
- have anti-slip glass where used in areas accessible by pedestrians

5.1.6 Bollard luminaires

Bollard luminaires are not preferred.

The use of bollard luminaires must be pre-approved by Northland Transportation Alliance. The construction and finishes of bollard luminaires must be consistent with the requirements for columns and luminaires. In addition, these lights must;

- have maximum luminous intensity in any normal viewing direction not exceeding 500cd, and

- have an optic to control the light distribution

5.1.7 In-fill luminaires

In-fill luminaires must be LED type unless specifically agreed otherwise with Northland Transportation Alliance.

5.1.8 Luminaire labelling

Luminaire labelling shall be to the approval of the NTA.

5.2 Light source

All new or replacement luminaires must be LED luminaires.

6 Road lighting in specific areas

6.1 Rural road lighting

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.

Rural areas should be discussed with NTA to clarify the need for lighting and the nature of the lighting.

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, and
- 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.

Guiding principles of lighting for CPTED include;

- Do not light a dead-end path (i.e. a path that is not a through link between lit public spaces),
- Provide sufficient light and clear views for a pedestrian to see at least 3m to the side of the path (to minimise the opportunity of concealment for a potential attacker), and
- Avoid dark areas immediately beside a public space (i.e. that could conceal a potential attacker)

6.3 Pedestrian crossing lighting

6.3.1 Standards

Where a pedestrian crossing is lit, it must be in accordance with the current version of AS/NZS 1158.4. Pedestrian crossings must be lit unless otherwise agreed with NTA. Luminaires shall have a photometric distribution specifically designed to suit pedestrian crossings utilising LED luminaires.

6.3.2 Un-signalised

The design criteria in AS/NZS 1158.4 shall apply at un-signalised crossings.

An LED Belisha beacon shall be installed on each new pedestrian lighting column. The column shall include alternating 300mm wide back and white bands up to the height of the Beacon. The Beacon and column features shall be in accordance with AS/NZS1158.4 clause 3.3. NTA do not require the beacons on either side of the road to be synchronised.

The Belisha beacon shall include integral controls to flash the beacon on and off repeatedly in accordance with AS/NZS 1158.4.

A Belisha beacon that includes an orange reflective disc is required.

Where pedestrian crossing luminaires are required on a channelization island in addition to those on each side of the road, then the roadside columns shall have Belisha beacons and the island columns shall have Belisha discs. Where physical site restrictions necessitate columns only on the island, then Belisha beacons are required on the island columns.

Design clarifications;

1. As per AS/NZS1158.4 (Table 3.5), pedestrian crossing lighting shall be calculated ignoring the contribution from road lighting.
2. Uniformity requirements for other areas (e.g. LATM's for P & V-cat roads or the full road reserve for P-cat roads) may be calculated without the contribution of the pedestrian crossing lights, where such contribution would otherwise indicate non-compliance.

6.3.3 *Signalised*

Subject to specific lighting design approved by the NTA for a particular site.

6.4 Railway level crossing lighting

At railway level crossings, illuminate the crossing to pedestrian crossing standard category X1 (horizontal illuminance requirements only) as a minimum. Striped columns and Belisha beacons or disks are not required. Designer to consult KiwiRail.

6.5 Local area traffic management

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

- Slow traffic on category P roads: Use 3.5 lux horizontal point illuminance in accordance with AS/NZS1158.3.1. 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)
- Slow traffic on V roads: For an LATM such as a speed hump or speed table, the illuminance design requirements for the specific road lighting design category in AS/NZS 1158.1.1 Table 2.2 Columns 8 and 9 shall apply. The design area shall be the full road width for the length of the LATM including ramps plus a further 5m in each direction along the road.
- Refer to AS/NZS 1158.1.1 for lighting of traffic management devices on V category roads.

6.6 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, subject to agreement with NTA.

6.7 Isolated Intersection

An isolated intersection shall only be lit if directed by NTA.

Lighting may be required at an isolated rural intersection on otherwise unlit roads to mitigate the risks associated with overshoot, sudden braking, and turning manoeuvres and to aid the safe operation at intersections at night. Lighting of this type is commonly referred to as “flag lighting”.

An effective flag light treatment consists of:

- Up to two strategically placed luminaires located on the main route with the intention of illuminating the full extent of the intersection, and

- A further (optional) luminaire located on the side road

If it is agreed to light an isolated intersection, the intersection shall be treated as a sub-category V4 intersection and any associated LATM devices (e.g. raised concrete islands, etc) shall also be lit to V4, in accordance with AS/NZS 1158.1.1.

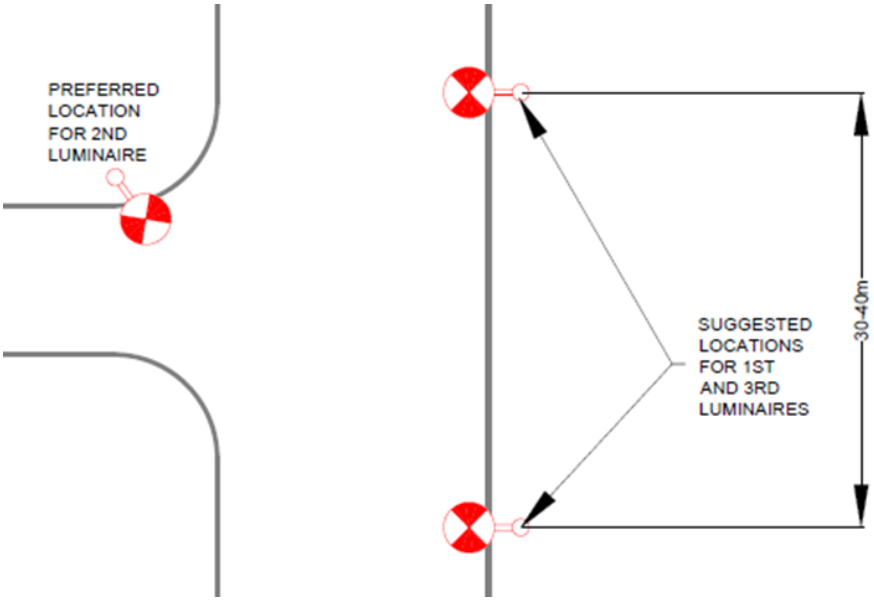

Figure 2: Indicative Isolated Intersection Arrangement

The preferred lighting arrangement is 3 lights arranged indicatively as per figure 1. Columns should be 8, 10 or 12m high as required to optimise the design, with luminaires mounted with zero upward tilt.

6.8 V to P intersection with signalised crossing

Where a V category road and P category road intersect, if a signalised crossing is present, the intersection shall be treated as a V to V category intersection for the purpose of calculation.

7 Electrical

7.1 Electrical design

The electrical design shall be undertaken by an Electrical Engineer. The design details are subject to NTA approval.

The RCA will be the asset owner of the consumer main downstream of the Lines Company point of connection for all new metered circuits.

The Electrical Design Engineer shall work closely with the Lines Company.

Unless otherwise agreed with NTA, run circuits in HD UPVC or HDPE conduit underground with the minimum depth of cover as stipulated in AS/NZS 3000 Wiring Rules.

All amenity lighting must be supplied and controlled as a separate asset from a specific distribution cabinet and be metered.

In descending order of priority (in the event of conflict), the electrical design and installation must comply with;

1. The NZ Electricity (Safety) Regulations
2. AS/NZS 3000 Wiring Rules
3. The Lines Company requirements (where applicable)
4. The NTA DM and appendices

7.2 Circuit load

The number of lights connected to a single circuit shall ensure that the total voltage drop from the point of supply to the furthest light does not exceed 2.5%.

The total circuit load shall not exceed half the rating of the protection or the luminaire manufacturer's recommended limit to suit the LED luminaire start-up and operating characteristics, whichever is the lesser.

7.3 Control

Each roadway luminaire must be supplied with either a 5 or 7-contact NEMA receptacle, compliant with ANSI C136.41, complete with a shorting cap where connected to a switched lighting circuit or a NEMA socket photocell where the power supply is un-switched (24/7).

Each roadway luminaire shall be equipped with a DALI dimmable ballast and be fully wired ready for future use with a communications node when fitted to the NEMA socket.

Amenity lighting control shall be located within the source distribution cabinet and agreed with NTA. Typically, such control would either be a combination of Time Switch plus Daylight Switch.

Refer also to section 7.17.

7.4 Road lighting (unmetered) in existing areas

New circuits shall be 1core 10mm^2 (minimum) Cu NS PVC/XLPE cable. Increase as required to suit loading and voltage drop requirements in accordance with the Electricity Safety Regulations, AS/NZS 3000 and Lines Company requirements.

NTA prefer lights to be connected to the nearest Lines Company Point of Connection (i.e. pillar/TUD).

Typically, one luminaire per connection/circuit and up to two connections/circuits per Point of Connection (e.g. where it is more cost effective to run one circuit up the street and one down the street to minimise/eliminate driveway/pathway/etc crossings).

Where there is a second or third luminaire close to another (e.g. pedestrian crossing lights near a streetlight), then up to 3 luminaires can be looped off one connection.

7.5 Road lighting (unmetered) in green field areas

Circuits shall be 10mm^2 (minimum) Cu NS PVC/XLPE cable. Increase as required to suit loading and voltage drop requirements in accordance with the Electricity Safety Regulations, AS/NZS 3000 and Lines Company requirements.

Ideally, there shall be one light on each Point of Connection from the Lines Company.

In some sections of road, it may be more cost effective to connect more than one light to a single Point of Connection.

Cables shall be looped in and out of each light column.

7.6 Dedicated pathway lighting (metered)

On long pathways the Lines Company will often not have an LV network nearby. Therefore, it is typically necessary to take supply from the Lines Company at two or more points along the pathway (Typically one at each end and if possible [depending on the length of the path] one in the centre).

Design a cable configuration along the pathway to fit the number and location of supply points.

At each supply point establish a switchboard cabinet with a meter and this is the MEN point.

Preferably, run multiple 2core 10mm^2 (minimum) Cu NS PVC/XLPE, with luminaires connected in alternating sequence to either phase A , then B if running as 2 phases, or to phase A, then B, then C if running as 3 phase. Increase as required to suit loading and voltage drop requirements in accordance with the Electricity Safety Regulations, AS/NZS 3000 and Lines Company requirements.

The design should have an objective of providing a cost-effective outcome with the least number of supply points along the route.

7.7 Amenity lighting (metered)

Amenity lighting comprises lighting other than functional (i.e. roadway, path, etc), such as decorative strip lights, marker lights, handrail lights, up-lights, under water lights, artwork lights, etc.

Always meter amenity power.

In the case of 230V luminaires, preferably run two 2core 10mm^2 (minimum) Cu NS PVC/XLPE cable. Increase as required to suit loading and voltage drop requirements in accordance with the Electricity Safety Regulations, AS/NZS 3000 and Lines Company requirements. IP68 joint and tail down as required at each light (to suit the available cable entry and termination space for the luminaire).

In the case of extra low voltage [ELV] luminaires, run 2core 1.5mm^2 (minimum) Cu PVC/PVC cable. Increase as required to suit loading and voltage drop requirements in accordance with the Electricity Safety Regulations, AS/NZS 3000 and Lines Company requirements.

7.8 Equipment and 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 Northland Transportation Alliance for at least another 10 years.

7.9 Energy efficiency

The installation must be designed for economic use of energy. Refer also to the Power Density section of the DM.

7.10 Adaptive lighting

Northland Transportation Alliance wish to future proof luminaires to enable adaptive lighting to be implemented at a future date. Adaptive lighting can reduce spill light and sky glow, as well as energy consumption at times of reduced traffic volumes. Such controls may include remote adjustment of illuminance levels to suit traffic flows, time of day, weather conditions, emergencies, etc.

Such a system may also potentially enable remote condition monitoring of individual luminaires to assist maintenance.

Each luminaire must be supplied with either a 5 or 7-contact NEMA receptacle, compliant with ANSI C136.41, complete with a shorting cap where connected to a switched lighting circuit or a NEMA socket photocell where the power supply is un-switched (24/7).

7.11 Installation

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 Appendix G1 – Street Lighting Electrical Connections.

7.12 Connection

Each streetlight must be connected to a Lines Company dedicated street lighting controlled 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.

Where more than one light is fed from a single Lines Company connection, the cable must be looped in and out of each column.

The demarcation point for NZ Transport Agency, District Council and private street lighting will generally be at the supply side of the fuse supplying the lights from the Lines Company network.

The fuse or demarcation point may be located in the following locations:

- On network reticulation (pillar or pole) with an exclusive supply on to the streetlights.
- At the base of the streetlight pole with underground supply hard tapped to the network. If there is no fuse at the base of the pole, the demarcation point shall be the point on the cable where it enters the base of the pole.
- On the streetlight pole with an overhead supply (one span) hard tapped to the network.
- On the network pole where multiple spans of streetlight conductor supported by dedicated poles are attached.
- On a network pole with a streetlight attached.

Streetlight reticulation run on Lines Company poles or run in the same trench with Lines Company distribution reticulation will be Lines Company owned. Where the streetlights are supplied from an installation (ICP) the demarcation point will be that of the ICP.

Poles dedicated for streetlights and streetlight conductors are to be owned by the RCA (District Council or NZ Transport Authority) or other party. Fuses and ripple control relays are to be owned by the Lines Company.

Where there are multiple spans of streetlight conductor supported by dedicated poles the demarcation point will be where attached to the Lines Company pole regardless of where fused. However fusing should be provided at this point in conjunction with any other works.

7.13 Isolation

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-disconnector must connect the light to the incoming

supply. Miniature circuit breakers (MCBs) are not permitted. Refer Appendix G1 – *Street Lighting Electrical Connections.*

7.14 Slim columns

A slim column is one which does not include a minimum 100 wide switchboard door.

Slim columns shall only be used with prior approval by the NTA on a project-by-project basis.

Slim columns approved for use on the network may use Transnet Amerace 65U in line fuse connectors (IP68) or equivalent. The neutral and earth bar arrangement must still comply with AS/NZS 3000

7.15 Shear base columns

Shear base columns shall only be used with prior approval by the NTA on a project-by-project basis.

Shear base 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).

7.16 Luminaires on lines company poles

In areas where a Lines Company's network is overhead and Northland Transportation Alliance has installed luminaires on Lines Company poles, each luminaire must be connected directly to the Lines Company supply through a line-tap fuse 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.

Luminaires attached to Lines Company poles must comply with the Lines Company requirements.

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

7.17 Luminaire control

Northland Transportation Alliance 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. Northland Transportation Alliance will advise the control type to be used in any particular area at time of briefing.

7.18 Internal wiring

The cable from the fuse board at the base of the column to the luminaire must be two-core 2.5mm^2 neutral screen. The screen must be earthed.

Where the luminaire is supplied with a Wieland flex and plug, the internal column wiring shall instead be 3 core x 1.5 mm^2 copper Wieland H05VV-F heavy duty cable – round black sheath, complete with a Wieland socket to match the luminaire plug.

7.19 Earthing

Each column must be earthed by means of 10mm^2 copper insulated wire, with a removable bolted connection to a driven earth electrode (16mm diameter copper-bonded steel earth rod), located 300mm from the column base. The connection must be housed in a capped toby box. AS/NZS 3000 applies. Refer Appendix G2 – *Street Lighting Earthing Details*.

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 mm^2 (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.

Each buried conductor shall be connected to the column via a bolted connection, toby box and cable as for the driven earth electrode arrangement.

7.20 Connection at traffic control cabinets

For connection at traffic control cabinets, refer Appendix G3 – *Traffic Signal/Street Light Combination Electrical Schematic.*

7.21 Third party connections

Third party connections to street light circuits is at the sole discretion of Northland Transportation Alliance. Not all items are acceptable as un-metered load.

In addition, street light columns are not suitable for many connections to other devices due to structural and space limitations.

Please contact the NTA for further details.

7.22 Open private networks

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

- The NTA owned streetlights will be Time of Use (TOU) metered on dedicated circuits. The cabling and connections to be in accordance with Section 7.1 of this document.

- The cables, columns and luminaires must be installed by an approved NTA contractor to work on the street light network. Cabling must be in accordance with NTA requirements. Refer Appendix H – Electrical Cable Specification.
- NTA will own and maintain the load side cables from the fuse connecting the public road lighting circuit 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 NTA.
- Columns and luminaires must be on the appropriate NTA Approved List.

7.23 Closed private networks

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

- The NTA owned street lights will be directly connected to the Lines Company network in accordance with the NTA Design Manual section 7.1
- Details of the connection to the Lines Company network must be agreed with NTA and Lines Company prior to installation.
- Cabling must be in accordance with NTA requirements. Refer Appendix H – Electrical Cable Specification.
- The cables, columns and luminaires must be installed by an NTA contractor approved to work on the street light network.
- Columns and luminaires must be on the appropriate NTA Approved List.

7.24 Underground cable specification

Cabling must be in accordance with NTA requirements. Refer Appendix H – *Electrical Cable Specification.*

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

They must also be used when installing cables that will be owned by a party other than NTA (e.g. within private subdivisions).

Agree hold points with NTA or their appointed agent, prior to commencing work (e.g. trenching prior to backfilling)

7.25 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.

A drip loop shall be provided to ensure that water cannot rest against the luminaire, the sleeved cable joint or the line-tap fuse.

7.26 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).

7.27 Personal protective equipment

All personnel working on the Northland Transportation Alliance lighting network must wear the appropriate Personal Protective Equipment (PPE) for the work being carried out, on all sites at all times.

7.28 Work on or near lines 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.

8 Approvals

8.1 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 NTA or an NTA approved independent reviewer, depending on the complexity of the design.

Refer also Section 1 – “Approval processes”. The following elements require approval;

- Roadway lighting luminaires
- Amenity lighting luminaires
- Roadway lighting columns
- Lighting design
- Lighting installation

As stated in section 1;

- **Designer Certification**: Once the installation has been completed, the lighting designer must visit the site, audit the installation and provide a letter to NTA certifying that the installation has been installed in accordance with the NTA approved design. Use the template supplied in Appendix B2.

8.2 Required information

The following information is required for the review (in PDF format unless otherwise stated):

- A covering letter briefly describing the physical extent of the design area, listing all of the documents included in the submission. If there are any unusual features that need to be clarified they should be included in the letter.
- A copy of the NTA design brief for the site.
- A Safety in Design register, specific to the proposed design, in accordance with the NZ Health and Safety at Work Act 2015
- A complete copy of the Council Resource Consent decision
- Make, model, optic, total luminaire output lumens and total luminaire input wattage for each type of luminaire – Must be on the NTA roadway or amenity luminaire approved list as applicable.
- Make, model, height and outreach for each type of column – must be on the NTA column approved list.
- Maintenance factor calculations (Refer Appendix B1).
- **Initial Lumen Output Calculations (in both PDF & AGI/DWG format**)
    - Provide a separate spill light calculation plan(s) at a recognised scale (no less than 1:500), with all luminaires set to a Maintenance Factor of 1.0. Include 2 lux and 10 lux horizontal illuminance isolux lines for the complete road reserve plus a further nominal 10m into the adjacent properties for both P & V category designs.
    - Include vertical illuminance calculations at residential windows – refer Section 3.1 – ‘Light Spill’.
- **Maintained Lumen Output Calculations (in both PDF & AGI/DWG format)**
    - Lighting design plan(s) at a recognised scale (no less than 1:500).
    - The lighting design layout shall include all relevant information – property boundaries, driveway crossovers, kerb line, footpath, landscaping, overhead power lines, road names, linear scale, lighting column locations, luminaire labels, detailed luminaire and column legend and any other elements relevant to lighting design constraints.

- All critical dimensions shall be shown – distance between adjacent luminaires to nearest 0.1m and locating dimensions for each luminaire group (e.g. from the beginning crossroad kerb/boundary).
- Show the closest existing luminaires beyond the design area (unless >100m away) with estimated height and luminaire details.
- Show any lighting equipment proposed to be removed.
- Documentation in accordance with the relevant part(s) of AS/NZS 1158 to show compliance.
- Lighting sub-categories used in the design, e.g. V2, PR3, etc. 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.
- 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 5 and 6 below.
- Include an isolux line for each of the minimum required horizontal illuminance values for each of the categories present in the design. Refer to Table 4 below. (Note: Compliance is required throughout the design area).
- Provide luminaire photometric file and data sheet upon RCA request.

Table 4: Minimum maintained illuminance isoline

ROADS		PUBLIC AREAS	
PR1	2 lux	PA1	7 lux
PR2	0.7 lux	PA2	4 lux
PR3	0.3 lux	PA3	2 lux
PR4	0.22 lux		
PR5	0.14 lux	**CONNECTING ELEMENTS**	
PR6	0.07 lux	PE1	17.5 lux
P Cat LATM	3.5 lux	PE2	(refer standard)
V1 specified locations	15 lux	PE3	(refer standard)
V2 specified locations	10 lux		
V3 specified locations	7.5 lux	**CAR PARKS**	
V4 specified locations	5 lux	PC1	3 lux

		PC2	1.5 lux
PATHWAYS		PC3	0.7 lux
PP1	2 lux	PCD	(refer standard)
PP2	1 lux	PCX	5 lux
PP3	0.5 lux		
PP4	0.25 lux		
PP5	0.14 lux		

Table 5: Information requirements for Category V roads

Parameter	Symbol	Notes
Average carriageway luminance	L	Straight sections
Overall uniformity	U_o	Straight sections
Longitudinal uniformity	U_L	Straight sections
Threshold increment %	TI	Straight sections
Surround (verge) illumination ratio	E_s	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	E_{ph}	Intersections, pedestrian crossings, pedestrian refuges and defined pedestrian crossing routes at signalised crossing
Illuminance (horizontal) uniformity	U_{E1}	Intersections and pedestrian refuges only
Vertical illuminance	E_{PV}	Pedestrian crossing

Table 6: Information requirements for Category P roads

Parameter	Symbol	Notes
Average horizontal illuminance	E_h	
Point horizontal illuminance	E_{ph}	
Illuminance (horizontal) uniformity	U_{E2}	
Point vertical illuminance	E_{pv}	
Luminous intensity at Gamma 80	I_{G80}	For maximum luminaire watts in the design
Peak luminous intensity	I_{PEAK}	For maximum luminaire watts in the design
Perfectlite maximum spacing		Straight sections

9 Differences between the design manual and AS/NZS 1158

9.1 Design manual takes precedence

Where there are differences between the Design Manual and AS/NZS 1158, this manual takes precedence. The following are instances where Northland Transportation Alliance's requirements vary from the standards:

1. 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 Northland Transportation Alliance. See Section 3.2.
2. The Threshold Increment (TI) along the road must not be greater than 12%. See Section 3.2.
3. 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 8.
4. Category P roads: Record maximum luminous intensity at Gamma 80 on the drawings. It should not exceed 400cd. See Section 3.2. Similarly, the peak luminous intensity should not exceed 1800cd.
5. Specific power density limits apply. See section 3.2.3.
6. Different pedestrian crossing luminaire luminous intensity limits. See section 3.2.6.
7. Different maintenance factor calculation method. See section 3.6.

Appendices

Appendix A	Street Lighting Column Specification
Appendix B	Lighting Designer Forms • B1 – Lighting Design Maintenance Factor Calculator • B2 – Installation Designer Certification
Appendix C	LED Roadway Lighting – LED Approved Luminaire List (AT-LALL)
Appendix D	LED Amenity Lighting – Amenity Luminaire Approved List (AT-ALAL)
Appendix E	Roadway Lighting – Lighting Column Approved List (AT-LCAL)
Appendix F	V and P Category Calculator Tools for Road Classification • F1 – V Category Calculator Tool • F2 – P Category Calculator Tool
Appendix G	Standard drawings • G1 – Street lighting electrical connections • G2 – Street lighting earthing details • G3 – Traffic Signal – Street lighting combination electrical schematic • G4 – Typical shear base detail
Appendix H	Electrical Cable Specification
Appendix I	Installation Checklists • I1 – Checklist for new streetlights • I2 – Checklist for streetlights (electrical) • I3 – Checklist for RAMM data

Revision Table

Version	Date	Amendments
1	15/10/2020	Original