



QUEENSTOWN LAKES
DISTRICT COUNCIL

SOUTHERN LIGHT
PART TWO – TECHNICAL
SPECIFICATIONS

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1 INTRODUCTION

The purpose of this document is to ensure that lighting infrastructure meets the outcomes specified in the Southern Light, Part One – A Lighting Strategy through providing safe environments for pedestrians, vehicles and to discourage illegal acts as well as ensuring that public lighting is attractive, robust, easy to maintain, cost effective and fit for purpose. This document will set out accepted best practice, minimum manufacturing and performance standards, as well as QLDC asset management and strategic objectives throughout the district, including QLDC vested road and outdoor lighting, private lighting and new developments (such as the 5 Mile commercial area), as well as parks and feature lighting.

This technical guide should be read in conjunction with the Southern Light, Part One – A Lighting Strategy 2016, the QLDC Land Development and Subdivision Code of Practice and the operative District Plan.

This document shall be used by developers, contractors, consultants, service/utility operators, QLDC design engineers, planners, project managers and others involved in the design, installation and management of new lighting installations. It may be used as a guide to repair or replace existing lighting infrastructure.

It is acknowledged the District has community specific urban design requirements and these will be referenced individually.

The main scope of this document includes areas covered by the AS/NZS 1158

- Roads (public & private)
- Reserves and public activity areas
- Pedestrian (Zebra) crossings
- Pedestrian and cycle paths
- Public precincts (e.g. shopping precincts)
- Public access areas (e.g. connecting elements including steps, ramps, subways, footbridges and CCTV)
- Outdoor car parks

It also provides indicative design guidelines for areas outside AS/NZS 1158 which includes, but not limited to

- Parks and Reserves and sports fields
- Illuminated Signs
- Feature Lighting (up-lighting & spot lighting)

Guidelines for exterior lighting can be found in AS/NZS 1680, AS/NZS 2293 and the NZ Building Code. Guidelines for sports lighting (interior/exterior) can be found in AS 2560.

QLDC's has a policy for street lighting on private roads which encompasses the following:

- Maintenance and operating costs of lights installed on private roads and rights of way after 01 January 2004 shall be the responsibility of lots serviced by such private access roads; and
- All lights installed on private roads and Rights of Way after 01 January 2004 shall be isolated from the QLDC lighting network.

Southern Light is a live document subject to periodic review and may be amended at any time as and when directed by QLDC.

In summary this document describes how to complete the detailed design and calculations required for compliance with the applicable standards to achieve the following:

- Provision of vehicular route lighting for vehicle and pedestrian safety
- Provision of pedestrian route/area lighting for pedestrian safety, crime prevention and to enhance the environment

- Provision of lighting infrastructure (luminaires, columns, outreach arms, bracket arms and associated equipment) that is energy efficient, cost effective and will cope with regional climatic and environmental conditions such as extreme temperatures and weather conditions
- Provision of feature and festive lighting (whether temporary or permanent) that do not create excessive glare or spill light into neighbouring properties. Exemptions must be granted by QLDC where this lighting contravenes Southern Light.
- While achieving safe and compliant lighting (as described above) also minimising any negative impacts such as obtrusive (spill) light, glare and light pollution (upward waste light contributing to sky glow)

2 APPLICABLE STANDARDS AND REGULATIONS

The following section lists the standards and regulations applicable to the design, installation and maintenance of road lighting installations. The latest copies of standards and their amendments shall apply.

Electrical:

The Electricity Act 1992

The Electricity (Safety) Regulations 2010

The NZ Electrical Codes of Practice

The NZ Building Code

AS/NZS 3000: Electrical installations (known as the Australian/New Zealand Wiring Rules)

Lighting:

AS 2560 (Series): Sports lighting

AS 4282: Control of the obtrusive effects of outdoor lighting

AS 60529: Degrees of protection provided by enclosures (IP Code)

AS/NZS 1158.0: Lighting for roads and public spaces, Part 0: Introduction

AS/NZS 1158.1.1: Lighting for roads and public spaces, Part 1.1: Vehicular traffic (Category V) lighting - Performance and design requirements

AS/NZS 1158.1.2: Lighting for roads and public spaces, Part 1.2: Vehicular traffic (Category V) lighting - Guide to design, installation, operation and maintenance

AS/NZS 1158.2: Lighting for roads and public spaces, Part 2: Computer procedures for the calculation of light technical parameters for Category V and Category P lighting

AS/NZS 1158.3.1: Lighting for roads and public spaces, Part 3.1: Pedestrian area (Category P) lighting - Performance and design requirements

AS/NZS 1158.4: Lighting for roads and public spaces, Part 4: Lighting of pedestrian crossings

AS/NZS 1158.5: Lighting for roads and public spaces, Part 5: Tunnels and underpasses

AS/NZS 1680 (Series): Interior and workplace lighting

AS/NZS 2293 (Series): Emergency escape lighting and exit signs for buildings

AS/NZS 60598.2.3: Luminaires - Particular requirements - Luminaires for road and street lighting

SA/SNZ TS 1158.6: Lighting for roads and public spaces - Luminaires - Performance

BS 5489-1: Code of practice for the design of road lighting, Part 1: Lighting of roads and public amenity areas

IEC 62262, Ed. 1.0: Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)

NZTA M30: Specification and Guidelines for Road Lighting Design

Refer to the International Dark Sky Association (IDA) for general information and guidelines

Lighting poles (design and construction):**AS/NZS 1214:** Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)**AS 1798:** Lighting poles and bracket arms - Recommended dimensions**AS 2979:** Traffic signal mast arms**AS 2309:** Durability of galvanized and electrogalvanized zinc coatings for the protection of steel in structural applications - Atmospheric**AS 4100:** Steel structures**AS/NZS 1170:** Structural design actions - Set**AS/NZS 1554:** Structural steel welding - Set**AS/NZS 1665:** Welding of aluminium structures**AS/NZS 2312:** Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings**AS/NZS 4676:** Structural design requirements for utility services poles**AS/NZS 4677:** Steel utility services poles**AS/NZS 4680:** Hot-dip galvanized (zinc) coatings on fabricated ferrous articles**AS/NZS 7000:** Overhead line design**NZS 3101:** Concrete structures standard**NZS 3404:** Steel structures standard**NZTA M26:** Specification for Lighting Columns

3 DESIGN REQUIREMENTS

The applicable design standards shall be the New Zealand requirements of the AS/NZS 1158 series and the following sections provide a summary of the main requirements. The designer shall be responsible for applying all the specific design requirements of AS/NZS 1158 (as well as any other QLDC specific rules or procedures) to the extent they are applicable whether or not they are included in this document.

3.1 Light Sources and Adverse Lighting Effects

All new lighting installations shall utilise light emitting diode (LED) technology luminaires. Refer to NZTA M30 for a list of acceptable luminaires. Alternative LEDs may be considered provided they meet the minimum manufacturing, testing and performance requirements of NZTA M30 including warranty period. QLDC reserves the right to exclude any alternative LED (not on the current NZTA M30 list) if the designer or supplier cannot clearly demonstrate full compliance with NZTA M30. Other technologies may be considered and shall be confirmed by QLDC before final design is finalised.

The only exception (to the above requirements) is the use of MH or HPS luminaires as in-fill maintenance lighting or temporary lighting during project construction.

As part of the lighting design process the designer shall take into account and minimise any potential adverse or obtrusive lighting effects such as spill light, glare and sky glow (upward light). The limits of adverse lighting and methods of mitigation, as provided in NZTA M30, shall be followed.

Feature and festive lighting outside of M30 may be approved by QLDC on an individual basis.

3.2 Lighting Categories

The primary aim of any road lighting scheme is to facilitate the safe movement of people and there are two main categories of lighting (category V and P), and various subcategories, that provide varying levels of lighting based on a number of particular traffic (vehicular and pedestrian) parameters applicable for each type of road.

Category V lighting is applicable to roads where the visual requirements of motorists are dominant e.g. arterial or main roads, motorways and sub-arterial roads. Category P lighting is applicable to roads and other outdoor public spaces where the visual requirements of pedestrians are dominant e.g. local roads, pedestrian pathways and cycleways.

The decision to install a lighting scheme in compliance with AS/NZS 1158 (and any other QLDC policies and procedures), including which subcategory of lighting is applicable, rests with QLDC. This decision is typically based on factors such as night time traffic flows, composition of traffic (vehicular and/or pedestrian), the need to enhance prestige, risk of crime and other patterns of use.

The designer shall not commence any design work until the lighting category has been established and confirmed with QLDC. Note that more than one subcategory may be required within one development, e.g. different road hierarchies and car park lighting.

The designer (or nominated QLDC representative) may be required to assist in the evaluation process, but no design shall be commenced until QLDC approval has been obtained.

Reference should be made to the relevant parts of the current AS/NZS 1158 series that provide indicative guidance on the application of the different categories and subcategories of lighting. Relevant parts include:

- Figure 2.1 from AS/NZS 1158.1.1 and AS/NZS 1158.3.1 - Example Road and Public Space Types and Indicative Lighting Categories and Subcategories
- Table 2.1 from AS/NZS 1158.1.1 - Category V Lighting Applications
- Table 2.1 from AS/NZS 1158.3.1 - Category P Lighting Applications for Road Reserves in Local Areas
- Table 2.2 from AS/NZS 1158.3.1 - Category P Lighting Applications for Pathways (Including Cycleways)
- Table 2.3 from AS/NZS 1158.3.1 - Category P Lighting Applications for Public Activity Areas (Excluding Car Parks)
- Table 2.4 from AS/NZS 1158.3.1 - Category P Lighting Applications for Connecting Elements
- Table 2.5 from AS/NZS 1158.3.1 - Category P Lighting Applications for Outdoor Car Parks (Including Rooftop Car Parks)

It is the responsibility of the designer to ensure they have current copies of AS/NZS 1158 and any other QLDC lighting standards, policies and procedures.

3.3 Lighting Categories and District Plan

To assist in the interpretation of this standard, QLDC has summarised AS/NZS 1158.3.1 Tables 2.1 - 2.5 of the standard to reflect the local needs based on the District Plan zones. Refer QLDC Table 1 below.

Category P (pedestrian) will be the main lighting standard used as it provides standards applicable to the majority of roads managed by the council.

QLDC preference is for *P5 as minimum requirement in residential areas. However factors such as night time traffic flows, composition of traffic (vehicular and/or pedestrian), the need to enhance prestige, risk of crime and other patterns of use should also be taken into consideration when selecting final subcategory.

QLDC Table 1 Lighting Category Summary for Road Reserves in Local Areas (Category P)

Area of Activity	District Plan Zone	Lighting Subcategory*
	All	P4

Collector Road or non-arterial		
Local Roads or street used primarily for access to abutting properties including residential properties	* Township, Residential Zones, Rural Zones, Special Zones	P5
	Town Centre, High Density Residential, Industrial and Business zones	P4
Pathways (including cycle ways, footpaths along roads, walkways and park paths) where these have been identified for lighting.	Town Centres – designated safe routes	P3
	Town Centres - other pathways	P4
	Pathways outside of Town Centres	P4
Town Centre and Township pedestrian activity areas (malls, open arcades, town squares, civic centres)	Town Centre and Township	P8
Transport terminals and service areas with mixed pedestrian and vehicle movements during hours of darkness	All	P8

3.4 Design Methodology

The following definitions and sections describe the main types of road lighting calculations required and their particular application is dependent on the category of lighting required.

Illuminance (E)

Illumination is a general expression for the process of light arriving at a surface and the physical measure of this is illuminance. Illuminance is the luminous flux (lumen - lm) arriving at a surface divided by the area of the illuminated surface.

Unit: lux (lx); 1 lx = 1 lm/m².

Illuminance calculations are required for category P roads and nominated locations on category V roads.

Luminance (L)

Luminance is the physical quantity of light corresponding to the brightness of a surface (e.g. a lamp, luminaire or reflecting material such as the road surface) when viewed from a specified direction.

Unit: candela per square metre (cd/m²).

Luminance calculations are only required for category V roads.

Uniformity (U)

The uniformity is a calculated ratio that is used to measure how evenly the light is distributed over a given area or length of roadway. Uniformity calculations are required for both category V and P roads; however the method of calculation differs between the two categories.

3.4.1 Category V Design Objectives

The principal design objectives for category V lighting are to provide the following:

- (a) Luminance and uniformity of luminance of the carriageway surface to a specified level.
- (b) Glare control to a specified level.
- (c) Illumination on intersections, carriageway verges, splitter islands and other nominated locations to a specified level.
- (d) Limitation of upward spill light from luminaires to a specified level.
- (e) A maintenance regime such that the lighting scheme complies at all times during each maintenance cycle.
- (f) Minimal energy consumption.

Refer to AS/NZS 1158.2 for the minimum design areas and applicable calculation fields.

3.4.2 Category P Design Objectives

The principal design objectives for category P lighting are to provide the following:

- (a) Illuminance and uniformity of illuminance over the road reserve to a specified level.
- (b) Glare control to a specified level.
- (c) Limitation of upward spill light from luminaires to a specified level.
- (d) Limitation to a specified level of the light spilled into adjacent properties.
- (e) A maintenance regime such that the lighting scheme complies at all times during each maintenance cycle.
- (f) Minimal energy consumption.

Refer to AS/NZS 1158.2 for the minimum design areas and applicable calculation fields.

3.4.3 Light Technical Parameters

The principal design objectives (outlined in the above two sections) are formally specified in terms of the following light technical parameters (LTPs):

- (a) Parameters that relate to the attainment of the required level of lighting performance.
- (b) Parameters that limit the adverse effects of the lighting on:
 - i. Users of the lit space e.g. pedestrians, vehicle drivers (i.e. control of glare);
 - ii. Night sky viewing conditions (i.e. reducing sky glow);
 - iii. Occupants of adjoining properties (i.e. minimise the amount of spill light).

Reference should be made to the relevant parts of the current AS/NZS 1158 series that provide the minimum levels of compliance that are required for each category and subcategory of lighting. Relevant parts include:

- Table 2.2 from AS/NZS 1158.1.1 - Values of LTPs for Category V Lighting
- Table 2.6 from AS/NZS 1158.3.1 - Values of LTPs for Category P Lighting of Roads in Local Areas and for Pathways
- Table 2.7 from AS/NZS 1158.3.1 - Values of LTPs for Category P Lighting of Public Activity Areas (Excluding Car Parks)
- Table 2.8 from AS/NZS 1158.3.1 - Values of LTPs for Category P Lighting of Connecting Elements

- Table 2.9 from AS/NZS 1158.3.1 - Values of LTPs for Category P Lighting of Outdoor Car Parks (Including Rooftop Car Parks)

It is the responsibility of the designer to ensure they have current copies of AS/NZS 1158 and any other QLDC lighting standards, policies and procedures.

3.4.4 Calculation of Light Technical Parameters

The calculations of all LTPs for category V and P roads shall be carried out in accordance with the computer based design procedures provided within AS/NZS 1158.2. This standard provides the basic formulae for the LTPs and the associated grid of points (calculation field) over which the calculations are to be made. Hand calculations shall not be accepted.

The use of a specific software application called “SAA STAN” is mandatory for the calculation of the luminance based LTPs for the category V straight road elements. This can be achieved using the software “Perfect Lite” or another shell program that is built around “SAA STAN” and which can be demonstrated to reproduce the values of all LTPs provided by “Perfect Lite”.

“AGi32” shall be used for the illuminance based calculations required for category V road lighting designs. “Perfect Lite” shall be used for the luminance based calculations required for category V road lighting designs.

“Perfect Lite” or “AGi32” shall be used for the illuminance based calculations required for category P road lighting designs.

It shall be the responsibility of the designer to ensure the appropriate software is used to carry out all the required calculations.

Spill light calculations shall be undertaken for all street lights adjoining residential activities.

3.4.5 Maintenance Factor

A design maintenance factor (MF) is used in the calculations to account for the combined light losses resulting from depreciation in the LED’s lumen output, expected luminaire failure rates and accumulation of dirt on the luminaire over a nominated maintenance period.

The MF is calculated as the product of the following depreciation factors:

- (a) *Luminaire Maintenance Factor (LMF)*: The LMF is dependant on the luminaire ingress protection (IP) rating, pollution category of the environment and the luminaire cleaning interval.

Note that AS/NZS 1158.1.2 Table 14.4 provides typical luminaire maintenance factors (based on pollution levels and routine luminaire cleaning) however it does not allow for longer cleaning intervals (over 48 months) associated with current technology LED luminaires. The luminaire maintenance factors provided in BS 5489-1 shall be used in place of those recommended in AS/NZS 1158.1.2.

- (b) *Light Source Lumen Depreciation Factor (LLD)*: The amount of light (lumen output) available at the end of a nominated operating period (85,000 hours - 20 years), as a proportion of the initial lumen output (when the LED was new), expressed as a decimal fraction. The LLD takes into account the operating temperature, driver current and electrical properties and shall be obtained from the luminaire supplier.
- (c) *Luminaire Survival Factor (LSF)*: This is the expected amount of failures after 85,000 hours of operation (including electronic components, drivers, lenses, premature failures or mechanical failure). A typical LSF for a modern LED road lighting luminaire is higher than 95% at 85,000 hours of operation. The LSF shall be obtained from the luminaire supplier.

The design MF can be calculated as follows:

$$MF = LMF \times LLD \times LSF$$

Refer to NZTA M30 Section 27.4 for further information on determining the design maintenance factor.

It is important to note that the design results are based on applying a realistic MF which needs to take into account the actual nominated maintenance (cleaning interval) that is expected to take place as well as the lumen depreciation and any luminaire failures.

As part of the design delivery process the designer is required to provide information on the MF used in the calculations including the following supporting information:

- (a) Luminaire ingress protection (IP) rating.
- (b) Luminaire cleaning cycle.
- (c) Light Source Lumen Depreciation (LLD).
- (d) Luminaire Survival Factor (LSF).

The maximum design MF shall not exceed 0.8.

Although the designer is required to supply the information relating to the MF used in the calculations it is the responsibility of QLDC to ensure that the appropriate levels of maintenance are applied so as to maintain the correct performance of the lighting scheme over the nominated maintenance period.

3.4.6 Design Output Deliverables

The designer shall submit the following design documents for QLDC approval before commencement of the installation works. Refer to Appendix D of AS/NZS 1158.1.1 and AS/NZS 1158.3.1 for a full list of the mandatory design information required to be submitted. Work shall not be started until the design documents have been approved by QLDC.

Layout Drawings (Refer Appendix 3)

The layout drawings shall be produced using a CAD based computer program and shall include the following minimum information:

- (a) Locations of all poles (dedicated lighting poles and/or overhead power poles) where the luminaires are installed and dimensions clearly showing the pole spacings.
- (b) All the particular roadway features including kerbs, carriageway edges, lane markings, property boundaries, traffic islands, pedestrian crossings, and any other features that form part of the road reserve or carriageway.

- (c) Equipment legend detailing the luminaire types (LED count and driver current), mounting arrangements, poles and outreach arms.

Design Report or Design Statement

A design report or design statement shall be provided along with layout drawings and shall contain comprehensive information detailing all aspects of the design and (in conjunction with the layout drawings) shall be used as a method of verification that the design is fully compliant with the New Zealand requirements of AS/NZS 1158 and any other particular QLDC requirements. As a minimum the following information shall be provided:

- (a) The applicable categories and subcategories for each road.
- (b) A list of the design methods employed and presentation of the modelling results to demonstrate compliance. This can be a list of tabulated calculation results with suitable printouts from the lighting software used.
- (c) Any areas of non-compliance (with the NZ standards and/or QLDC requirements) shall be noted along with explanatory notes describing why a fully complying design was not achieved. QLDC approval shall be required for any areas of non-compliance.
- (d) Details of the lighting arrangement (single sided, staggered, opposite, etc.) and geometry (spacing, mounting height, overhang, up cast angle).
- (e) Details of the lighting columns including type, size, material, finish and any particular mounting requirements (frangible, shear based, etc.).
- (f) Luminaire details including luminaire name, description, input power, LED count, driver current, optical setting, lumen output and IP/IK rating.
- (g) The origin of the photometric file (used in the design modelling) for the luminaires.
- (h) The name and source of the computer software used.
- (i) The MF used and the basis for the MF selection (refer to section 3.3.5).

Calculation Results (Refer Appendix 2 and 4)

A printout of the calculation results (directly from the lighting software) shall be required to be submitted for approval along with the other design information listed above. The calculation results can be pasted into the design report or onto a drawing information sheet provided it is a direct output from the lighting software.

Combination Layout Drawings and Design Information (Refer Appendix 1 and 2)

QLDC will accept a set of drawings with the calculation results and design information pasted onto an information sheet, provided all of the above mentioned design information is clearly presented.

Spill Light Calculation Results

Spill light calculations shall be carried out in accordance with NZTA M30 for all new category V street lighting installations adjoining residential properties. The spill light calculations shall be carried out with a maintenance factor of 1.0. Spill light calculations are not required for category P lighting installations unless specifically requested by QLDC. Examples where spill light calculations might be requested would be:

- Commercial P11a/P11b car parks bordering residential areas
- Lighting of pedestrian activity areas or narrow alleyways adjacent to residential (particularly multi-story apartments where windows may be close to light poles)
- Lighting of areas elevated above other residential development

QLDC will reject any design that is submitted with missing or incomplete information, or any unjustified areas of non-compliance.

3.5 Flag Lighting

At isolated rural unlit intersections, where particular night time safety issues have been identified, flag lighting (in addition to reflective strips) should be used as a means of providing advance warning to alert approaching motorists to the presence of the intersection. In such cases specific illuminance design is not required and the following table has been provided as a guide to selecting the most appropriate luminaire and mounting parameters.

The designer should also follow any NZTA guidelines around the use of flag lighting at isolated rural unlit intersections.

QLDC Table 2 Parameters for Flag Lighting

Vehicle Volume (VPD)	Subcategory	Maximum Mounting Height (m)	Maximum Lumen Output (lm)
> 20,000	V2	12	18,000
7,500 to 20,000	V3	10.5	14,000
< 7,500	V4	9	9,000

QLDC will advise each applicant whether flag lighting is required on a case by case basis.

4 DIFFERENCES BETWEEN THE QLDC TECHNICAL SPECIFICATION AND AS/NZS STANDARDS

Where there are differences between the QLDC Technical Specification and the AS/NZS Standards this Technical Specification takes precedence. The following are instances where QLDC's requirements differ from (or are in addition to) the Standards:

- Luminaire tilt angles shall not exceed 0° for Category P roads and 5° for Category V roads unless otherwise approved by QLDC.
- Spill light shall be controlled as per District Plan
- On Category V roads the Threshold Increment (TI) shall not exceed 12% (AS/NZS 1158 allows up to 20%)

The QLDC may also impose other requirements (that deviate from these specifications and/or the AS/NZS Standards) based on special site or community specific requirements, and in such cases the applicant shall be advised accordingly.

5 EQUIPMENT SELECTION AND INSTALLATION REQUIREMENTS

All equipment specified by the designer shall be subject to final approval by QLDC. The design life and durability performance shall be 20 years for all luminaires and 50 years for all other equipment.

5.1 Luminaires

The following LED minimum performance requirements are applicable to all new lighting installations and shall be read in conjunction with NZTA M30:

QLDC Table 3 LED Minimum Performance Requirements

Main Characteristics	
Colour Temperature	Between 3000K and 4000K
CRI	≥ 70
Rated Optical Life	≥ 85,000 hours
Insulation Class	II
Protection Degree	IP66
Impact Protection	IK08
LED Modules	Removable
Luminaire Tilt Angle (when installed)	0° - 5° above the horizontal (Adjustable on site).
Weight	≤ 15kg
Mounting	Bracket attachment Ø42mm to Ø60mm
Temperature Range	-10° to +40°
Gear Tray	Removable plate
DALI	Dimmable driver
NEMA socket	7-Pin
Electrical Characteristics	
Rated Voltage	230V (50Hz)
Power Factor	>0.9 (at full load)
Integrated Surge Protection	Up 10kV/10kA
Total Harmonic Distortion	≤ 20%

All luminaires shall be designed to enable the LED light engine to be replaced and/or upgraded. The IP66 rating of the complete luminaire shall not be compromised as a result of either replacement or upgrade of the luminaire components.

The integral Surge Protection Device (SPD) shall be an electronic device capable of sustaining 5 strikes with automatic reset capability and must be of a type capable of protecting all electronic components within the luminaire. Varistor type SPD devices shall not be used as their operating times are not always fast enough to protect electronic components. Suppliers shall provide details of the SPD's characteristics and demonstrate that the installed device will protect all electronic componentry.

The 20 year design life applies to all component parts of the luminaire and includes the housing, lens, gaskets, LEDs, compartments, drivers and control gear.

In addition to meeting the above minimum standards the LED manufacturer and/or supplier shall provide a 10 year performance warranty on the luminaire, based on normal LED operation within the QLDC district. The warranty must be in the name of QLDC and details must be provided with As-built information.

The introduction of smart computerised central management systems (CMS) can provide greater flexibility in how lighting systems are operated. Simple on/off functionality can now be replaced with a CMS which allows remote control and dimming functions to be implemented. QLDC requires each LED luminaire to be provided with a DALI dimmable driver and a 7-Pin NEMA socket (complying with ANSI C136.41) complete with Zodian SS6 photocell QLDC will advise each applicant of any other particular CMS requirements.

Refer to NZTA M30 Specification and Guidelines for Road Lighting Design for the acceptable LED testing procedures and methods of determining optical performance, production of photometric files (IES and CIE format) and method of measuring lumen depreciation.

NZTA M30 contains a list of accepted LED luminaires that have been assessed as meeting the M30 criteria and this list has been adopted by QLDC. Refer to section 3.1.

QLDC varies from NZTA M30: where it is deemed more appropriate to apply a lower colour temperature. Specifically 3000K is the colour temperature required in Category P residential areas.

5.2 Environmental Conditions

All equipment selected for use in QLDC region shall have to cope with particular climatic and environmental conditions including seasonal weather fluctuations such as heavy winds (wind loadings), heavy snow (snow loadings) in the winter and very high temperatures in the summer.

5.3 Lighting Columns

The new luminaires shall be mounted on any combination of the following configurations:

- (a) New street lighting columns.
- (b) Existing overhead power poles using suitable outreach arms mounted onto each power pole.
- (c) Joint use mast arm (JUMA) or joint use signal (JUSP) lighting columns.
- (d) Mounted directly onto buildings (or other infrastructure) using suitable mounting brackets and hardware.

All new lighting columns (and mounting hardware) shall comply with the relevant structural standards and the performance and durability requirements of NZTA M26 in addition to any local environmental conditions such as high wind and/or snow loadings and poor ground conditions.

In the case of any building mounted luminaires, permission from the building (or asset) owner is required prior to installation.

5.3.1 New lighting columns

Unless otherwise advised by QLDC all new lighting columns shall be octagonal steel (hot dip galvanised) ground planted poles complete with curved outreach arms. The column shall be unpainted unless there are particular visual or environmental concerns that need to be addressed. QLDC shall approve the colour and painting shall be carried out by the column manufacturer during fabrication and assembly.

All new lighting column shall be of the frangible type as a minimum requirement, however certain ground conditions or safety issues may require the columns are shear or flange based (with either a stub base or concrete foundation). High speed areas exceeding 70kph will require use of shear or flange based columns. Specific design may also be required at locations that have particular environmental or physical constraints i.e. bridges, retaining walls, gabion baskets, or other structural elements that may be present.

On category P roads, that are being installed as part of a new subdivision, decorative or heritage style poles may be used provided they meet all of the performance requirements listed within this design guide, on approval by QLDC.

New lighting columns shall be designed and constructed based on the luminaire mounting parameters, weights and sail areas specified in the following table.

QLDC Table 4 Luminaire Mounting Parameters

Luminaire Mounting Height (m)	Maximum Bracket Outreach (m)	Maximum Luminaire Weight (kg)	Maximum Luminaire Sail Area (m ²)
12.00	4	15	0.15

10.50	4	15	0.15
9.00	3	10	0.12
7.50	3	9	0.10
6.00	2	9	0.10

Where possible the above standard mounting heights shall be used, however there may be special circumstances where other mounting heights and/or outreach lengths are required, and in such cases compliance with the structural and durability requirements of NZTA M26 will need to be demonstrated in addition to obtaining QLDC approval prior to column selection.

Refer to Appendix 5 for typical arrangement.

5.3.2 Existing Power Poles

At locations where there are existing overhead power poles and it is not practical to install new street lighting poles, the luminaires may be able to be mounted onto the existing poles using suitable steel (hot dip galvanised) outreach arms, subject to approval from the local electricity distribution company.

All new outreach arms (and mounting hardware) shall comply with the relevant structural standards and the steel performance and durability requirements of NZTA M26.

5.3.3 Traffic Poles

Where new lighting is required at signalised intersections involving the addition of new signal poles the preference is to mount the luminaires onto JUSP or JUMA poles.

6 POWER SUPPLY AND CONTROL REQUIREMENTS

6.1 Power Supply and Cabling Requirements

The design and installation of power supplies to the new lighting, including alterations and extensions to the street lighting network (SLN), shall be undertaken by an experienced and competent designer and/or contractor “approved” by the local electricity network company.

All installation work shall be carried out in accordance with the requirements of the local electricity network company and all related electrical regulations and standards including (but not limited to) AS/NZS 3000 (wiring rules) and the NZ Electricity (Safety) Regulations.

6.2 Lighting Control Systems

Road lighting control systems typically involve any combination of the following:

- (a) Manual switching from a central location (area substation) supplying a group of luminaires.
- (b) Photocell control from a central location supplying a group of luminaires or individual photocells mounted on each luminaire.
- (c) CMS or SCADA control using signals transmitted over a local network to remotely control and/or dim groups of lights.

As a minimum all new luminaires shall come with dimmable drivers in accordance with M30.

7 COMMUNITY SPECIFIC DESIGN GUIDELINES

This section draws attention to urban design, the QLDC District Plan, community specific requirements as well as non-transport related elements. It is important to adhere to the Southern Light Part One - A Lighting Strategy, the operative QLDC District Plan and the QLDC Urban Design Strategy which provides design guidelines and other urban design reference documents.

Where community specific guidelines are available these shall be taken into consideration throughout the design and construction of subdivisions and development. Contact should be made to QLDC to ascertain current status of community specific plans.

8 DESIGN GUIDELINES FOR LIGHTING NOT COVERED IN AS/NZS 1158

AS/NZS 1158 provides minimum performance and design requirements for the lighting of roads and public spaces. However there are other forms of outdoor lighting that are not covered within the AS/NZS 1158 series (or are included in other standards), and the following sections provide guidance to designers and others responsible for lighting schemes (permanent or temporary) that fall outside AS/NZS 1158.

As a minimum requirement all lighting listed within this section shall comply with the requirements of AS 4282 which covers the control of the obtrusive effects of the following outdoor lighting applications:

- For work or recreation (outdoor workplace lighting shall also comply with AS/NZS 1680.5)
- For safety or security
- For amenity
- For advertising or display

AS 4282 excludes:

- Road and public lighting
- Lighting installed for the purposes of colour television broadcasting

Vested infrastructure must be cost effective and should be a nationally and readily available product, approved by QLDC.

8.1 Feature Lighting (Up-lighting and Flood Lighting)

Adherence to the Southern Light Strategy and Technical Specifications gives the Council and private owners the opportunity to celebrate and highlight the special features in our community without over-saturation of lighting. While some festive and feature lighting may contravene the upward waste light requirement, there are some circumstances where this will be allowed through both permanent and temporary installations. Special dispensation must be approved by QLDC and may reflect the communities' intention to seek accreditation for Dark Skies.

Feature lighting (including in-ground up-lighting, bollards and above ground floodlighting) shall only be provided for specific locations that are of special or historical significance. There are no specific minimum or maximum illumination levels, however each individual design shall be submitted (for approval by Council) with accompanying calculations clearly showing the horizontal and/or vertical illuminance values corresponding to each feature being lit.

In the case of a statue, tree, building façade or sign the vertical design area shall match (as closely as possible) the item being illuminated. Where multiple floodlights are required to illuminate the perimeter of a tree or statue a vertical calculation shall be required for each floodlight aimed at the item.

Any lighting installation, either temporary or permanent, that is installed within a QLDC tree or within the root zone of a QLDC tree shall be required to be assessed with regard to any potential harmful or negative effect the installation may have on the wellbeing of the subject tree. This assessment shall be undertaken by the QLDC Arborist and should it be considered that the installation will likely have a detrimental effect on the wellbeing of the subject tree, approval shall not be granted.

Should approval be granted, it will likely be subject to conditions to ensure that there is no subsequent detrimental effect on the subject tree, such conditions may include:

- The installation and removal of any decorative lighting within the crown of a QLDC tree shall be installed by a suitably qualified professional arborist
- Any works within the root zone of a QLDC tree (cable installation etc) shall be overseen and monitored by a suitably qualified professional arborist
- Only low wattage LED shall be installed in trees. Conventional incandescent light bulbs create excessive heat that can be harmful to the tree

All floodlights shall be directionally aimed and focused towards the items required to be illuminated, and in no case shall any up-light be aimed straight up into the atmosphere. The Council's preference is to have building or pole mounted floodlights aimed down (below the horizontal) towards the items being lit. The Council recognises that this may not always be practical and will allow in-ground floodlights to be used subject to their approval.

The Council reserves the right to withhold approval for any feature lighting in a public setting if the adverse lighting effects are deemed to be too excessive, and in such cases the lighting designer may be required to submit an alternative design using lower lumen output fittings.

All feature lighting equipment (luminaires, housings, columns, fixing brackets, etc) shall comply with the durability requirements in section 4. Any in-ground luminaires, located where vehicles may be active, shall have a maximum surface load capacity of 5,000 kg.

8.2 Parks and Open Spaces

Parks and Open Spaces must adhere to public spaces within AS/NZS 1158 where appropriate. Areas containing feature lighting (e.g. trees, shrubs or monuments) are covered in Feature Lighting.

8.3 Illuminated signs

For externally illuminated signs it is preferential that the light source is positioned to point downwards towards the sign rather than upwards to minimise upward light pollution (sky glow). Refer to Feature Lighting for further details.

All illuminated sign shall adhere to Section 18, Signs of the Operative and Proposed District Plan. Signs exceeding 150cd/m² of illumination require QLDC consent.

8.4 Outdoor Domestic Lighting

While the QLDC does not have a vested interest in domestic outdoor lighting installations, there may be occasions where neighbours (or pedestrians) raise complaints about excessive glare and/or spill light.

This document does not cover outdoor domestic lighting, however AS 4282 contains some informative text on good practice including the use of passive infra-red movement detectors or low brightness (dimmed) lighting when continuous (over-night) operation is required.

8.5 Outdoor Workplaces

The design and performance requirements for outdoor workplace lighting is covered under AS/NZS 1680.5, and should be followed for all applicable areas. The obtrusive effects of outdoor workplace lighting can be mitigated by applying the requirements of AS 4282.

APPENDIX 2 - TYPICAL DESIGN NOTES AND CALCULATION RESULTS

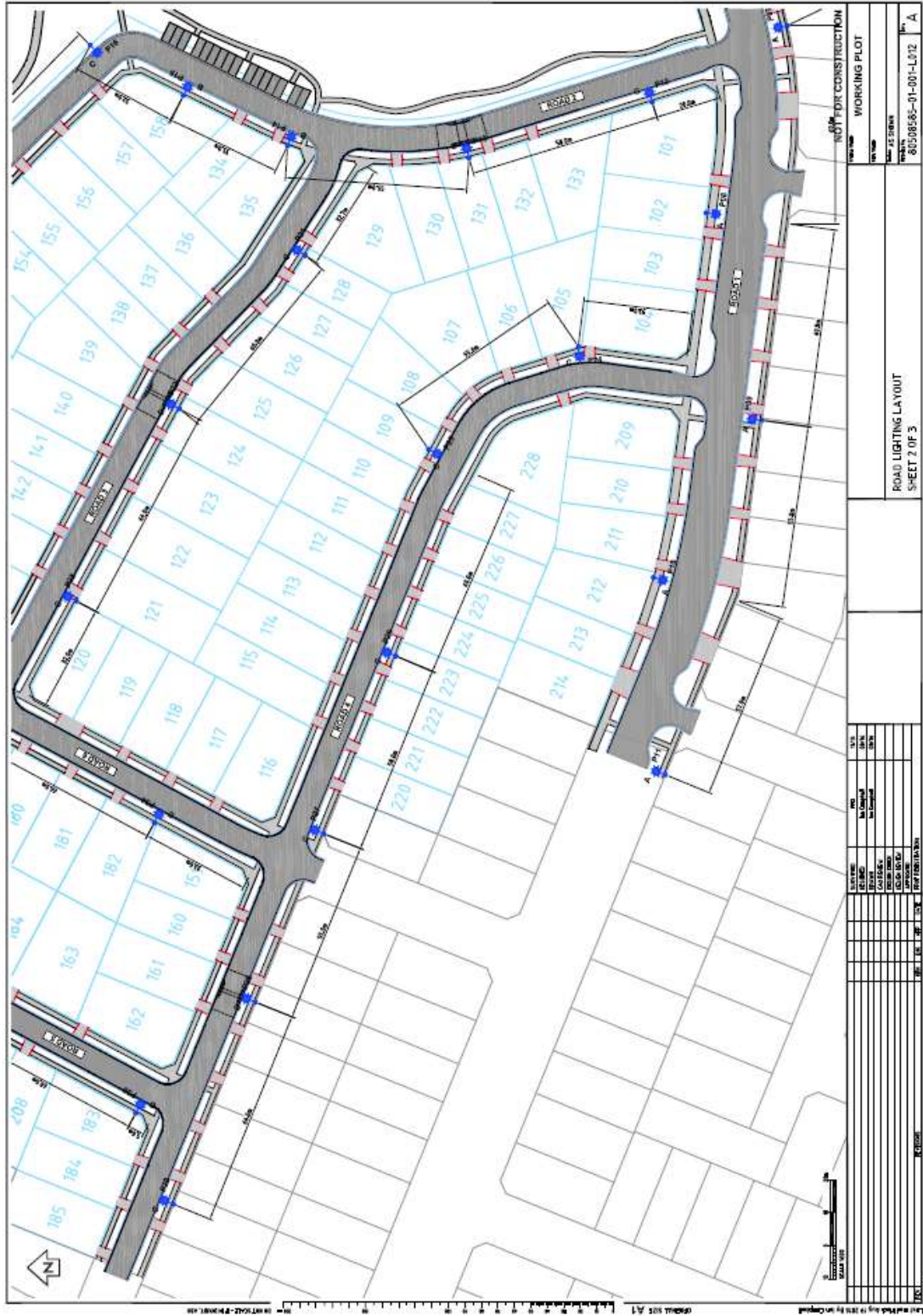
Drawing Notes (alternative to design report):

NOTES	
1.	ALL NEW STREET LIGHTING POLES SHALL BE SPUNLITE (OR EQUAL) TAPERED OCTAGONAL STEEL FRANGIBLE GROUND-PLANTED COLUMNS COMPLYING WITH NZTA M26.
2.	THE NEW STREET LIGHTING POLES SHALL BE LOCATED IN FRONT OF THE PROPERTY BOUNDARIES (WITHIN THE ROAD RESERVE) OR WHERE SHOWN ON THE DRAWINGS.
3.	THE ROAD LIGHTING HAS BEEN DESIGNED TO COMPLY WITH THE CATEGORY P REQUIREMENTS OF AS/NZS 1158.3.1 AND THE QLDC SOUTHERN LIGHTS STRATEGY. THE LIGHTING ALONG ROAD 1 (OFF SH6) HAS BEEN DESIGNED IN ACCORDANCE WITH THE CATEGORY P4 REQUIREMENTS AND THE ROAD LIGHTING ALONG THE REMAINING ROADS HAS BEEN DESIGNED IN ACCORDANCE WITH THE CATEGORY P5 REQUIREMENTS. THE PARKING AREA ON ROAD 2 HAS BEEN DESIGNED IN ACCORDANCE WITH THE CATEGORY P11c REQUIREMENTS.
4.	THE LUMINAIRES SHALL BE AEC ITALO LED _s (OR EQUAL), WITH MODULES AND WATTAGES AS SPECIFIED IN THE LUMINAIRE AND POLE LIST. THE QUALITY OF MANUFACTURE AND OPTICAL PERFORMANCE OF ANY ALTERNATIVE LED LUMINAIRES SHALL MATCH OR EXCEED THAT OF THE AEC ITALO (INCLUDING THE CURRENT DESIGN SPACINGS) AND SUPPORTING CALCULATIONS SHALL BE SUBMITTED ALONG WITH ANY ALTERNATIVE LUMINAIRES OFFERED.
5.	WHEN INSTALLED, ALL NEW LUMINAIRES SHALL HAVE MOUNTING HEIGHTS, OUTREACH ARM LENGTHS AND TILT ANGLES AS SPECIFIED IN THE LUMINAIRE AND POLE LIST.
6.	WHEN POLES ARE SET IN PLACE THEY SHALL BE VERTICAL TO WITHIN 2°. WHEN EACH LUMINAIRE IS FITTED IT SHALL HAVE THE REQUIRED TILT TO WITHIN 2° AND THE AXIS OF THE LUMINAIRE BEAM SHALL BE IN A VERTICAL PLANE TO WITHIN 2°.
7.	ALL MATERIALS (INCLUDING LUMINAIRES, POLES, ARMS AND MOUNTING HARDWARE) SHALL COMPLY WITH THE DURABILITY REQUIREMENTS OF NZTA M26 AND M30.
8.	THIS DRAWING ONLY DEPICTS THE LUMINAIRES, POLE LOCATIONS AND MOUNTING REQUIREMENTS ASSOCIATED WITH THE LIGHTING DESIGN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY STREET LIGHTING NETWORK (SLN) DESIGN AND INSTALLATION (THAT MAY BE REQUIRED TO ESTABLISH AND/OR EXTEND THE SLN) AND ALL WORK SHALL BE UNDERTAKEN BY AN EXPERIENCED AND COMPETENT CONTRACTOR "APPROVED" BY THE LOCAL LINES COMPANY.
9.	THE CONTRACTOR SHALL COMPLY WITH THE NZ ELECTRICITY (SAFETY) REGULATIONS, NZ WIRING RULES (AS/NZS 3000) AND ANY SPECIFIC LINES COMPANY RULES AND PROCEDURES. THIS SHALL INCLUDE MAINTAINING THE REQUIRED CLEARANCES BETWEEN POWER LINES AND ANY LIGHTING AND CONSTRUCTION EQUIPMENT DURING THE CONSTRUCTION PERIOD AND FOLLOWING COMPLETION WHEN ALL THE LIGHTING EQUIPMENT HAS BEEN INSTALLED.

Illuminance Calculation results (exported from AGi32):

AS/NZS 1158.3.1 Category P - Calculation Summary						
Scene: Scene_1						
Label	CalcType	Units	Avg	Min	MaxAvg	Description
Road 2 Car Parks	Illuminance	Lux	4.23	0.9	2.62	Category P11c - 3.5 Lux (Avg), 0.7 Lux (Min) & Uniformity (Max/Avg) of 10 (Max)
Road 2 LATM 131 L	Illuminance	Lux	N.A.	3.6	N.A.	Category P5 - 3.5 Lux (Min)
Road 2 LATM 131 R	Illuminance	Lux	N.A.	4.0	N.A.	Category P5 - 3.5 Lux (Min)
Road 2 LATM 149 L	Illuminance	Lux	N.A.	4.2	N.A.	Category P5 - 3.5 Lux (Min)
Road 2 LATM 149 R	Illuminance	Lux	N.A.	4.1	N.A.	Category P5 - 3.5 Lux (Min)
Road 3 LATM 139 L	Illuminance	Lux	N.A.	4.6	N.A.	Category P5 - 3.5 Lux (Min)
Road 3 LATM 139 R	Illuminance	Lux	N.A.	4.1	N.A.	Category P5 - 3.5 Lux (Min)
Road 4 LATM 161 L	Illuminance	Lux	N.A.	4.1	N.A.	Category P5 - 3.5 Lux (Min)
Road 4 LATM 161 R	Illuminance	Lux	N.A.	4.5	N.A.	Category P5 - 3.5 Lux (Min)

APPENDIX 3 - TYPICAL LAYOUT DRAWING



APPENDIX 4 - TYPICAL PERFECT LITE CALCULATION RESULTS

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Road 1_P4_SS 42m_7.5+2+5_Italo 1 STA 525mA 54W
P Category Lighting - AS/NZS 1158.3.1:2005
*****

I-table Filename: C:\Data\Road Lighting\Photometric Files\AEC\Italo
Range 2015-08-20\Italo 1\ITALO 1 0F2 STA 4.5-4M.ci
e

Job Name: Hanley Downs DP1 - Road 1

Luminaire Description: IT1 0F2 STA 5-4M      5440 lms
Lamp Wattage & Type: 54W
Initial Lamp Flux: 5440 lms
Maintenance Factor: 0.8
Stores Code:
Upcast Angle: 5 degrees
Arrangement: Single Side
Offset Distance: 2.56 m
Upward Waste Light Ratio: .0 %
Light Source: LED - Light Emitting Diode
Luminaire Classification: Not specified

Lighting Category: P4 (Local Area Roads - Tables 2.1 & 2.6)

Illuminance Criteria: Average Illuminance (Eav) >= 0.85 lx
(Maintained values) Minimum Illuminance (Eph) >= 0.14 lx
Illuminance Uniformity (Up) <= 10

Calculation Grid: 20 x 11 points - Figure 3.7 of AS/NZS 1158.2

@B Mounting          Maximum Spacing for different
@B Height            Road Reserve Widths
@B -----

      25.0
7.5 | 42.6 |
    +-----+

Value/s in above table are all in metres.
The table contains maximum spacings which, for the specified luminaire
and lamp combination, provide compliance with the light technical
parameters (LTPs) of Table 2.6 of AS/NZS 1158.3.1:2005.

Refer next page for list of LTP's at compliant maximum spacings.

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@IPlEpcat - Vers 3.09 (Built: 18/10/12)          Run: 16/ 8/2016 at 16:38:41

Light Technical Parameters at Maximum Spacing
*****

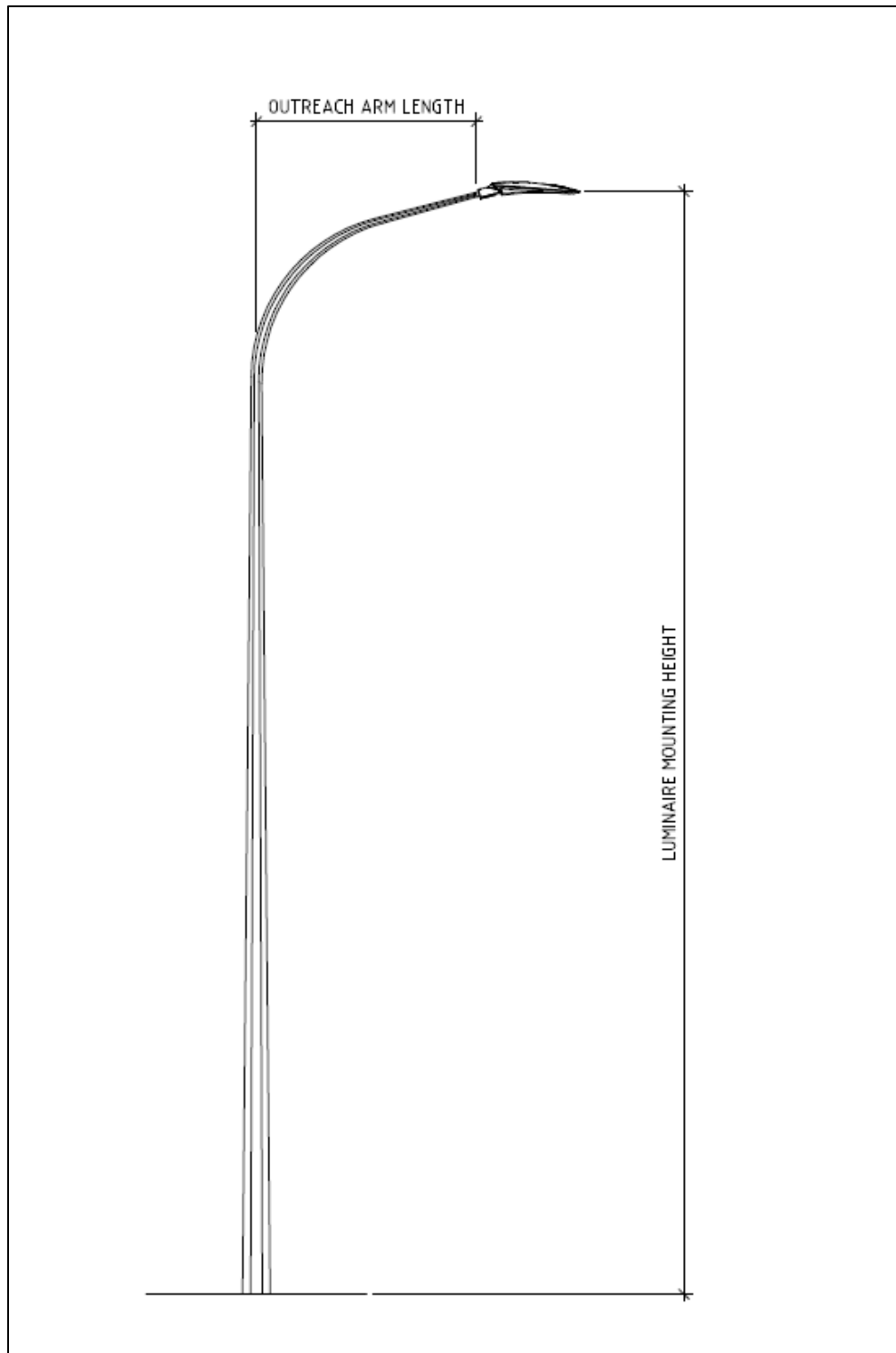
Mounting Road   Maximum   Eav     Eph     Up     Emax
Height  Reserve  Spacing  (lx)    (lx)    (Emax/Eav)  (lx)
(m)      (m)      (m)
-----
7.5      25.0    42.6     3.37    0.14    6           20.42

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@IPlEpcat - Vers 3.09 (Built: 18/10/12)          Run: 16/ 8/2016 at 16:38:41

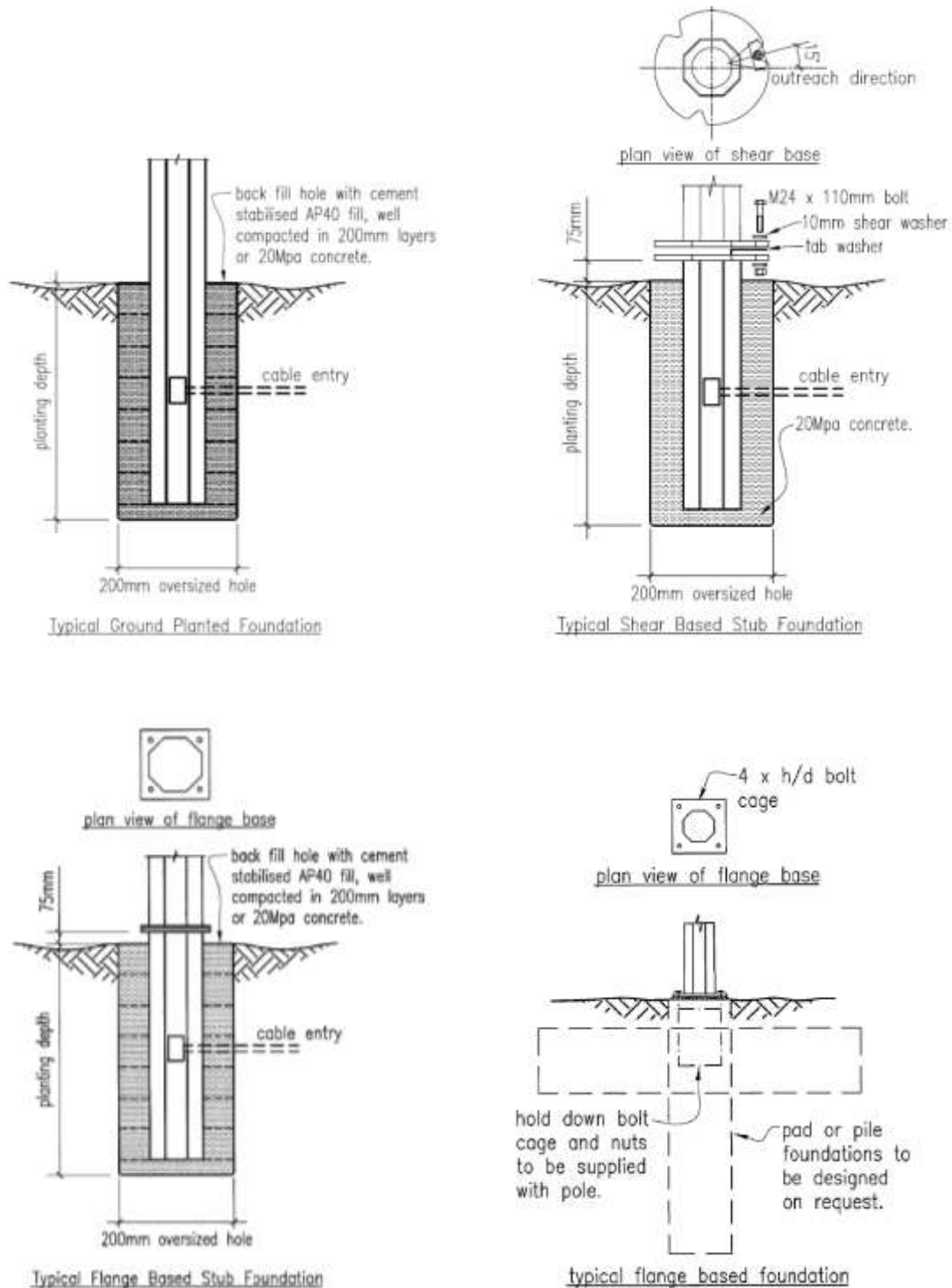
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APPENDIX 5 - TYPICAL POLE DETAILS

Tapered Octagonal Steel Lighting Pole c/w Curved Outreach Arm



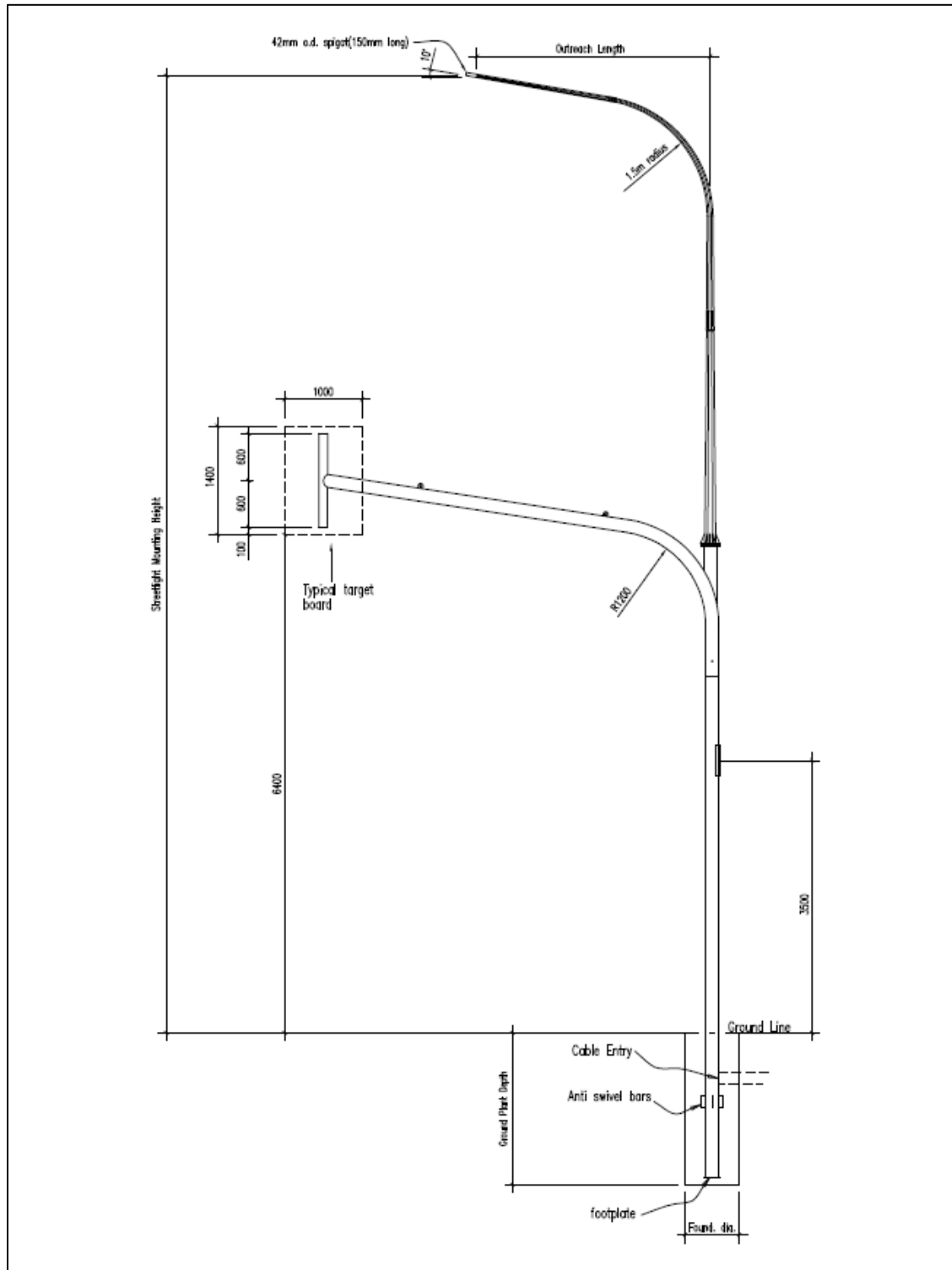
Typical Lighting Pole Foundation Details



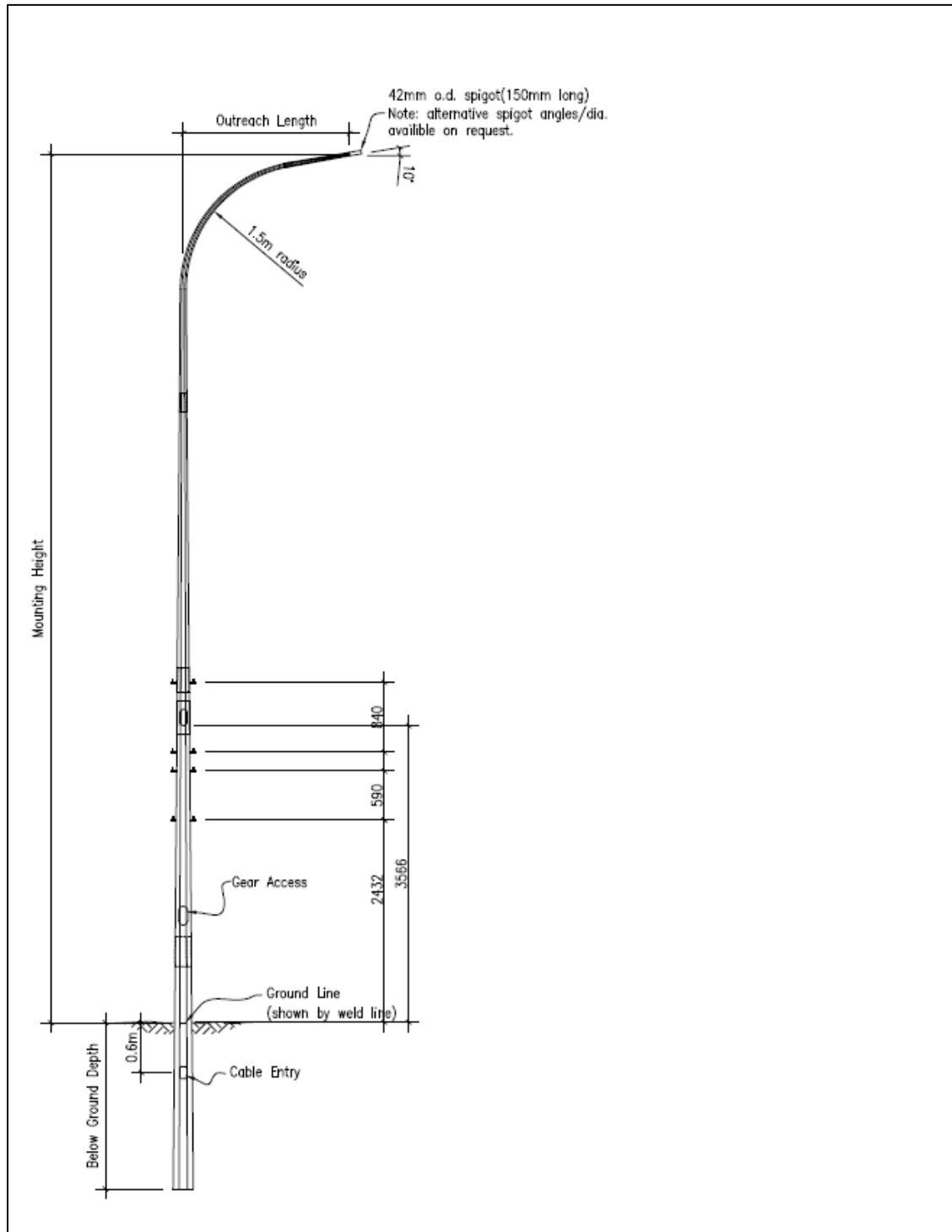
Note: The above arrangements depict typical details only and the actual mounting details may vary between pole suppliers. Specific design may also be required due to site specific ground conditions.

JUMA and JUSP Signal Poles

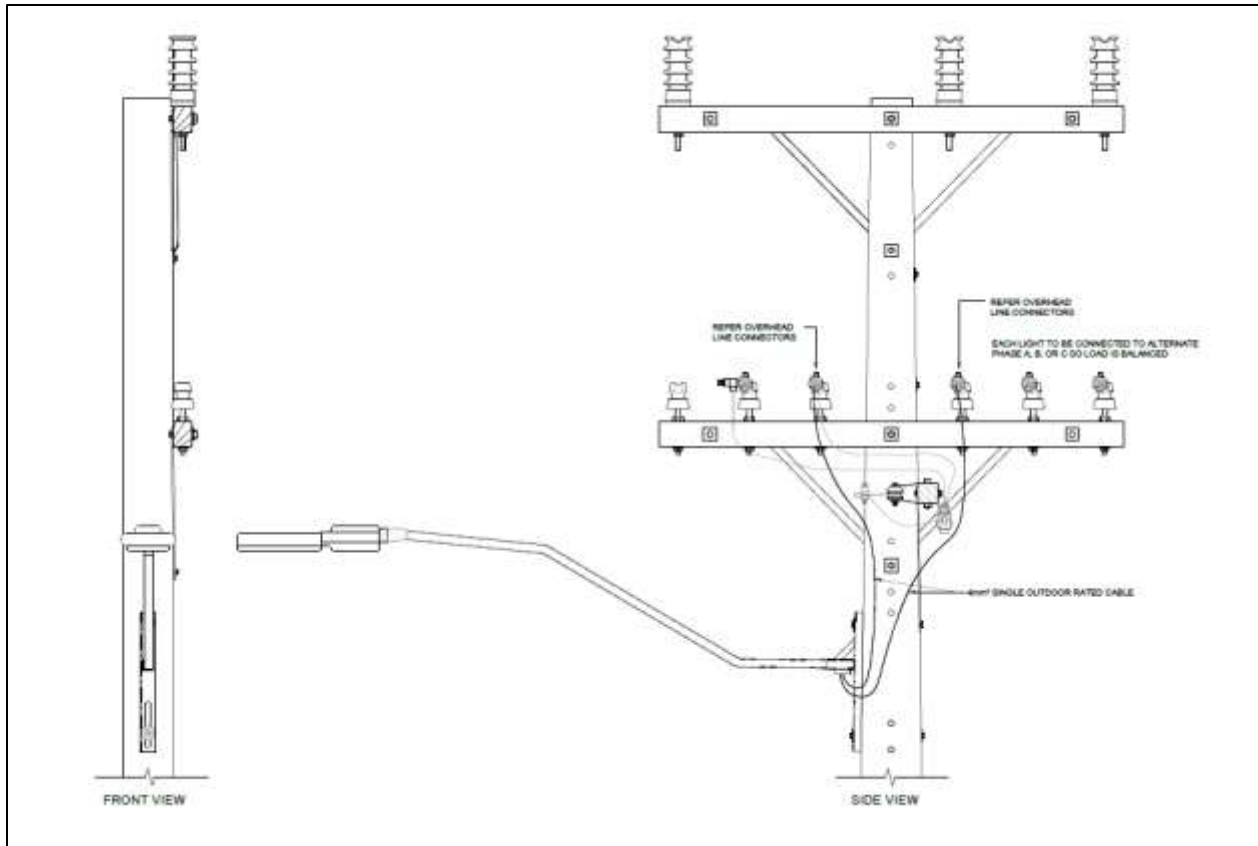
JUMA Signal Pole:



JUSP Signal Pole:



Typical Power Pole Mounting Details



Note: The above arrangement is typical only and any work on or near overhead lines shall be undertaken by the local electricity network company or a contractor approved by the local electricity network company.

APPENDIX 6 - EXAMPLE OF COMMUNITY SPECIFIC DESIGN (CARDRONA)

The following images have been presented as an example of a community specific design that was applied to a lighting upgrade at Cardrona where equipment (luminaires and poles) were selected to blend in with the historical context of the Cardrona Hotel and surrounding environment.

Image date December 2009 (before upgrade):



Image date July 2015 (after upgrade):

