



Development Design Guide

Appendix 10 – Street Lighting

Appendix 10 Road Lighting Specification and Checklist

Purpose of the Document

Section 38 of the Highways Act 1980 enables Cumbria County Council (CCC) to take over and maintain at the public expense (adopt), roads, footways, footpaths and other areas constructed by a third party through a legal agreement.

The purpose of this document is to guide developers through the process of establishing a Section 38 Agreement with CCC to ensure works are carried out to the satisfaction of all parties. This guide outlines what CCC will expect to achieve.

- The highest quality development possible.
- Efficient and effective delivery of projects for all parties.
- Development is not a financial burden or maintenance liability to CCC.
- The delivery of highway works constructed to adoptable standards.
- Delivery in accordance with relevant legislation
- Consistent use of acceptable materials on the publicly maintained highway

Road Lighting Columns and Brackets.

Cumbria County Council's design guide on street lighting sets out minimum standards required for highway use.

General

All developments must be provided with an approved form of street lighting prior to being considered eligible for adoption. It should be noted that the Highway Authority will not be responsible for any street lighting erected in non-adoptable situations.

Proposals for street lighting must be included with the drawings and specifications to be incorporated in the Section 38 Agreement. The provision of street lighting will be the responsibility of the developer and all proposals must have the approval of the Highway Authority prior to the works commencing.

The Developer must ensure that all relevant street lighting is operational before occupation of dwellings.

Regulation and British Standards

All street lighting designs must comply with Cumbria County Council Lighting Policy and Standards and all documents listed below. Developers must also take into account any applicable Institution of Lighting Professional Technical Reports, Dark Landscapes or any other relevant guidance.

BS 5489 Code of Practice for the Design of Road Lighting

BS 5489-1:2013 Part 1: Lighting of roads and public amenity areas.

BS 5489-2:2003 Part 2: Lighting of tunnels and underpasses.

BS EN 13201 Road Lighting

BS EN 13201-2:2003 Part 2: Performance Requirements

BS EN 13201-3:2003 Part 3: Calculation of performance

BS EN 13201-4:2003 Part 4: Methods of measuring performance.

All materials must comply with the British Standards including the following:-

BS 4533 - Luminaires

BS 5972 - Photo electric control units

BS 4782 - Ballasts

This list is not exhaustive and other standards where relevant shall be applied.

The Highway Authority may consider other light sources which may become available subject to approval. Consideration will be given to the best value solution when selecting light sources given this does not compromise the quality of the lighting installation.

Street lighting and associated electrical installations must comply with the following:-

BS7671:2008 (A3 2015) Requirements for Electrical Installations, IET Wiring Regulations

Engineering Recommendation G39 Issue 2 2012

Guidance Note GS6 (HSE) – Avoidance of Danger from Overhead Electricity Lines

This list is not exhaustive and other standards where relevant shall be applied.

Those involved in managing and providing the service should have appropriate experience, skills, training and equipment to perform their tasks. Monitoring and training should be coordinated to ensure high levels of

competence. Effective training should support changes in techniques, materials and procedures. All personnel should have a thorough understanding of personal and task related risks, together with awareness of the available range of actions and options.

Selection of Lighting Class

Important outcome of the selection process is to ensure developments are neither under lit nor over lit. It is advised that the selection process is undertaken by a competent person.

BS5489-1: 2013 Code of practice for the design of road lighting.

Part 1: Lighting of roads and public amenity areas.

Step 1 - Evaluate: Select lighting class from the relevant table:

Table A.3: Moderate speed traffic route (30 mph < $v \leq 40$ mph), mixed users.

Table A.4: Conflict areas.

Table A.5: Subsidiary Roads, low speed ($v \leq 30$ mph).

Table A.6: subsidiary roads, very low speed (walking pace), pedestrians and cyclists.

Step 2 – Risk Assess: Each designer shall carry out a risk assessment to identify any specific needs for the development e.g. local custom and practice and topography of the area can be taken into account.

This put the onus upon on a competent person with good local knowledge of the site to make an appropriate judgement on the lighting level chosen.

Step 3 - Re-evaluate: Depending on the assessed risks associated with the development lighting classes can be adjusted up or down, with the adjustment normally not being more than 1 class up or down.

Step 4 - Apply: Apply lighting standard and adjust the lighting level according to the S/P ratio of the light source. When the light source

has a $R_a \geq 60$ use Table A.7 within BS5489: 2013.

Design Requirements

General

The Developers lighting design proposals, including illuminance/luminance data in the form of grid diagrams together with electrical cable calculation (if required), must be submitted for approval to the Highway Authority.

It is essential that the height of lighting columns is appropriate for the development proposals. Local distributor roads will require mounting heights of 8m or 10m. Mounting heights on proposed bus routes must be a minimum of 8m unless stated otherwise from the Highway Authority. Mounting heights of 5m or 6m will also be required on all housing estate roads unless otherwise stated from the Highway Authority.

Lighting columns shall be positioned at the back of footways/footpath, or verges within the adopted highway approximately 1.8m from carriageway edge.

Street lighting columns must not obstruct any footways/footpaths, vehicular accesses or be sited in potentially hazardous positions. They themselves must avoid obstructs like trees/hedges, all types of overhead lines and bedroom windows.

Where lighting columns are to be in the vicinity of overhead power lines the Developer shall ensure that the appropriate Electricity Authorities are notified and given written agreement to the specific clearances to be provided and that warning notices are permanently fixed to the columns affected prior to erection.

Where lighting columns are sited with no vehicular access, raising and lowering columns will be required.

Passive Safety

The Designer shall assess the requirements for passive safety of support structures. This assessment shall form part of the design proposal submitted for approval. Where it is determined that passive safety support structures are required Table A.2 shall be used for specifying passive safety requirements for lighting columns and illuminated sign posts.

Passive safe equipment shall be considered on rural 'A' roads with an Average Annual Daily Traffic (AADT) flow greater than 5000 vehicles. All other road shall be subject to a site specific risk assessment in accordance with Institution of Lighting Professionals (ILP) Technical Report 30, Passive Safety Guidance on the Implementation of Passively Safe Lighting Columns and Signposts.

The following documents shall be taken into consideration for any passive safety installations.

BS EN 12767:2007 (2009) Passive safety of support structures for road equipment, requirements classification and test methods.

ILP Technical Report 30 Guidance on the Implementation of Passively Safe Lighting Columns and Signposts

Passive Safe UK Guidelines for Specification and use of Passively Safe Street Furniture on the UK Road Network.

Design of Lighting Columns and Brackets

The following Tables A.1 to A.3 shall be used for specifying lighting columns.

The developer shall submit to a copy of the design check and data sheets for lighting columns and foundations. The design of the foundations shall be appropriate to the soil conditions encountered on site.

General Requirements

Road lighting columns and illuminated sign posts shall be suitable for installation in all locations within the administrative area of Cumbria and, where applicable, shall comply with the following standards

BS EN 40-1:1992 (2006) - Lighting Columns Definitions and Terms

BS EN 40-2:2004 - Lighting Columns General Requirements and Dimensions

BS EN 40-3-1:2013 Lighting Columns Design and Verification – Specification for characteristic loads

BS EN 40-3-2:2013 - Lighting Columns Design and Verification – Verification by testing

BS EN 40-3-3:2013 - Lighting Columns Design and Verification – Verification by calculation

BS EN 40-5:2002 - Lighting Columns Requirements steel lighting columns

BS EN 40-6:2002 - Lighting Columns Requirements for aluminium lighting columns

PD 6547:2004+A1:2009 - Guidance on the use of BS EN40-3-1 and BS EN 40-3-3

BS EN 1991-1-4:2005+A1 - UK National Annex to Eurocode 1 – Actions on Structures – General Actions – Wind Actions

Columns shall be guaranteed for a minimum 50 year design life based on the information given in Tables A.1 to A.3.

Columns shall carry a unique identification mark which indicates the name of the manufacturer, year of production and any other design information to enable details of the column to be determined through design life.

Table A.1 Design Loads

Item	Requirement
Administrative Area	Cumbria
Rationalised Wind Loading Region	Extra Heavy
Rationalised Wind Loading Factor R_{wf} (N/m ²)	576
BS EN 1991-1-4 10 min Mean Wind Velocity (m/sec)	24.5
Maximum Altitude (m)	250
Partial Load Factor	Class B
Deflection Class	Class 3
Topographical Factor	1
Soil Type	Determined on Site
Terrain Category ≥ 8.0 metres	I
Terrain Category < 8.0 metres	II
Exposure Coefficient $C_e(Z)$ 12.0 metres	2,89
Exposure Coefficient $C_e(Z)$ 10.0 metres	2,78
Exposure Coefficient $C_e(Z)$ 8.0 metres	2,64
Exposure Coefficient $C_e(Z)$ 6.0 metres	2,04
Exposure Coefficient $C_e(Z)$ 5.0 metres	1,93
Exposure Coefficient $C_e(Z)$ 4.0 metres	1,80

Table A.2 Passive Safe Requirements

Item to be Specified	Value	
	Non-built up all-purpose roads with speed limits >40mph	Built up roads and other roads with speed limits \leq 40mph
Impact Speed Class	100 km/h	70 km/h
Energy Absorption Class	In verges of dual carriageway and single carriageway roads: NE Locations with significant volumes of non-motorized users: LE/HE Locations where major risk of items falling on other Carriageways: LE/HE	All locations: LE/HE
Occupant Safety Level	All safety levels 1, 2 and 3 are acceptable.	All safety levels 1, 2 and 3 are acceptable.

Table A.3 Additional Column Attachments

Column Height (m)	Column Type	Maximum Sign Size	Additional Notes
4.0	Standard	PD 6547: 2004 + A1: 2009 Table 3 Class B 0.6m ²	None
5.0	Standard		Flower Basket 0.6m ² , weight 100kg concentrically mounted (Clamp on) 1.0 shape coefficient mounted 2.5m to bottom edge.
6.0	Standard		Spring Loaded Banner 1.54m ² (740mm x 2030mm) mounted 2.7m to bottom edge of banner (Wind Loading 0.4m ²)
8.0	Standard		Or
10.0	Standard		Festive Decoration 2.0m ² (2000mm x 1000mm), weight 20kg, 30% solidity, 1.2 shape coefficient mounted minimum 2.5m to bottom edge.
12.0	Standard		Or Flower Basket 0.6m ² , weight 100kg concentrically mounted (Clamp on) 1.0 shape coefficient mounted 2.5m to bottom edge.

Column Material

All columns shall be manufactured from one of the following materials:

- Extruded aluminium manufactured from alloy complying with 000 series of BS EN 573 series Aluminium and Aluminium Alloys.
- Austenitic Stainless Steel grade EN 1.4372 (AISI 316 marine) of BS EN 10088 series Stainless Steels.
- Hot Rolled Steel grade S355 series of BS EN 10025 series Hot Rolled Products of Structural Steel to be hot dip galvanised in accordance with BS EN 1461:2009 Hot Dip Galvanized Coatings on Fabricated Iron and Steel Articles – Specification and Test Methods.

Column root section shall be protected by a suitable protective coating to a minimum level of 300mm above ground level to ensure adequate protection of the base of the column throughout the 50 year Design Life. Internal and external surfaces to be coated with the same material and thickness.

Additional protective coatings may be applied to provide 50 year Design Life.

Column Construction

Column manufacture shall be one of the following:

- Two piece tubular parallel sided construction with a one piece shaft and one piece base, jointed by a tapered shoulder. There shall be no lateral joints in base or shaft.
- Continuously tapered conical (parallel over base section) single piece with no lateral joints.
- Continuously tapered conical seamless (parallel over base section) single piece with no lateral joints
- Seamless single piece cylindrical parallel sided with stepped shaft and base.

Columns to be designed for post top mounting 60mm diameter spigot, 120mm length. Other spigot diameter and length on request.

Columns to be designed for planting, other options available on request.

Columns shall be provided with either brass or stainless steel earth terminals on the column and column door. Minimum size to be M8, 30mm long complete with two brass or stainless steel hexagonal nuts and two plain brass or stainless steel washers. These shall be attached to the rear of the access door and inside wall of the base compartment and shall be fitted with a distinct and durable metal label marked “SAFETY ELECTRICAL CONNECTION – DO NOT REMOVE”.

The base compartment shall be fitted with a hardwood or other substantially non-hydroscopic material baseboard not less than 90mm wide and 15mm thick securely fixed internally. Base compartment shall have sufficient capacity to accommodate 1 x DNO service cut out unit (W70 x L160 x D70) and 1 x Cumbria County Council cut out unit (W90 x L160 x D100).

Each column base shall have a single opening with weatherproof door giving protection to IP42 BS EN 60529. Column door shall be interchangeable between columns of the same mounting height or base diameter.

The door arrangement shall be such that it can only be opened by releasing a single or double equilateral tamperproof locking device (triangular headed with 8mm diameter rounded corners) captive non-corrosive bolt fixing into a door locking bar. The locking mechanism shall be a screwed thread type. All column doors shall have rounded corners of 27mm minimum radius. An alternative tamperproof hex headed with centre pin type should also be available on request.

There shall be no sharp edges within the columns or spigots which could cause damage to electrical cables either during installation or whilst in service.

Extension pieces shall not be used to extend column shaft to required mounting height.

Cable entry slots shall be directly below the column door.

Each column shall have a permanent mark at ground level. The mark shall be 25mm wide and extend round the full circumference of the column.

Raising and Lowering Columns

Columns shall be as standard columns with the following exceptions:

- Column shall be suitable for operation without a specialist tool.
- The raising and lowering mechanism must be suitable for operation by one operative.
- Columns must have a discrete internal locking mechanism which has the capability of being internally locked.
- Columns to be hinged using a stainless steel hinge and pin with a suitable with no maintenance dry lubricated bush.
- Column shaft to be profiled to ensure the overlap section of the shaft fits neatly in position ensuring the circular section is maintained. The gap between where both shaft profiles meet shall not exceed 3mm.

Foundations for Lighting Columns

Planted Columns

All planted columns shall be founded on ST4, minimum 75mm thick, compacted in the bottom of the excavation up to the base of the column,

The cable entry slot shall be temporarily plugged as necessary in order to prevent any ingress of concrete or granular materials during the concreting and backfilling operations.

The hole into which the column is placed shall be backfilled with ST5 concrete, well compacted by vibration over the full planting depth of the column. A duct equal in size to the width of the cable entry slot, shall be formed through the concrete filling using an suitable pre-formed lining tube capable of retaining its cross sectional shape during compaction.

Foundations - Flange Plate

Concrete in the foundation shall be Grade 30/0 and shall comply with the 1700 series of the Highways Agency Specification and have a minimum cement content of 275 kg/m³ and a maximum free water/cement ratio of 0.65.

The bedding mortar between the underside of the column flange plate and the top of the concrete base shall comply with the Highway Agency Specification Clause 2601. A cable duct shall be provided through the foundation.

Handling, Transport and Erection

Lighting columns shall be handled, transported and stored in such a way as to avoid any damage to the surface protection system. Any damage shall be made good to the satisfaction of the Highway Authority.

Lighting columns and brackets shall be stored clear of the ground in a way that contact with elements or other deleterious material is prevented and that water does not accumulate on any surfaces or inside sections. Suitable packing shall be placed between the columns to allow a free passage of air and dispersion of water

All rivets, bolts, washers, screws and small articles generally shall be suitably packed and identified. All such items shall be stored under cover.

Columns shall be installed in accordance with the manufacturer's recommendations and to the approval of the Authority.

All wall mounted brackets shall be fixed in accordance with the manufacturer's instructions.

Where there is no footway and a 1.0 metre wide service strip the column shall be erected 600mm from face of kerb and be within 1.3m² "hard area" edge with a concrete edging strip.

Attachments to Lighting Columns

Attachments to lighting columns shall be subject to approval from the Highway Authority, be by means of protected circumferential clamps of stainless steel complying with AISI Grade 201 or other suitable material which shall not damage the column or its protective coating. All attachments to columns shall comply with the information given within Table A.3

Location Markings and Warning Labels

The Developer shall liaise with the Highway Authority to establish if location marks are required. If directed to provide location marks for inspection and maintenance purposes each mark shall be applied to each column at a height of 2.2 metres above ground level and facing in the direction of the road.

Each mark shall be plastic numerals applied adhere to the column. Plastic numerals shall be black on a yellow reflective background. The numerals shall be 30mm high and 35mm wide with a minimum of 12mm border. In addition to the unit number the location mark shall include Cumbria County Council logo at the top and "STREET LIGHT FAULTY? Tel: 0845 6096609" at the bottom.

Multiple number location marks shall be numbered vertically.

A durable label with minimum 10mm high black letters on a yellow background shall be adhered to the outside of Feeder Pillar doors with the following legend 'DANGER 230 VOLTS'. In addition a durable standard electricity symbol BS 5378 Part 1-3 (A.2.8) shall be adhered to the outside of Feeder Pillar doors

Electrical Work for Road Lighting and Traffic Signs

Cumbria County Council's design guide on street lighting sets out minimum standards required for highway use.

General

The Developer shall obtain at his own expense a design for road lighting installation which shall comply with this Document. The Developer shall submit the design with full supporting information to the Highway Authority for approval and shall at his own expense incorporate any amendments were required.

The design shall be to the requirements of Cumbria County Council Policy and Standards. BS5489: 2013, BS EN 13201-2:2003 and BS EN 13201-3: 2003 and also take into account applicable Institution of Professionals Technical Reports or any other relevant guidance or good practice.

Materials, equipment and workmanship shall comply with the current edition of BS 7671 Regulations for Electrical Installations (IEE Wiring Regulations) and the rules and regulations of the electricity supplier who provides the supply.

All those involved in managing and providing the service should have appropriate experience, skills, training and equipment to perform their tasks. Monitoring and training should be coordinated to ensure high levels of competence. Effective training should support changes in techniques, materials and procedures. All personnel should have a thorough understanding of personal and task-related risks, together with awareness of the available range of actions and options.

The County Council requires that the ability of a Developer to carry out street lighting works safely shall be verified by his being able to assure the competence of his operatives through the National Highways Sector Schemes Scheme 8 9B and 10 as applicable. The sector scheme provides for the accreditation of operatives for the installation and maintenance of highway electrical equipment. Competence shall be verified through the Developers operatives holding Registration Cards to confirm they are accredited under the scheme as competent in respect of the tasks that they undertake.

Anyone undertaking design on road lighting installations should be an Approved Person as defined within the above scheme.

No work will be permitted to be undertaken until the Authority has inspected and approved the Developer as complying with the Sector Scheme in all respects.

Definitions

- (i) A Road Lighting Unit shall consist of the following elements: - Column, Bracket, Electrical Equipment as defined below and wiring excluding electrical supply cable.

- (ii) A Lit sign unit consist of a traffic sign requiring an electrical supply and Electrical Equipment and wiring as detailed above
- (iii) The term Lighting Unit applies to both Road Lighting Units and Lit Sign Units.
- (iv) Electrical Equipment for Road Lighting Units shall consist of the following elements: - Luminaire(s), photo-electric control units (PECUs), shorting plugs, lamps, time switches, LED Driver, cut outs, fuses, fuse folders and miniature circuit breakers (MCBs).
- (v) The network is the electrical distribution system installed by the Developer from the electricity supplier's interface to the Road Lighting Units.

The Developer shall provide facilities for the electricity supplier for service connections and commissioning of the network.

Site Records

In accordance with the requirements of the Electricity at Work Regulations the Developer shall, on the completion of the electrical work, show on a set of as-installed drawings, showing the position and identification mark (including luminaire type, LED attributes, LED type and serial numbers) of equipment requiring electrical connections, ducts, underground cables and joints and the type and depth of cables. The Developer shall also supply test certificates and Operation and Maintenance manuals.

Locational measurements shall be taken of the underground equipment to the nearest 100 mm from the nearest edge of the carriageway or fence line. Offsets to cables and ducts shall be recorded at 20 metre intervals along their line. Offsets shall be defined longitudinally by distance from a permanent highway feature or other suitable point.

The Developer shall keep a record of the work in sufficient detail, including the type and drum number of underground cables, to enable site records to be completed. Copies of the daily records shall be retained by the Developer for inspection by the Authority.

The Developer shall also supply to the Lighting Officer 'as-built' drawings of power supply arrangements for road lighting and illuminated signs.

No adoption inspection will be made until the records are available.

Location of Lighting Units and Feeder Pillars.

Positions of all lighting units and feeder pillars shall be shown on the Developers approved Design. The Developer/Contractor shall be responsible for recording the locations.

In any case where it is impossible because of underground obstructions, new locations shall be agreed with the Highway Authority.

Change of Lighting Arrangements

No existing Lighting Unit shall be switched off, dismantled- re-sited or removed without prior approval from the Authority.

Temporary Lighting

The standard of temporary Lighting Units shall conform to the Lighting Standards within this series.

The developer shall ensure that any temporary lighting provided does not cause glare to traffic using the highway or give annoyance to any occupants in surrounding properties.

Radio Interference

All electrical equipment shall be installed so that the levels of interference given in BS EN 55014-2 are not exceeded.

Luminaire

All luminaires shall comply with BS EN 60598-2 and BS EN 60598-3.

All luminaires shall be LED as specified below. The use of HID and florescent lamps shall not be permitted.

All luminaires shall be manufactured with die cast housing.

Luminaires shall have a degree of protection to BS EN 60529 of not less than IP66. The integrity specified shall be maintained for the guaranteed life of the lantern.

Luminaire shall have a separate optic and gear compartment. Both compartments shall be rated at least IP66.

Luminaire shall have the capability of mounting to Side Entry \varnothing 36mm, 42mm, 60mm and Post Top \varnothing 60mm and 76mm.

All luminaires shall have a minimum life expectancy of 25 years.

The complete luminaire assembly shall be independently tested and accredited in accordance with EN60598-1-2008 and EN 60598-2-3: 2003 by an approved independent body.

The supplier and manufacturer shall operate a Quality Management system certified to ISO 9001, or equivalent by a UKAS accredited, or equivalent body. The supplier and/or manufacturer shall have in place quality procedures for the production, delivery and return of goods.

All luminaires shall be packaged and delivered in a recyclable material.

All luminaires shall preferably be manufactured within the UK to minimise on the environmental impact. Manufacturers/Distributors shall have a well-established distribution network present within the UK. They shall also have a UK based technical support team for any after sale enquiries.

LED, LED Module and Testing

All LED's shall have a correlated colour temperature (CCT) of 4000k +/- 300.

LED's shall have a Rated Colour Index (CRI) of 70 +/- 7.

LED's shall have an S/P ratio of ≥ 1.49 .

LED's shall not be ran at more than 70% of their maximum rated running current.

Testing

All electrical and photometric measurements of solid state lighting (LED Luminaire) shall be tested and results displayed to the methods given with LM-79-08

All LED packages, modules and arrays shall be tested and results displayed to the methods given within LM-80.

The LED source case temperature within the luminaire shall be recorded using the In Situ Temperature Measurement Test (ISTMT). This temperature shall be included within the LM80-08 source report and for lifetime interpolation based on TM-21.

Photo-Electric Control Unit (PECUs).

One Part Miniature:

Be manufactured to the requirements of BS 5972: 1980.

Be fully electronic with solid state circuitry and switching.

Have a surge device fitted to prevent damage to electronic components in the event of mains borne voltage spikes.

Be fitted with a photodiode sensor which is filtered to closely match the CIE photopic curve.

Have a built in time delay of at least 15 seconds to prevent spurious switching.

Have a maximum average power consumption of 0.25 watts.

Have an operating temperature of between – 20°C and +75°C

Have an operating voltage of between 198V and 264V.

Have a 20/20 Lux switch on/off level with a switching ratio of 1:1. Level to be factory set and not adjustable.

Photocell locking nut shall be preferably coloured purple to enable verification from ground level.

Be clearly marked on cell body to indicate Manufacturer, Date of Manufacture and Model Number of cell.

Have an IP rating of 65.

One Part NEMA.

Manufactured to the requirements of BS5972 1980.

Fully electronic with solid state circuitry and switching.

Surge device fitted to prevent damage to electronic components in the event of mains borne voltage spikes.

Self-cleaning configuration made from impact resistant UV stabilised translucent material.

Fitted with a Photodiode sensor, which is filtered to closely match the CIE photopic curve.

Photocell body housing or cone to be preferably coloured purple to enable verification from ground level.

Have a built in time delay of at least 15 seconds to prevent spurious switching.

Have zero cross switching to reduce stresses on switching device load start up to the absolute minimum.

Have a maximum average power consumption of 0.25 watts.

Have an operating temperature of between -40°C and +80°C

Have an operating voltage of between 198V and 264V.

Have a 20/20 Lux switch on/off level with a switching ratio of 1:1. Level to be factory set and not adjustable.

Shall have a minimum life expectancy of 25 years.

Be fitted with 3 contact legs on base of the unit suitable for any NEMA twist socket.

Be clearly marked on cell base to indicate Manufacturer, Date of Manufacture and Model Number of cell.

Have a gasket fitted to base to ensure seal between cell and NEMA socket.

Electronic Control Gear

Be manufactured to the requirements of EN61347-2-13, EN61000-3-2, EN61000-3-3, EN61547, EN55015.

Shall have an output current range of between 350mA and 1050mA.

Shall have the capability to dim down to 10% of maximum output.

Shall have a mains frequency of between 50 – 60 Hz.

Have a power factor at full load of at least >0.90.

To have a mains input voltage of between 180v and 240v.

Shall have a main surge protection of at least 6kv.

Shall have an efficiency of at least >0.85 at full power.

Shall have an input/output isolation of at least 3kv.

To have an ambient temperature range of -25°C to 60°C and a maximum Tc temperature of 80°C.

Driver shall have a humidity of at least 90% non-condensing.

Shall have a thermal reduction management system with self-resetting capability.

Driver to be capable to fit a wire size of between 0.5mm² – 1.5mm².

Driver body to be made of polycarbonate or similar type material.

Driver shall be DALI 1-10v enabled and have the ability to step dim by switching between two power levels via an additional 230V switched phase or by internal timer to reduce the output power at the given times required.

Driver shall have the ability to be reprogrammed at the column door.

Driver shall be set to run at Constant Lighting Output.

LED driver shall not be directly mounted above LED module or arrays.

Cut Outs and Miniature Circuit Breakers

Cut Out Units

Cut out units shall be purpose made for road lighting applications comply with BS 7654 and shall have moulded housings with minimum protections of IP2X, IP31.

In addition all double pole isolator units shall comply with the following: -

- (i) Be fitted with a DIN rail mounted double pole isolator to BS EN 60947-3 having positive contact indication 32A rating.
- (ii) Be fitted with DIN rail mounted BS 88 fuse carrier or a DIN rail mounted Type C MCB.
- (iii) Have a lockable transparent cover which may only be removed by use of a tool.

Maximum incoming cable CSA for termination in the double pole isolator shall be 6 mm². Cables shall not be looped in and out of isolator terminals.

Where it is desirable, and only with prior agreement with the Authority, to loop service cable from cut-out units then those units shall be fitted with extension boxes and terminal blocks of the same manufacture as the cut-out unit.

Miniature Circuit Breaker

- (i) Be manufactured and tested to BS EN 60898
- (ii) Be Type C
- (iii) Operating voltage 230/415V a.c 50Hz
- (iv) Have minimum short circuit breaking capacity 6KA
- (v) Let through energy classification of 3
- (vi) Have positive contact indication (on/off indication)
- (vii) Have trip free mechanism operating even when toggle is locked
- (viii) Be lockable in the ON or OFF position
- (ix) Have part number clearly painted on the front face for ease of identification
- (x) Have a terminal capacity of 25mm for rating up to 25A and 35mm capacity for rating 32A and above
- (xi) Have IP rating, front face IP4X and screw terminals IP2X

Base Compartment Fixing Arrangements

All electrical equipment installed within the base compartment of columns or posts shall be fixed in accordance with manufacturer's instructions with corrosion resistant fixing screws and laid out in accordance with Standard Details Nos. CDG1430 to CDG1440.

NOTE: ALL STANDARD DETAIL DRAWINGS ARE CURRENTLY UNDER REVIEW

Feeder Pillars

Feeder pillars shall be manufactured from sheet galvanised or stainless steel. They shall comply with IP54 of BS60529. They shall include a full size backing board of varnished marine plywood at least 15mm thick or other approved non-hygroscopic material. Alternatively a purpose-designed equipment mounting system may be used. The entry for cable shall be via the root.

The distribution MCB's or fuse board shall have sufficient spare capacity to accommodate at least one extra circuit. There shall be at least 25% usable spare space on the back board.

The distribution MCB's or fuse boards shall have sufficient spare capacity to accommodate at least one extra circuit. (One three phase spare way on a three phase distribution unit and one single phase spare way on a single phase distribution unit). There shall be at least 25% usable spare space on the back board.

The pillar doors shall be fitted with tamper-proof locks, all locks being identical in pattern and two sets of keys shall be provided. All hinges and locks shall be of stainless steel.

Distribution boards shall be provided with an external earth, phase barriered and colour coded. They shall be fitted with same number of live and neutral bus bar terminals as there are outgoing circuits plus at least one spare pair.

The main earthing terminal in each feeder pillar shall be connected to earth in such a way as to comply with the IEE Wiring Regulations and BS 7430: 1998 Code of Practice for Earthing.

Feeder Pillars shall be mounted on a 150mm thick foundation of ST2 concrete. After completion of the cabling the feeder pillar base shall be filled to 25mm below the door with rounded coarse aggregate conforming with Table 2 of BS EN 1220, 4/12 aggregate with a grading category of G_c90/15.

Feeder pillars of a suitable size shall be provided to accommodate the installation of equipment in accordance with Standard Details in CDG 1400 series.

NOTE: ALL STANDARD DETAIL DRAWINGS ARE CURRENTLY UNDER REVIEW.

Wiring

Wiring between the terminal block in the luminaire and the components in the base of the column or sign unit shall be PVC or XLPE insulated and sheathed single, multi core or composite cable to BS 004 of 300/500 volt grade. Phase and neutral copper conductors shall be not less than 2.5mm² in cross sectional area except where the vertical unsupported length does not exceed 6 metres their cross sectional area can be reduced to 1.5mm². Cable types and sizes shall be selected to ensure that the operation of the lighting systems shall not be adversely affected.

All cores shall be correctly colour coded throughout their length and labelled appropriately at the feeder pillar and the cut-out.

All unsupported lengths of cable shall be kept to a minimum and shall not be allowed to come into contact with components by their freedom of movement. Vertical cables within columns shall be adequately supported along their length at the top of the cable run.

On all double bracket columns the wiring shall connect PECU sockets in series.

All wiring shall be housed inside columns, wall brackets and posts or stiffening members. Connections between conduit and sign housing and other components shall be waterproof.

Earthing

All street lighting and other electrically supplied street furniture shall be earthed and bonded in compliance with BS 7430.

Circuit protective and equipotential conductors shall be green/yellow PVC or XPLE insulated or sleeved. Where bolted connections are required, these conductors shall be terminated in accordance with manufacturer's instructions in correctly sized purpose made non insulated lugs. Such connections shall be made with non-ferrous nuts, bolts and washers.

The circuit protective conductor shall be of equal cross sectional area to be associated circuit conductor except where it is contained within a composite cable when its cross sectional area may be reduced to 1.5 mm² and 1 mm² for circuit conductors of 2.5 mm² and 1.5 mm² respectively.

A circuit protective conductor shall connect the earth terminal on each luminaire to the main earth terminal associated with the service cut-out unit.

A separate circuit protective conductor of not less than 2.5mm cross sectional area shall connect all metal enclosures of all electrical components to the main central earthing point.

All conductive parts as described in BS 7671 and including doors to feeder pillars, lighting columns and sign units shall be bonded to the main central earthing point using an equipotential bonding conductor of 6 mm² cross sectional area of suitable flexible type conforming to BS 6004. The cable shall be of sufficient length to allow the door to be placed on the ground during maintenance etc.

Underground and Ducted Cable

Cables shall be installed in ducts under all carriageways, vehicular crossings, private drives and planted areas.

All lighting services ducts shall have a minimum internal diameter of 50mm and a maximum internal diameter of 100mm. The number of cables installed in each duct shall be restricted to a quantity that does not impair the operation or integrity of the system. This shall be determined by calculation and reference to BS7671: Requirements for Electrical Installations shall be made.

Where ducts are laid under verges, footways on open ground they shall be Type L or L2 with an average depth to invert of 450mm. Ducts laid under carriageways shall be Type L/C or L2/C with an average depth to invert of 750mm.

Cable covers for protection of underground cables shall comply with BS 2484. When cable covers are installed, marker tapes are not required.

A yellow, self-coloured PVC or polythene plastic tape for cable marking, not less than 0.1 mm thick and 150 mm wide with the wording "Street Lighting Cables Below" printed in black along the full length so as to occupy not less than 75% of its available length and occurring at least 1 metre interval, shall be laid approximately 250mm above any power supply cable.

Cable shall be split concentric PVC sheathed 600/1000V grade to BS 6346 having copper conductors of equal cross section.

Cables shall only be laid when the ambient temperature is above 0°C and the cable has been stored at a temperature greater than 0°C for the previous 24 hours.

Sufficient length of cable shall be allowed for its termination. When termination does not proceed immediately following the installation of the cable, its end shall be sealed against the ingress of moisture. If in a case where cable ends are buried their positions shall be marked with a pre-cast concrete marker block and recorded on site records.

All cable networks shall have an access chamber of sufficient capacity and depth provided at each lighting column and feeder pillar.

Cable Joints

Cable joints shall not be permitted.

Inspection and Testing to be carried out by the Developer

Testing

The installation shall be tested in accordance with BS 7671 and this specification. Results in all electrical tests shall be presented as shown in BS 7671. The methods of testing shall be such that no danger to persons or property can occur even if the circuit tested is defective.

Tests shall be carried out in the sequence given below and recorded on an appropriate form, which shall then be submitted to the Authority immediately after complete of all the tests,

- (i) For Lighting Units (b), (d), (f), (g) apply.
- (ii) For networks (a), (b), (c), (e), (f), (g), (h), (i) apply.

All methods of testing are given in BS 7671.

- (a) Cable sheath insulation test
- (b) Continuity of protective conductors including main and supplementary equipotential bonding.
- (c) Earth electrode resistance.
- (d) Insulation resistance at a test voltage of 500V to be not less than 1.0 M ohm.
- (e) Insulation resistance at a test voltage of 500V to be not less than 6.0 M ohm.
- (f) Insulation of the site-built assemblies.
- (g) Polarity, including the continuity of circuit conductors
- (h) Earth fault loop impedance at every cut-out.
- (i) Operation of residual current devices

Voltage readings shall be taken at each feeder pillar and at the terminals of the last current-using equipment on each circuit, with all equipment energised.

The developer shall give not less than 7 days' notice to the Authority of his intentions to carry out any of the tests specified and the Authority shall be given the opportunity to witness such live tests.

The Developer shall provide the Authority with two copies of a certificate verifying compliance with BS 7671 upon satisfactory completion of the inspection and tests.

The Developer shall ensure that all test instruments have been calibrated and adjusted in accordance with BS EN ISO 9001 and come complete with calibration certificates to verify that BS EN ISO 9001 has been complied with.

No adoption inspection will be made until the test results and completion and inspection certificate are made available.