STREET LIGHTING

SPECIFICATION

Buckinghamshire Council

Version 8 – March 2024

Document Control

Issue	Date	Comment	Originator	Checked	Approved
1	July 2016	Original	PP	CG	PB
2	March 2017	Luminaire list Photocell switching levels Ballast dimming regime Bollard types	PP	CG	TE
3	May 2017	Minor revision	PB	PP	TE
4	February 2018	Minor revision	PP	TE	ST
5	February 2019	Revision	CG	TE	PL
6	January 2020	Revision	PB	TE	IS
7	April 2020	Minor revision & Unitary Authority details update	TE	MD	IFF
8	March 2024	Revisions & re-branding	TE	IS	SE

Contents

1. GENERAL

1.1. This Document identifies the basic principles and standards for street lighting required by the Lighting Authority.

1.2. The Lighting Authority reserves the right to alter / amend the standards contained within this Document as deemed necessary.

1.3. This Document shall be read in conjunction with the following documents:

a) Manual of Contract Documents for Highway Works (MCHW) Volumes 1 and 2.

b) Lighting Authority site specific Lighting Brief.

c) Lighting Authority Standard Detail Drawings.

2. REQUIREMENTS FOR LIGHTING

2.1. This Document identifies the basic principles and standards for street lighting required by the Lighting Authority.

2.2. The Developer shall adhere to the requirements as outlined in this Specification and the site-specific Lighting Brief (see section 3 below).

2.3. The Developer shall be responsible for undertaking any amendments to existing lighting equipment which will be affected by their proposals.

2.4. Where it is determined that lighting should be provided, extended, or improved, the Developer shall be responsible for the supply and installation of that lighting equipment and all the associated electrical connections.

3. LIGHTING BRIEF

3.1. Before commencing a street lighting design, a lighting brief shall be requested from the Lighting Authority. For point of contact refer to Annex A.

3.2. When requesting the Lighting Brief, the following information shall be provided:

a) Location Plan.

b) Adoption Plan (sometimes referred to as the pink plan).

c) Planning drawings (to include all phases of the development).

d) Confirmation of Stat diversions with details and plans provided.

e) Confirmation of Environmental issues that affect lighting and the provision of details such as Conservation Areas, Areas of Outstanding Natural Beauty and Bats etc.

f) Confirmation of lighting restrictions such as proximity to airports, aerodromes, navigable waterways etc.

g) Speed limit changes, traffic flow data.

h) Traffic calming measures proposed.

i) Illuminated sign schedule.

3.3. The information provided for the purpose of obtaining a brief shall include the location of proposed bus routes, cycle facilities, schools, shops, amenities, parking restrictions, disabled bays and the like. Changes in the provided information may result in a change to the Lighting Brief and subsequent change to any submitted street lighting proposals.

3.4. A Lighting Brief shall provide guidance to the Lighting Designer and shall include (but not limited to) the following:

a) Lighting Authority Project Contact.

b) The Lighting Class.

c) Extent of lighting area.

d) Variable lighting requirements (if applicable).

e) Mounting heights.

f) Control & supply requirements.

g) Special material requirements (if required).

h) Site specific notes.

Asset data will also be provided where applicable.

3.5. If the Developer or Lighting Designer feel that an alternative lighting requirement is more appropriate than that indicated in the Lighting Brief, then this shall be communicated to the Lighting Authority with supporting information. The Lighting Authority shall review the supporting information and make a decision. The Lighting Authority's decision is final.

4. DESIGN APPROVAL

4.1. Lighting proposals shall be submitted to the Lighting Authority for approval. This shall exclude non adoptable lighting.

4.2. Designs shall be undertaken by a competent Lighting Designer.

4.3. For approval to be given, lighting designs must demonstrate compliance with the requirements of the Lighting Brief and this Specification.

4.4. Lighting scheme design approval shall be obtained in writing from the Lighting Authority prior to commencement on site.

4.5. Once a street lighting design has been approved a re-submission will be required if:

a) There are changes to the street lighting design.

b) The housing, highway or landscaping layouts are changed.

c) The proposed luminaire, optic or lumen package is no longer available.

d) There is a period of three years or more between approval of the street lighting proposals and implementations of the proposed works.

5. DOCUMENTATION REQUIRED FOR APPROVAL

5.1. Lighting Design construction drawings shall;

All information specified in the Lighting Brief is to be sent electronically to the Lighting Authority. The following information will be required for approval:

a) CDM details (Designer Risk Assessment, H&S File etc.).

b) Location plan.

c) Adoption plan ("Pink plan").

d) Lighting Design Calculations including electronic calculation files, all input data and details of the software package that has been used (lighting plots alone are not acceptable), including min and max spacing's.

e) Details of Design Consideration(s) made, including assessment of existing site for S278 schemes.

f) Relevant on-site survey pictures, including electrical inspection photos of existing street lighting furniture.

g) Details of all equipment proposed with supporting certification and documentation (if not detailed in this specification).

h) Details of power supplies, including Cable Calculations and Schematic drawings (where required, including existing affected by the design).

i) If the scheme includes electrical design, please provide a copy of the Electrical Installation Certificate.

j) Column / Distribution Network Operator (DNO) connections schedule with Eastings and Northings, and electrical load of the proposed luminaires.

k) Scheme drawings – including the lighting class minimum and average Lux as well as 2 lux & 1 lux ISO contour in DWG and PDF format.

l) Passive Safety Risk Assessment (as per ILP TR30 “Guidance on the Implementation of Passively Safe Lighting Columns and Signposts”)

m) Details of signing layout including supply connections.

n) Environmental considerations.

o) Details of landscaping showing existing trees, proposed trees and tree clearance on the lighting layout drawing.

5.2. Lighting Design construction drawings shall;

a) Be no larger than A1.

b) Ensure that DWG shall be aligned to OS base coordinates.

c) Schematic to be provided in DWG format.

d) Be at a scale of 1:500 (with 1:200 used if required).

e) Have a minimum text size of 2.5mm for A1 drawings and 1.8mm for A3 drawings.

f) Have cut lines where required.

g) Have a North point.

h) Have a key where symbols can be identified.

i) Key symbols shall be specific to the scheme.

j) Show luminaire optic, CCT, CLO, minimum lumen output, dimming profile and PEC switching levels in the drawing key.

k) Luminaire wattage, number of LEDs and drive current should be expressed as maximum not specific values. This is to try to reduce the need for redesign due to lantern output changes between design and installation.

l) Show overhead lines (LV, HV and BT), and major services (e.g. HV cable, High, intermediate and medium pressure gas, fibre optic cable, fuel lines etc.). Any easements or clearances shall be stated on the lighting layout drawings.

m) Highlight significant hazards that the installer of the street lighting furniture and Lighting Authority shall have to allow for.

n) Grid coordinate to locate the development.

o) Include a note referring to the latest DM Specification version applicable for the design.

6. DESIGN

General

Note: This Section shall be read in conjunction with Annex A.

6.1. All Lighting Designs shall be in accordance with the latest edition of BS 5489 with reference to the latest edition of BS EN 13201 where required; or other lighting standards that are appropriate.

6.2. When approved by the Lighting Authority, a footpath or cycleway may be considered independent from the adjacent carriageway. Where this is the case the lighting for the footpath or cycleway shall have a separate calculation grid from the carriageway and may have a different lighting class.

6.3. For Luminaire Correlated Colour Temperature refer to Annex A.

Design Consideration

6.4. The proposed location of the lighting installation shall be inspected to determine the type, arrangement, source, supply details and any existing lighting within 100m of the scheme limits.

6.5. The street lighting system must be an integral part of the design of the estate and sufficient space for the installation of street lighting shall be provided.

6.6. Columns shall be located on highway land adopted by the Highway Authority.

6.7. Columns shall not be placed in a shared surface. Any column lighting a shared surface shall be set-back with an adoptable zone added.

6.8. On housing estates, columns shall be placed to minimise spill light towards properties, particularly windows.

6.9. Lighting columns shall be located at the back of the footway/path wherever possible. Where lighting columns are placed in the verge, a hard standing shall be provided. The lighting column set back may be increased at the request of the Lighting Authority. Exception for a Zebra Crossing Beacon where the clearance to the beacon can be 450mm from kerb edge if required for visibility splays.

6.10. Designers shall specify tool free mid-hinged columns operated by one person where maintenance access cannot be achieved from a Mobile Elevated Work Platform (MEWP), such as:

a) Remote footways.

b) Behind parking bays.

c) Near overhead electricity lines.

d) Any location where maintenance operation would require a road closure.

6.11. Where mid-hinged columns are specified, the Lighting Designer shall ensure that the column is located so that, when the column is being lowered or raised, the action of the column is not obstructed, and that no part of the column passes over un-adopted land when being lowered.

6.12. Where the new street lighting works are located within or adjacent to an existing lighting scheme, the proposed lighting design shall be integrated into the existing layout to provide a continuous lighting layout.

6.13. Due consideration is to be given to trees and their growth, traffic calming, parking and pedestrians when deciding the locations of lighting columns. No column shall be located any closer than 5m to an existing or proposed tree, unless agreed with the Lighting Authority.

6.14. Within or adjacent to conservation areas, and in other environmentally sensitive areas, heritage style equipment may be required at the discretion of the Lighting Authority. This will be provided as part of the Lighting Brief and may attract an additional commuted sum.

6.15. The lighting shall provide visual guidance and assist in revealing the run of the road, particularly at junctions and bends, as described in the latest edition of BS 5489. The layout of columns at the junction with main roads and roundabouts shall be in line with the recommendation contained in ILP Professional Lighting Guide PLG02 “The Application of Conflict Areas on the Highway”.

6.16. The lighting arrangements shall be co-ordinated with any traffic signing, signalling and surveillance installations.

6.17. The Lamp Lumen Maintenance factor shall be as per Manufacturer’s guidelines. The Luminaire Maintenance Factor shall be based on a six-year clean cycle.

6.18. Signs shall only be illuminated where it is a requirement of the latest edition of the Traffic Signs Regulations and General Directions (TSRGD).

6.19. Lighting Designers shall take into account guidance given in the ILP ‘Guidance for the Reduction of Obtrusive Light’.

6.20. Lighting Designers shall identify if Passively Safe equipment is required using the ILP TR30 “Passive Safety Risk Assessment”.

6.21. The Lighting Designer shall provide a lighting design that reduces or eliminates the need for Passive Safe street lighting columns.

6.22. Where Passive Safe equipment is specified, they shall be fed via a RCBO in accordance with Appendix 14/1.

6.23. Lighting Designers shall identify the most appropriate and acceptable type of lighting for locations in rural, environmentally sensitive and conservation areas and discuss proposal with the Lighting Authority.

6.24. Where P classes are required the Lighting Designer shall carry out minimum and maximum design spacing's using a straight road calculation prior to carrying out an area calculation.

6.25. The Lighting Designer shall ensure that the design is the most economic by maximising column spacing's, to minimise the number of columns and energy used as well as to minimise the installation, operating and maintenance costs. However, luminaires shall only have a maximum drive current of 700mA, with lower currents preferred for efficacy.

6.26. Where P class designs are required, calculation grids shall be per road except for roads that contain three or less lighting columns. These roads shall be included in the connecting road where they have the same lighting class.

6.27. Where it is proposed that existing private cable network may be retained or modified as part of the permanent works, electrical testing to BS 7671 shall be undertaken to ensure suitability. If found that the cable to be retained is not suitable then it shall be replaced.

6.28. Where it is proposed that existing private cable network is to be retained the supply point and any modified circuit shall comply with the earthing requirements of ENA Engineering Recommendation G12.

Glare and Light Spill

6.29. For illuminance designs (P and C classes) the Luminaries are to conform to the Glare Classification Class as described in BS EN 13201-2, Table A.1 to provide adequate control of glare.

6.30. The following Lighting Control shall be applied for Environmental Zones:

Environmental Zone	G Class	Additional requirement
E1 & E2	G4*	
E3 & E4	G2	Lighting intensity above 90° to be 0.0 cd

*If class G4 cannot be met evidence shall be provided in the form of Lighting Reality calculations to show compliance with:

a) The recommended TI (%).

b) The recommended illuminance in ILP GN01.

6.31. All Lighting Designs shall take account of the environment that they are located within and maintain light spill within ILP Guidance Note 01 for the Reduction of Obtrusive Light.

Conflict Areas

6.32. Conflict area limits will be specified in the Lighting Brief and shall be designed as follows:

a) Conflict areas shall be illuminated to the class as specified in the Lighting Brief and in compliance with BS 5489.

b) The application of the Conflict Area shall be as ILP PLG02 "The Application of Conflict Areas on the Highway."

c) It shall be noted that the 5 second rule relates to the approach being lit to the correct lighting standard and does not require the approach to be included within the conflict area calculation.

Pedestrian Subways and Underpasses

6.33. Details for the lighting of Pedestrian Subways/Underpasses shall be included in the Lighting Brief from the Lighting Authority.

6.34. Motion sensors shall be incorporated only where specified by the Lighting Authority.

Other Design Requirements

6.35. Cycleways shall be designed in accordance with the principles laid out in ILP document PLG23 Lighting for Cycling Infrastructure.

6.36. Cycleways next to the carriageway shall be lit by the carriageway lighting.

6.37. Zebra and Parallel crossings shall be lit to ILP Technical Report TR12 “Lighting of Pedestrian Crossings”.

6.38. Refuge Beacons shall be in accordance with the requirements of The Traffic Signs Regulations and General Directions and the Traffic Signs Manual Chapter 4.

6.39. Belisha Beacons shall comply with the requirements of The Traffic Signs Regulations and General Directions and Lighting Authority Standard Detail Drawings.

7. CONTROL

Photo Cells

7.1. Generally, all lit units require a photocell.

7.2. Photo-electric Control Unit switching levels shall be in accordance with Annexes.

Central Management System (CMS)

7.3. If required, this will be specified in the Design Brief.

8. MOUNTING

8.1. Unless otherwise stated in Annex B, luminaires shall be post top mounted for columns less than 8m in height. 8m and higher, a bracket shall be used.

8.2. Steep hills where the gradient is 10% or more shall require side entry mounting and the luminaire shall be tilted sideways to be parallel to the road.

8.3. Brackets may be used or increased in projection where issues such as tree lined areas exist or where the use of brackets will significantly improve the design spacing. However, this shall be approved with the Lighting Authority prior to approval.

8.4. Lanterns mounted on poles not owned by the Lighting Authority such as DNO poles shall not be permitted.

8.5. No adoptable lighting shall be installed onto buildings unless:

a) No alternative is available.

b) It is agreed with the Lighting Authority.

c) The Developer obtains a wayleave or easement from the property owner.

9. SPECIAL / RETENTION SOCKETS

9.1. Retention sockets shall be used for all zebra crossing columns, refuge beacons or any column on a refuge island and units located on traffic islands/roundabouts. This includes all wide based posts and bollards unless approved by the lighting authority.

10. ELECTRICAL SERVICES

10.1. For details of electrical service connections see Annex A.

10.2. DNO / IDNO cut outs shall be located at the bottom of the backboard and a secondary double pole isolator shall be installed above.

10.3. The primary cut-out (installed by the DNO / IDNO) shall be fitted with a fuse rated at not less than 10Amp.

10.4. Selectivity must be provided for all fuses and the secondary isolation fuse shall not be less than 4Amps.

10.5. The fuse ratings of the primary and secondary isolators shall be stated on the construction drawing.

10.6. All electrical supplies shall be unmetered.

11. IDNO AND ICP

11.1. The Lighting Authority's preference is for the Developer to utilise DNO connections. If IDNO's are used, the Developer shall provide the Lighting Authority with contact details of the IDNO and shall include the information in the Health and Safety File. Guidance on Independent DNO's can be found on the Highways Electrical Association website.

11.2. Guidance on Independent DNO's can be found on the Highways Electrical Association website.

11.3. If the Lighting Contractor is planning to use an ICP to undertake the DNO connections/disconnections an Appendix 5 letter from Buckinghamshire Council will need to be requested before this would be permitted by the DNO. Guidance on Independent DNO's can be found on the Highways Electrical Association website.

11.4. Where alteration to IDNO connections are to be undertaken by an ICP there may be additional delays if Buckinghamshire Council does not have an Asset Owner Agreement in place with the relevant IDNO.

12. INSTALLATION

12.1. Installation shall be carried out in accordance with the approved layout. If the highway or property layout is changed then a revised lighting proposal will be required for technical approval via the Development Management team prior to installation.

12.2. For new works on existing adopted highways, e.g., Section 278 works, the Developer shall inform the Lighting Authority of the programmed works start date, not less than 28 days before commencement on site, (including the maintenance numbers of the items affected by the works).

12.3. Street lighting works shall be carried out by a competent contractor who shall be registered under HERS (Highway Electrical Registration Scheme) and that their operatives are suitably qualified under the National Highway Sector Scheme 8. The Lighting Authority shall request proof of accreditation and authorisation of any subcontractor to perform such duties. The Lighting Authority reserves the right to request a resubmission of any Test Certificates.

12.4. If the development works impedes access to a column (or other electrical highway asset) as a result of scaffolding, hoarding or the like, the Developer shall be responsible for the operation and safety of the electrical highway asset affected for the duration of the obstruction. The Lighting Authority shall be notified when this situation occurs.

12.5. Where lighting already exists, the Developer shall maintain an adequate standard of road lighting as detailed in Appendix 14/3.

12.6. The street lighting and electrical installation shall be inspected and tested in accordance with BS 7671 and the Specification for Highways Works. The Developer shall give the Lighting Authority 21 days' notice of electrical inspection and testing being carried out so that the Lighting Authority have the opportunity to witness the inspection and testing.

12.7. Where it has been agreed that existing columns may be retained as part of the permanent works, structural testing shall be undertaken in line with nationally recognised methods of non-destructive testing and copies of the certificates shall be supplied to the Lighting Authority.

12.8. Where it is proposed that existing private cable network may be retained or modified as part of the permanent works, electrical testing to BS 7671 shall be undertaken to ensure suitability. If found that the cable to be retained is not suitable then it shall be replaced.

13. PRE ADOPTION (MAINTENANCE) PERIOD

13.1. It shall be the Developer's responsibility to ensure that prospective purchasers of their properties shall be fully aware of the locations of all street lighting furniture.

13.2. Any relocation of equipment shall be at the Developer's expense, prior to adoption and shall be within design parameters. If a revised column location differs to that indicated in the approved lighting layout the Developer will be required to provide a revised lighting calculation and obtain technical approval prior to installation.

13.3. The Developer shall be responsible for the mitigation of light intrusion, such as putting up shields if required by the residents or the Lighting Authority.

13.4. The Developer's maintenance responsibilities prior to and during the Maintenance Period shall be as detailed in Buckinghamshire Highways S38 and S278 Design Guides

13.5. **Emergency Repair** - The Lighting Authority holds the right to make safe, or cause to be made safe, any equipment that is dangerous (i.e., though vehicular impact damage etc.) and all reasonable costs shall be chargeable to the Developer.

13.6. The Developer shall not offer the street lighting furniture for inspection by the Lighting Authority, until such time as they are confident that all works have been completed satisfactorily and copies of electrical test certificates supplied. See Appendix 14/1.

13.7. The Lighting Authority's inspection shall not to be utilised as a snagging inspection by the Developer. This will lead to the inspection being aborted where this appears to be the case.

13.8. Final numbering scheme shall be provided by the Lighting Authority. The Developer shall provide road names and postal addresses for each property so that the maintenance numbers can be specified. The Developer shall be responsible for fixing the numbers to all the street lighting furniture.

13.9. Prior to inspection the Developer shall provide a Health & Safety file which shall include the recorded information as detailed in Appendix 14/1 of this specification. A schedule of equipment including details of the electricity cable network provider (DNO/IDNO).

14. ADOPTION

14.1. Once the site is ready for adoption (after the maintenance period), a final inspection will be carried out by the Lighting Authority.

14.2. If the development is not adopted within 3 years of installation commencement, the Lighting Authority reserves the right to review the suitability of equipment installed and require it to be upgraded.

14.3. Only when the Lighting Authority is satisfied that all equipment has been installed and all issues resolved, will the street lighting system be accepted for adoption.

15. EQUIPMENT SPECIFICATION

15.1. All new street lighting furniture shall be in accordance with this Specification.

15.2. Equipment shall be supplied in new and unused condition.

15.3. Electrical equipment shall be stored in suitable weatherproof accommodation.

15.4. The Developer shall ensure that the equipment supplied is compatible with all other equipment with which it is associated.

15.5. Manufacturers shall be certified for the manufacture, supply, and verification of apparatus under BS EN ISO 9001.

15.6. Preferred materials are detailed in Annex B.

15.7. The following shall apply when the Manual of Contract Documents for Highway Works (MCHW) Volumes 1 and 2 is used where Local Authority documentation is not available:

Table 0/1: Schedule of Pages and Relevant Publication Dates (10/22)

Series/Appendix	Page Number	Publication Date
000	1 to 3	May 2014
000	6 to 7F	February 2016
000	4 to 5	October 2022
100	2, W1F, N2 to N11F	May 2014
100	N1	December 2014
100	1, 3 to 30F	April 2022
200	1 to 3F	February 2016
300	1	May 2001
300	4	November 2002
300	2 to 3, 5 to 6F	May 2008
400	1, 9 to 11, 13, 17 to 20, 21, 23F	May 2017
400	2 to 8, 12, 14 to 16, 22	March 2020
500	1 to 2, 4 to 39F, N1 to N2F	February 2020
500	3	March 2020
600	1 to 68, 70 to 77F, S1 to S4F, W1 to W4F, N1 to N5F	February 2016
600	69	February 2017
700	1 to 5, 8 to 36F, N1 to N4	February 2016
700	6 to 7, N5 to N6F	October 2022
800	1, 3 to 42F	November 2021
900	1 to 83F, S1 to S3F, W1 to W2F, N1F	July 2021
1000	3 to 33	January 2020
1000	1 to 2, 34 to 58F	November 2021
1100	1 to 16F	February 2021
1200	5	May 2001
1200	2 to 3, W1F	August 2003
1200	1, 14 to 16F	May 2004
1200	4, 9 to 11, 13	May 2005
1200	12	November 2006
1200	6 to 7, N1 to N4F	November 2007
1200	8	May 2008
1300	N2F	November 2003
1300	3 to 4	November 2004
1300	1, 5 to 10, 12F	November 2005
1300	2, 11 and N1	May 2006
1400	2, N1F	May 2001
1400	1, 3 to 9F	May 2006
1500	1 to 31F	February 2017
1600	1, 4 to 5, 9, 15, 17 to 18, 24 to 26, 29 to 31, 35, 38, 49F	March 1998
1600	2, 6 to 8, 10 to 14, 16, 19, 27 to 28, 32 to 34, 36 to 37, 39 to 42, 44 to 48	November 2003
1600	3, 20 to 23, 43	November 2005
1700	2, 4, 6 to 7, 19, 24 to 27, 30 to 34	December 2014
1700	1, 3, 5, 8 to 18, 20 to 23, 28 to 29, 35 to 39F	March 2020
1800	1	August 2014
	2 to 39F	April 2021
1900	1 to 35F, S1 to S2F	August 2014
2000	1, 3 to 4F	May 2001
2000	2	November 2004
2100	1 to 2F	February 2016
2300	1	March 1998
2300	2 to 3F	May 2001
2400	1, 4, 7F	May 2005
2400	2	May 2006
2400	3, 5 to 6	May 2008

Series/Appendix	Page Number	Publication Date
2500	1	May 2001
2500	2, 8, 11F	November 2003
2500	10	November 2004
2500	6 to 7, 9	May 2005
2500	5	May 2006
2500	3 to 4	November 2006
2600	2 to 4	November 2003
2600	5	November 2004
2600	6	May 2005
2600	7	November 2006
2600	1, 8F	March 2020
3000	4 to 7, 10, 12 to 17, 19, 22 to 27F	May 2001
3000	20	November 2004
3000	2 to 3	May 2006
3000	8 to 9, 11, 18, 21	May 2008
5000	1, 4 to 19F, S1F	May 2005
5000	2 to 3	November 2008
5700	1 to 30F	February 2020
Appendix A	1 to 4F	May 2014
Appendix B	1 to 3F	May 2014
Appendix C	1 to 2F	May 2014
#Appendix D	1F	May 2014
Appendix D (NI)	N1F	May 2014
Appendix E	1F	May 2014
Appendix F	1 to 60F	October 2022
Appendix G	Not used	
Appendix H	1	May 2004
Appendix H	2	November 2005
Appendix H	3	November 2006
Appendix H	4 to 9F	November 2008

Appendix 0/2: Contract Specific Minor Alterations to Existing Clauses and Tables

1305 Delete sub-clause 4 and insert:-

Concrete backfill shall be ST5 concrete complying with Clause 2602, well compacted by vibration over the full planting depth of the column/mast post. A duct equal in size to the width of the cable entry hole, shall be formed through the concrete filling using a suitable preformed lining tube capable of retaining its cross-sectional shape during compaction.

1409 Delete sub-clause 3:-

1419 Delete sub-clause 2 and insert:-

Wiring between the terminal block in the luminaire and the components in the base of the column or sign unit shall be PVC insulated and sheathed multi-core flexible cable to BS 6500 of 300/500V. Phase and neutral copper conductors shall be not less than 2.5 mm^2 in cross-sectional area except that where the vertical unsupported length does not exceed 6 metres their cross-sectional area may be reduced to 1.5 mm^2. Cable types and sizes shall be selected to ensure that the operation of the lighting systems shall not be adversely affected.

1420 Delete sub-clause 4 and insert:-

All extraneous conductive parts, as described in BS 7671, and including hinged doors to feeder pillars, lighting columns and lit sign units, shall be bonded to the main earth terminal. Lift off doors to feeder pillars, lighting columns and lit sign units may be bonded, where bonded they shall be bonded to the feeder pillar, column, or lit sign unit's earth bolt not the MET. The equipotential bonding conductor shall have a cross-sectional area of not less than 6mm^2. Earth electrodes shall be installed where required.

1420 Delete sub-clause 5 and insert:-

All street lighting and other electrically supplied street furniture shall be earthed and bonded in compliance with BS 7430 and ENA Engineering Recommendation G12.

1421 Clause 1.

Delete and insert "Cables shall be 3 core - Copper Cable 90°C - XLPE/PVC/SWA/MDPE to BS5467:600/1000v

1424 Insert after sub-clause 2(j):-

Upon completion of testing a weatherproof UV resistant label shall be fitted in the unit, which clearly indicates the month and year that the unit was tested.

The label shall:-

a) Be 65mm in diameter.
b) Have black text on white.
c) Be made of a non-degradable material.
d) Be either fixed to the backboard or tie-rapped to the internal cabling.

1424 Delete sub-clause 3 and insert:-

Power Cables in Jointed System.

No jointed system is allowed.

Power Cables in Looped System.

The cable sheath insulation test shall be carried out using an insulation tester. The insulation resistance test of 1000V, direct current, shall be applied and maintained for not less than one minute between the continuous cable armour and the general mass of earth.

The measured insulation resistance shall not fall below 1.0 MΩ for the full duration of the test. The cable sheath test shall be carried out after the cable has been laid and the trench backfilled, and after the cable armour has been terminated.

Appendix 1/5: Testing to be Carried Out by Contractor

Clause	Work, Goods or Material	Test	Frequency of Test	Test Certificate	Comments
Series 1300					
1305	Anchorages for use in drilled holes	Tensile load (Manufacturer's tests)		Required	To provide well attested and documented evidence
1306	Anchorages in drilled holes to column flange plates	Load test on site			
Series 1400					
1421	Cable				Product certification scheme applies
1424	Lighting units	Tests specified in Clause 1424	Each unit	Required	Product certification scheme applies. Certification that the installation complies with BS7671 (the IET Wiring Regulations) is required
	Networks	Tests specified in Clause 1424 (as amended in Appendix 0/2)	Each circuit and sub-circuit	Required	Certification that the installation complies with BS7671 (the IET Wiring Regulations) is required

Appendix 5/1: Drainage Requirements

1. Chambers

1.1. Plastic duct chambers shall conform to the following and be installed as per the manufacturers' guidelines:

a) Either be 600mm x 600mm, 600mm x 900mm or 900mm x 900mm.

b) Be installed with galvanised eye bolt(s) the number required is to be dependent on the required number of draw ropes (see Appendix 5/2 for ducting requirements). An additional eye bolt(s) (as required) is to be installed in each draw pit which is to be used to support column cabling.

c) Have a 100mm diameter drain hole cast into the concrete base of the draw pit and be filled level with suitable filter drain material. The foundation shall be cast on site.

d) Standard colour black.

e) Vertical loading capability of not less than 40 Tonnes.

f) Comply with the following Standards:

(i) EN 124 B125 & D400 Vertical Loading Requirements.
(ii) BS 5834 Part 4. 1993 Side Wall loading for small chambers.
(iii) BS 1247 Part 2. Cold Impact Test.
(iv) EN 228 Resistance to Petrol & Chemicals.
(v) EN 295-3 Stress Relief.
(vi) BS 2782 Part 4. Methods 430A to 430D Water Absorption.

1.2. Covers and Frames shall conform to EN 124 and have load rating as appropriate for the location it is placed (B125, C250 & D400).

1.3. Shall state 'Street Lighting' on the Cover.

1.4. The Lighting Authority shall be provided with a set of access keys.

Appendix 5/2: Service Duct Requirements

1. Ducts

1.1. Ducts shall be smooth bore, manufactured from Medium or High-Density Polyethylene, with a minimum wall thickness as follows:

a) For column entry from main duct, signs and supplies from mini pillars, duct shall be: Min Internal diameter 47mm, normally use 50mm diameter, 3.5mm thickness or twin wall.

b) For all other ducts they shall be: Min Internal Diameter 94mm, normally use 100 mm diameter, 5mm thickness or twin wall.

1.2. Ducting shall be in accordance with National Joint Utilities Group (NJUG) guidelines on positioning and colour coding of underground utilities.

1.3. Private street lighting duct is currently coloured orange and shall be laid at the following depth;

a) Minimum of 450mm depth in footway and verge.

b) Minimum of 750mm depth in the carriageway.

1.4. Equipment requiring a DNO electricity supply shall be fitted with a duct for the entry of the DNO supply cable, colour in accordance with NJUG guidance.

1.5. Ducts shall be fitted with a pigmented, stranded, nylon draw rope of at least 5.0 kN breaking load, the ends of which shall be made fast.

1.6. Duct chambers shall be installed at the beginning and end of any carriageway crossing. A spare duct for each crossing with a draw rope shall also be provided.

Appendix 12/1: Traffic signs: General

1. Sign Plates

1.1. Signs shall comply with Class RA 2 of BS EN 12899.

1.2. Sign plates must have a guaranteed on-site life of not less than 25 years.

1.3. Sign plates shall be made from composite material.

1.4. All signs shall be manufactured and erected in accordance with BS EN 12899-1, Traffic Signs Regulations and General Directions, Traffic Signs Manual, Specification for Highway Works, location plan and associated Sign Schedules and the following specification.

1.5. The finish shall be Class RA 2 retro-reflective material with a warranted life of not less than ten years and shall fulfil the requirements of BS EN 12899-1.

1.6. Signs shall be stiffened such that post fixings can be positioned at any point across the width of the sign without the need for drilling of the stiffening to permit erection onto posts of unspecified spacing.

1.7. Protective overlay film shall be provided for signs.

2. Illuminated Traffic Signs

2.1. Illumination of sign plates shall be external and overhead mounted unless directed otherwise by the Lighting Authority. One-piece light units with integral brackets shall be mounted directly on the signpost and/or on luminaire support posts or as directed by the Lighting Authority.

2.2. All lit traffic signs shall comply with Class RA 2 of BS EN 12899 and sections 7.4.1.2 - Mean Illuminance and 7.4.1.3 – Uniformity of Illuminance.

2.3. All sign and luminaire fixings shall have a guarantee of 25 years on site life.

2.4. Signs which require illuminating shall be mounted on a wide based post or lighting column when within loading requirements.

2.5. The orientation of signpost doors shall be in accordance with Lighting Authority standard details.

3. Attachments on Columns

3.1. Where signs are to be attached to lighting columns, the column shall be designed by the manufacturer to take the sign size, as per Appendix 13/1.

3.2. Signs can be attached to existing columns subject to the approval of the Lighting Authority:

4. Wide Based Signposts

4.1. Signposts shall conform to BS EN 40, BS EN 12899 and Appendix 13/1, in this document.

4.2. Caps shall be applied to the top of the post to prevent ingress of water.

4.3. Posts shall be protected in accordance with Appendix 19/1

4.4. The housing shall have an aperture of not less than 400mm x 115mm and be fitted with a weatherproof metal door having a vandal-resistant lock with key. The door and housing shall have the same finish as the post, both inside and out.

4.5. Wide based posts shall have an access door and cable entry slot. The cable entry slot shall be 75mm wide and 150mm high and shall be 500mm below ground level.

4.6. The support posts and fittings shall comply with the requirements for signposts and shall be fixed directly to the sign stiffening members.

4.7. Caps shall be applied to the top of the post to prevent ingress of water.

4.8. The supply should be as stated in Appendix 14/5.

5. Additional Requirements for Passively Safe Signposts

5.1. Shall comply with the same requirements for Passive Safe Columns. See Appendix 13/1 section 5.

Appendix 13/1 Lighting columns and brackets

1. General Column Requirements

1.1. Column shall be as shown in the Standard Details HTS-SD-1300-001.

1.2. Column label must be clear and state Authority spec compliance.

1.3. Amendment to BS EN 40 column design life shall be 40 years.

1.4. All Columns and associated Brackets shall be CE marked in accordance with the European legislation.

1.5. Columns shall comply with BS EN 40 as above, using Annex A Table A.1 in PD 6547 for the rationalized wind loading factor, and be designed for

a) For 5m-6m - Terrain Cat. 2.

b) For 8m-12m - Terrain Cat. 1.

1.6. Attachments to columns: Columns shall be designed to accept attachments in both configuration "A" and configuration "B" (as detailed below), but not at the same time. (i.e. a single design of column can be used for either configuration, "A" or "B").

Height	Config	Attachment (area)	Eccentricity from the centre line of the column	Smart equipment assembly Area / Weight	Height	Rear shield (top of column, post top only)	Shape coefficient (BS EN 1991-1-4-2005)
5m & 6m	A	0.3m² (e.g., signs)	300mm	Not permitted	2.5m	0.1m²	1.8
	B	Not permitted	offset allowance of 150mm	0.13msq / 7.1 kg	at 0.75m from top of column	Not permitted	1
8m and above	A	0.6m² (e.g., signs)	500mm	Not permitted	2.65m	0.1m²	1.8
	B	Not permitted	offset allowance of 150mm	0.15msq / 8.5 kg	at 1.0m from top of column	Not permitted	1

1.7. See standard detail HTS-SD-1300-010 and HTS-SD-1300-011 for smart equipment general arrangement.

1.8. Column shall:

a) Where brackets are required, they shall have maximum projections as detailed below:

Column Height	Bracket Projection (Maximum)
5m & 6m	1.0m
8m	1.5m
10m & 12m	2.0m

b) Be designed for Luminaire Weight

(i) 5/6 metre 14kg.
(ii) 8/10 metre 18kg.
(iii) 12 metre 22kg.

c) Be suitable for a max luminaire windage area:

(i) 5/6 metre post top - 0.25m$^{2.}$
(ii) 5/6 metre side entry - 0.1m^2

(iii) 8/10/12 metre - 0.12m^2

1.9. Shall be protected as per Appendix 19/1 Section 1.

1.10. Brackets diameter shall be straight section tubular steel and not tapered.

1.11. Columns, posts, and brackets shall be coated in accordance with Section 19/1 Section 2 (where required by the Lighting Authority).

1.12. All columns shall come with a 76mm spigot when using post top mounted luminaires.

1.13. Shall have a 50mm duct cable entry hole to protect incoming cable.

1.14. Shall have a welded bead to identify ground level placed below the door with a minimum length of 40mm.

1.15. Have a backboard made from material which is substantially non hygroscopic and rot-resistant, of not less than 15mm thickness and suitable size. Fixed securely in the base compartment of each column to accommodate all equipment with adequate space left at the bottom for cable termination and service cut-outs.

1.16. Have a M8 tapped stud, set-screw, and shake-proof washer to be used as an earth terminal and this is to be so positioned as to be easily accessible from the door opening. The screw, shake-proof washers and nuts are to be made of non-corrodible material.

1.17. The foundation design for the column shall allow for an installation tolerance of ± 50mm. (i.e. the foundation shall be suitable for a column that has been installed 50mm too high or too low)

1.18. Where the column manufacturers identification label has been located on the back board (and therefore likely to be obscured by electrical equipment), a duplicate label shall be provided, laminated, and fixed to the column earth terminal (or similar permanent part of the column).

2. Column Door Requirements

2.1. Generally, have one access door (including double arm columns).

2.2. The door shall be wrap around with a single clamp fixing arrangement and M8 tri-head stainless steel bolts.

2.3. Door lock type shall be triangular type unless otherwise specified.

2.4. The column shall be designed so that the bottom of the column door shall not be less than 300mm above ground level with a maximum of 1.0m.

3. Hinged Columns

3.1. Nothing shall be added to the column to hinder operation of the column, no attachments shall be added such as signs.

3.2. The design of the column only needs to take into account the luminaire and baffle windage in accordance with above spec.

3.3. Hinged columns shall be post top for 5/6m columns unless otherwise approved by the lighting authority. They shall have a stub bracket (max 0.5m) for 8m or higher. ALC hinged columns shall be used for 8m – 9m columns. Lighting Authority must approve any mid-hinged column over 6m.

3.4. All hinged columns shall be tool-free mid-hinged and be operated by one person unless agreed otherwise by the Lighting Authority.

3.5. Hinged columns shall be fitted with a door and base compartment that is accessible without requiring the column to be folded down.

3.6. A captive length of flexible conduit should protect the internal wiring cables from accidental pinching between the column base and shaft sections.

3.7. When located on the central reservation, the luminaire(s) must fall within the central reservation or if required only in one lane of the carriageway.

4. Special Design Columns / Non-Standard Columns

4.1. Any column that deviates from the above specification shall be agreed by the Lighting Authority.

4.2. Festive decorations and hanging baskets shall not be fitted to columns unless the column and foundation has been designed for the additional loading and approved by the Lighting Authority.

4.3. A consent from the Lighting Authority shall be required if festive lighting is to be used on any of the columns.

4.4. The installation of CCTV, ANPR & mobile phone masts require consultation with, and approval from the Lighting Authority.

4.5. Columns identified by the Lighting Authority as requiring additional security to the base compartment shall be specified by the Lighting Authority on a case-by-case basis.

4.6. Additional attachments may be required by the Lighting Authority where the use of festive lighting, hanging baskets and other equipment are to be installed.

4.7. Luminaire weights and windage area may be increased by the Lighting Authority where the use of decorative luminaire and brackets are specified.

5. Passively safe columns

5.1. Where approved for use, passively safe lighting columns shall meet the requirements of BS EN 12767 Passive Safety of Support Structures for Road Equipment. Requirements, Classification and Test methods.

5.2. Power supply cables must be by supplied via a RCBO as described in Appendix 14/4.

6. Retention Sockets / Flange Plates

6.1. Retention socket head shall be of cast steel construction, to BS EN 10340 Steel castings for Structural Uses, grade: GS240.

6.2. Retention socket shall be capable of withstanding impact forces to steel posts with a wall thickness up 6mm.

6.3. Shall be galvanised on all internal and external surfaces as per Appendix 19/1.

6.4. Shall be designed to take incoming and outgoing electrical cables.

6.5. Shall be installed in accordance with the guidelines set out by the Manufacturer.

6.6. Shall be provided with supporting calculations proving it fit for purpose.

7. Maintenance Numbers

7.1. Electrical furniture shall be identified by a maintenance number in accordance with a schedule or drawing which will be provided by the Lighting Authority. The developer shall confirm the accuracy of the numbers with the Lighting Authority prior to purchase of the column labels.

7.2. Maintenance numbers shall be as detailed in Annex A.

7.3. Numbers shall be as detailed on the standard drawings.

Appendix 14/1 Site records

1. Site Records

1.1. As built drawings shall be produced by the developer and shall be in accordance with the requirements of Clause 1402 of the Specification for Highways Works

1.2. The record information and “As built” drawing must be submitted to the Lighting Authority prior to the works being adopted.

1.3. The recorded information shall include:

a) Electronic “As-built” drawings in editable format with grid references to be submitted after installation.

b) Schematic drawings of all private networks shall be provided in editable format and shall asset IDs of columns etc not original design numbers.

c) Schedule of lighting columns and other highway electrical equipment including maintenance numbers, connection type and electrical load (total circuit watts, as agreed by ELEXON), installation date.

d) Details of the Electrical Distribution Network Operator or Independent Distribution Network Operator for each column, feeder pillar, sign etc.

e) A completed column data sheet to Appendix 13/2.

f) Electrical test certificates – for individual columns, illuminated signs etc.

g) Electrical installation certificates and electrical test certificates – for Feeder Pillars and Cable network.

h) Column paint system data sheet.

i) Data for the Lighting Authority’s street lighting inventory. Details as required in Annex C, until such time as a template spreadsheet is provided for this purpose.

j) List of remedial works completed.

k) Operation and maintenance manuals to support the site records together with all user information manuals to operate the plant.

l) Luminaire & column delivery notes.

1.4. The record information (“As built” drawings) to be provided by the developer shall clearly show the position of all street lighting equipment, cabinets, cables, draw pits, ducts, and the like, as actually installed, including cable sizes, and route, that cross or run within 5m of the line of a street lighting cable or duct.

a) The location of cable ducts shall be shown by dimensions from fixed reference points on both sides of the carriageway, depth of cover on both sides of the carriageway and the length of any under kerbs.

b) The Developer shall make records of ducts installed during the contract and ducts that are re-used or exposed as part of the Works.

Appendix 14/3 Temporary Lighting

1.1. The levels of illumination of the existing trafficked carriageways shall be maintained at a level not lower than that existing until the date of the completion certificate for the whole of the works. New and temporary carriageway used for traffic during the works shall be illuminated by temporary or permanent lighting to the standards detailed in paragraph 1.2 below.

1.2. The levels of illumination of temporary lighting shall not be lower than the standard provided by the permanent road lighting system, or BS 5489, whichever is the greater.

1.3. Where the Developer proposes to use either temporary lighting, or temporary supplies or cable networks, the Developer shall submit his proposals to the Lighting Authority for their approval. The developer shall not proceed until the temporary lighting proposals have been approved by the Lighting Authority.

1.4. Where necessary the developer shall provide protection to existing cables or install new diversion cables to maintain electrical supplies to luminaires.

1.5. The use of generators and portable lighting rigs shall only be considered by the Lighting Authority where there are no practicable alternative methods of temporary supply available.

1.6. Where the use of generators or portable lighting rigs has been approved by the Lighting Authority, the Developer shall provide a maintenance schedule for checking the operation and refuelling of the generators or portable lighting rigs.

Appendix 14/4 Electrical equipment for road lighting

1. Luminaires

1.1. Luminaire correlated colour temperature shall be as specified in Annex A, unless specified otherwise in the Lighting Brief.

1.2. Luminaires shall be as stated below unless agreed otherwise.

1.3. CRI of no less than Ra. 70.

1.4. LED luminaires shall have a warranty of no less than 10 years on all parts including luminaire body, LED driver and any other internal parts. A collateral warranty must be in place to ensure that this warranty is transferred to the Lighting Authority.

1.5. Luminaires shall be Class I insulation and be of aluminium construction marine grade alloy.

1.6. Luminaires for road lighting shall have degree of protection rating of at least IP66 to BS EN 60529 for Luminaires, LED optics and LED Drivers.

1.7. LED luminaires shall conform to IEC 60598-1.

1.8. Luminaires shall be of a totally enclosed design, shall be of sound construction and be capable of being easily dismantled for maintenance.

1.9. Drivers for LED luminaires shall be Constant Light Output (CLO), dimmable and be contained within a separate compartment to the LEDs.

1.10. Luminaires shall be supplied with a 7 pin NEMA socket suitable for the CMS system used on the network where the luminaires will be installed or to allow for future CMS installation.

1.11. The part of the luminaire providing access to the interior of the luminaire shall, when in the closed position, be firmly attached to the fixed part of the luminaire. In the open position it shall be attached so that it may not become accidentally detached.

1.12. The canopy, hinges, toggle catches, captive screws and nuts shall be of a non-corroding metal.

1.13. The Luminaire shall have a tilt adjustment of -15 to +5 degrees to enable luminaires to be mounted with 0 degrees uplift when fitting to existing bracket arms to ensure they are parallel to the road.

1.14. In relation to the maintenance factor, the luminaire shall be provided with the following:

a) Light Loss: L80 or better.

b) Cleaning Frequency: 72 Months.

c) LED Design Life: 100,000 Hours.

1.15. IK Rating (Impact Resistance) shall be IK08 or better.

1.16. Luminaires to be EMC Test Compliant / RoHS Compliant / CE compliant / WEEE compliant.

1.17. LED shall be tested in accordance with IEC/PAS 62717(LED Modules) and 62722(LED Luminaires) performance requirements.

2. Photo-electric Control Units (PECU)

2.1. Details of the switching levels for photo-electric cells are provided in Annex B.

2.2. Photo-electric control units shall:

a) Have a UV Stabilised Polycarbonate

b) Be LED pulse-encoded to indicate current operating status.

c) Be one part for 7 pin NEMA socket type or (where agreed by the lighting authority) miniature type mounted on the luminaire canopy.

d) Be fully solid state with a self-test on initial power up with an output via a bi-stable relay and a filtered silicon photo diode sensor.

e) Be protected to at least IP65.

f) Have a power consumption of less than 0.25W.

g) Be capable of switching a 5A load.

h) Include a delay device so that the lamps are not switched on by transient changes in the illuminance, switching delay 10 - 20 seconds.

i) Sealing rings shall be provided to prevent dirt and moisture from entering the photocell and luminaire.

j) Have sensor drift of zero over 10 years.

k) Have a guarantee of 10 years.

l) Comply with BS EN 60068 and EN 50081-1 Emissions and EN 61000 Immunity.

m) Have an operational temperature range of -20 °C to + 80 °C.

3. CMS (Central Management System)

3.1. Where the Lighting Authority uses a CMS as described in the Lighting Brief, the CMS specific equipment shall be specified in Annex A.

4. Drivers

4.1. LED shall not be driven at an amperage of more than 700mA.

4.2. LED drivers shall be replaceable throughout the design life of the luminaire.

4.3. The driver shall be housed in a separate compartment to the LEDs but within the luminaire body.

4.4. Drivers to comply and be tested in accordance with EN 61347-1:2008, EN 61347-2- 13:2014, EN 62384:2006.

4.5. The drivers shall include surge immunity in accordance with BS EN 61000 and can withstand a single surge of 10kV and multiple surges of a minimum 6kV.

4.6. The driver compartment shall have its own heat sink feature, independent of the LEDs.

4.7. The Power Factor must be above 0.85 @100% light output leading as required by UMSUG.

4.8. The installer must ensure that the equipment is not connected to electrical supplies unless they comply with the requirement of BS EN 50160.

4.9. The insulation test shall be carried out in accordance with the requirements of EN 60598-1.

4.10. Where required shall be pre-programed as per Annex A.

4.11. Luminaire must operate normally in a voltage range of 230V -6/+10%

5. Cut-Outs & Isolators

5.1. Cut-outs and isolators shall:

a) Have a gland plate with grommets.

b) Be rated at 25A (minimum).

c) Provide double pole isolation.

d) Consist of a substantial moulded-plastic enclosure with separate terminals for live and neutral conductors, incorporating a BS 88 fuse.

e) Be designed primarily for use in road lighting columns and be suitable for terminations or looped services.

f) Have terminals large enough to accommodate the supply cables specified, in single cable or looped cable terminations.

g) Be securely fitted to the backboard by means of at least 3 No stainless-steel screws.

5.2. Labelling and layouts shall be in accordance with the Standard Details.

5.3. Cut-outs shall be used when the cable termination is located below ground level (e.g., Bollards).

5.4. Isolators shall be used when the cable termination is located above ground level (Columns, Signs, etc.).

5.5. Cut-outs shall:

a) Be designed and tested in accordance with BS 7654 and EN 60947-Part 1.

b) Be fitted with a BS 88 LST type fuse.

c) Be requested with clear cover.

5.6. Isolator shall:

a) Be designed and tested in accordance with IEC/EN 60269-1, IEC/EN 60947-3.

b) For 6m columns have a DIN Rail for taking 3 modules and for 8m columns and higher have a DIN rail capable of taking up to 4 modules. The Din Rail shall comprise of a 32A double pole isolator with additional BS EN 60269 (BS 88) fuse carriers for outgoing circuits.

c) Be fitted with a BS 88 MD type fuse.

6. Miniature Circuit Breakers (MCB)

6.1. MCB may be required to protect apparatus such as smart devices and CCTV equipment when required they shall conform to the below:

a) Miniature circuit breakers shall be for use on 230V single phase supply.

b) Have a "lock off" facility.

c) Be Type C or D (as appropriate).

7. RCBO

7.1. For circuits that include passive safe equipment these shall be via a type F RCBO

8. Wiring

8.1. All cable must be British Approvals Service for Cables (BASEC) approved.

8.2. Cable from isolator to luminaires shall be 3 core PVC, a minimum 2.5mm^2, insulated and sheathed flexible Copper Cable 70˚C to BS 6004 table 44 rated 300/500V.

8.3. Connection between the cut-out and DNO apparatus shall be sheathed single core cable (double insulated).

8.4. All exposed live conductors in base compartments shall be insulated and sheathed.

9. Private Network Cabling

9.1. Cable joints are not allowed on the network.

9.2. All private cables shall be labelled (source and destination) as shown in the Standard Details.

9.3. All incoming and outgoing private supplies shall be connected securely using Central Earthing Terminals (C.E.T) glands.

9.4. Buried cable shall have a minimum length of 2m left as a loop at all feeder pillars which shall be coiled in a draw pit.

9.5. Electrical networks shall be designed using minimum 6mm^2 for using 3 core cross linked polyethylene steel wire armoured cable (XLPE SWA).

9.6. If utilising private network supplies to lit traffic signs and bollards these shall be sub-fused.

10. Earthing

10.1. In private cable arrangements with two or more columns; supply point and the last column shall be earthed with an earth rod and pit arrangement or earth mat.

10.2. Cable armouring shall be terminated in a CET. The CET shall be the bracketed, 'bend back' type (CET 003) and shall be securely fixed to the backboard, as detailed on the Lighting Authority Standard Detail Drawings.

11. Earth Rods and Earth Mats

11.1. Earth bonding conductor terminations shall be made using suitably sized crimp type lugs and brass bolts, nuts and washers of a minimum diameter of M8.

11.2. Attach the earth clamp and appropriate conductor to the column or pillar.

11.3. Where ground condition and/or existing services preclude the safe installation of earth rods, earth mats may be used subject to prior agreement with the Lighting Authority. The size, depth and number of mats or rods shall be selected to ensure an impedance of no greater than 20Ω or lower where required by ENA Engineering Recommendation G12.

11.4. Earthing shall comply with ENA Engineering Recommendation G12 – requirements for the application of protective multiple earthing to low voltage networks and any additional requirements of the DNO/IDNO.

11.5. Earth rods shall be located with an inspection chamber, for details see Standard Detail Drawings.

11.6. Any excavation undertaken to locate services to facilitate the safe installation of the rod shall be backfilled with a minimum of 50mm surround layer of Marconite, FurseCem or other electrically conductive aggregate that includes an orange dye.

11.7. Earth rods shall be inserted in the ground to a depth to achieve the required impedance.

11.8. If unable get the required depth an additional rod can be installed adjacent to the rod at a distance not less than the length of rods already installed. This can be done multiple times until the correct impedance is achieved.

11.9. Earth mats must be solid and not lattice type with a minimum surface area of 1m².

11.10. The required depth of cover above the earth mat shall not be less than 650mm, where possible use a minimum of 1m.

12. Feeder Pillars

12.1. Feeder pillars of up to 450mm wide shall be fabricated from a minimum of 3mm steel and larger pillars shall be fabricated from minimum of 5mm steel or constructed from cast iron.

12.2. Steel feeder pillars shall be hot dip galvanised, have root protection, and be painted all in accordance with Appendix 19/1.

12.3. Cast Iron feeder pillars shall have root protection and be painted all in accordance with Appendix 19/1.

12.4. Feeder pillars must have a wiring schematic laminated in the feeder pillar. A pocket on the inside of the door shall be able to accommodate the schematic drawing. This shall show asset IDs not original design numbers, an editable electronic copy shall also be supplied.

12.5. Outgoing supplies shall be labelled as shown on the Standard Details.

12.6. Shall have warning labels in accordance with BS 7671.

12.7. The door locks shall be as 1418.4 of "Specification of Highway Works" and shall be of a tamper proof design and be a greased non-corrodible lever design operated by 8mm triangular headed tamper proof lock.

12.8. Feeder pillar shall be sealed as per the Standard Details.

12.9. Feeder pillars shall be identified by maintenance numbers as detailed in Appendix 13/1.

13. Internal Equipment

13.1. The backboard shall be at least 18mm non-hygroscopic marine ply (with 5mm airgap and pressure treated).

13.2. Internal equipment located in feeder pillars shall be housed in an arrangement of IP54 modular enclosures, occupying no more than 75% of the backboard, with at least 10% spare capacity in the enclosures and 20% additional electrical capacity.

13.3. There shall be a lockable isolator wired in between the DNO supply and the distribution panel and shall be rated for its intended use in accordance with BS 7671.

13.4. Feeder pillars that are shared with ITS shall have separate labelled isolators connected directly to the DNO/IDNO's cutout for Street Lighting, Traffic Signals and Communications so that any one of these can be isolated without impacting on the electrical supply to any of the others.

14. Cable Identification

14.1. The cables into (and out of) a unit shall be labelled to indicate where the cable comes from or what it supplies, respectively as shown in the Standard Details.

14.2. The supply source point of isolation shall also be indicated.

14.3. The labelling shall take the form of K-type markers on universal carrier strip fixed to the cable with using self-locking plastic cable ties or similar.

Appendix 14/5 Electrical equipment for traffic signs

1. Illuminated Traffic Signs

1.1. All sign and luminaire fixings shall have a guarantee of 25 years on site life.

1.2. Signs shall only be lit when the (TSRGD) states that a sign must be lit.

1.3. Lit traffic signs shall conform to BS EN 12899.

2. Traffic Bollards

2.1. Bollards shall be retro-reflective and mounted in a 50x50mm retention socket unless specified otherwise in the Lighting Brief.

2.2. Bollards shall conform to BS 8442 and BS EN 12899 as applicable.

2.3. Bollards shall be reflective R3B material.

2.4. Reflective bollards shall have reflective material on the front, back and sides.

3. Belisha Beacons

3.1. Wide base post painted black to the same specification as lighting columns with the addition of micro prismatic reflective bands to BS EN 12899;

a) Refer to Standard Details

b) Light source shall be LED flashing at intervals in accordance with Traffic Signs and General Directions.

c) The globe shall be mounted on an anti-vandal gallery which is designed to be fitted quickly and securely onto a 76mm circular post.

d) Where required appropriate tunnel, half tunnel shields or halo boards shall be installed around the beacon.

e) Other enhancements or variations may be specified in Annex B or the Lighting Brief.

4. Centre Island Beacon

a) Standard centre island post, shall be a 5m steel lighting column that may be mid hinged where specified in Annex B or the Lighting Brief, finished in accordance with Appendix 19/1.

b) Shall comply with the TSRGD.

c) The globe shall be illuminated using an LED lamp, have easy access and minimum IP54 sealing. The globe shall be mounted on an anti-vandal gallery which is designed to be fitted quickly and securely onto a 76mm circular post.

d) Illuminated 600mm diameter sign to diagram 610 back-to-back or a sign to diagram 611 on a one-way street, mounted 3000mm above the surface of the carriageway.

e) A cast iron retention socket shall be used for centre island beacon installations.

Appendix 19/1 Protection of steelwork against corrosion

1. Sign, Column and Feeder Pillar Protection

1.1. Columns, posts, steel feeder pillars and brackets shall be galvanised to the latest edition of BS EN ISO 1461 "Hot Dip Galvanised Coatings on Fabricated Iron and Steel Articles, Specifications and Test Methods" and shall be free from imperfections including porosity. Galvanising shall be fettled and rasped to remove all spikes and sharp edges and leave a smooth finish prior to finishing application.

2. Root Protection

2.1. Pre-treat galvanised internal and external surface of the column, post or steel feeder pillar to 250mm above ground level shall be treated as the following Technical Data Sheet (shop applied). Rinse/wash after using fresh clean water and allow it to dry before proceeding.

<table>
<tr><td colspan="2">3. Environment and accessibility Factory applied</td></tr>
<tr><td>4. Required durability of system
No maintenance 15 years
Minor maintenance 15 years
Major maintenance 25 years</td><td>5. Colour of finish
Black RAL 9005</td></tr>
<tr><td colspan="2">6. Paint systems to be applied over:
Clean, Lightly Abraded, De-Greased Hot Dipped Galvanised Steel</td></tr>
<tr><td colspan="2">7. Details</td></tr>
<tr><td>Product Description:
Product Name:
Reference Number:
Colour:
Application Shop/Site:
Application Method:
Wet Film Thickness:
Dry Film Thickness:</td><td>High Solids Glass Reinforced Two Pack Epoxy
Epidac 2 Glass Reinforced Epoxy
79-489
Black RAL 9005
Shop
Brush/Airless Spray
225 microns
200 microns</td></tr>
<tr><td>8. Stripe coat description (including item No. and colour)
Workshop:</td><td>9. Paint manufacturer's official stamp</td></tr>
</table>

3. Colour Finish

3.1. Lighting Columns, Sign Posts, Beacons and Feeder Pillars shall be painted as detailed below:

3. Environment and accessibility **Factory applied**		
4. Required durability of system No maintenance 15 years Minor maintenance 15 years Major maintenance 25 years	**5. Colour of finish** As detailed in Annex B	
6. Paint systems to be applied over: Clean, Lightly Abraded, De-Greased Hot Dipped Galvanised Steel		
7. Details	**1st Coat**	**2nd Coat**
Product Description:	2PK Epoxy Primer	Polysiloxane Finish
Product Name:	SigmaCover 280	PSX 700
Reference Number:	7417	7546
Colour:	Grey	As Annex A
Application Shop/Site:	Shop	Shop
Application Method:	Airless Spray	Airless Spray
Wet Film Thickness:	140 microns	100 microns
Dry Film Thickness:	75 microns	75 microns
10. Stripe coat description (including item No. and colour) Workshop:	**11. Paint manufacturer's official stamp**	

16. LIST OF STANDARD DETAILS.

Drawing No	Description
HTS-SD-1300-001	Standard Column General Arrangement
HTS-SD-1300-002	Planted Column Foundation
HTS-SD-1300-003	Tree & Vegetation Trimming
HTS-SD-1300-004	Maintenance Number Location & Orientation
HTS-SD-1300-005	Column Door Orientation
HTS-SD-1300-006	Zebra Crossing Mid Post Beacon
HTS-SD-1300-007	Zebra Crossing Bracket Mounted Beacon
HTS-SD-1300-008	Zebra Crossing Beacon Only
HTS-SD-1300-009	Refuge Column & Beacon
HTS-SD-1300-010	Smart Equipment 5-6m Columns
HTS-SD-1300-011	Smart Equipment 8-12m Columns
HTS-SD-1300-012	Retaining Wall Pocket for Column
HTS-SD-1400-001	Cable Identification Labels for Private Cables
HTS-SD-1400-002	Typical Termination Detail DNO with optional looped sub circuit
HTS-SD-1400-003	Typical Termination Detail Private with optional looped sub circuit
HTS-SD-1400-004	Typical Mini Pillar
HTS-SD-1400-005	Pillar Switch Gear - Mini Pillar
HTS-SD-1400-006	Typical Medium Pillar
HTS-SD-1400-007	Pillar Switch Gear - Medium Pillar
HTS-SD-1400-008	Typical Large Pillar
HTS-SD-1400-009	Pillar Switch Gear - Large Pillar
HTS-SD-1400-010	Earth Rod
HTS-SD-1400-011	Typical Termination Unswitched Socket on Lighting Column
HTS-SD-1400-012	Typical Termination Switched & Unswitched Socket on Lighting Column
HTS-SD-1400-013	Combined Feeder Pillar for Signals, Comms and Street Lighting

17. ABBREVIATIONS.

BASEC	British Approvals Service for Cables
C.E.T	Central Earth Terminal
CMS	Central Management System (computer)
DNO	Distributor Network Operator
ENA	Energy Networks Association
IDNO	Independent Distributor Network Operator
IEC / PAS	International Electro-technical Commission Publicly Available Specifications
PECU	Photo-Electric Control Unit
TSRGD	Traffic Signs Regulations and General Directions (Statutory Instrument)
UMS	Unmetered Supply

ANNEX A - Design Considerations

A1 Correlated Colour Temperature

A1.1 Luminaire correlated colour temperature shall be detailed below:

a) 3000K for residential roads and traffic routes

b) Zebra lanterns 4000K

c) Areas with ecological / environmental impact (e.g., Bat flight / roosting / foraging arears) shall be highlighted to the Lighting Authority and if an appropriate colour temperature shall be agreed.

A2 Service Connections and Cable Network

A2.1 Supplies shall generally be DNO / IDNO supplies except for illuminated signs, illuminated bollards and Belisha Beacons, which shall be fed via a private network.

A2.2 The use of private cable networks (in location other than traffic islands and roundabout central islands) may be permitted where no DNO/IDNO mains are present or where there the existing lighting uses a private cable network. Use of a private network shall only be permitted with the approval of the Lighting Authority in advance of design work.

A3 Column Hard Standing

A3.1 Where columns are in a verge or service strip then the columns shall be provided with a hard standing and shall be as per standard detail HTS-SD-1300-002.

A4 Controls

A4.1 Road lighting luminaires shall be fitted with a 7 pin NEMA socket and photocell as detailed in the main specification.

A4.2 Sign lights shall be fitted with miniature photocells with a higher switching level as per Annex B.

A4.3 CMS is not required unless specified in the Lighting Design Brief.

A5 Illuminated Street Furniture Maintenance Numbers

A5.1 Maintenance numbers shall:

a) Be self-adhesive, reflectorised R3B or similar.

b) Be Helvetica Medium (unless otherwise specified).

c) Have black characters on a white background.

d) Have a text height of 75mm except for 6m columns on minor residential road where a text height of 50mm shall be used.

A6 Dimming Profiles

A6.1 Unless overruled in the Design Brief the luminaires shall be pre-programmed as follows:

Regime D61 - For lighting except areas lit to Class P5 or lower	
Lighting up to 20.00	100% of design light output
20.00 to 23.00	70% of design light output
23.00 to 05.00	50% of design light output
05.00 to 06.00	70% of design light output
06.00 to switch off	100% of design light output

Regime D18 - For lighting on Residential Roads to Class P5	
Lighting up to 22.00	100% of design light output
22.00 to 06.00	70% of design light output
06.00 to switch off	100% of design light output

Lighting on Roads to Class P6 shall have no dimming profile.

Zebra Lanterns shall have no dimming profile.

A7 Socket Mounted Columns, Beacons, and Posts

A7.1 Zebra crossing beacons, refuge beacons and reflectorized bollards shall be mounted in NAL, or similar approved, sockets.

A7.2 Signposts on islands, roundabouts, buildouts or similar shall be mounted in NAL, or similar approved, sockets.

ANNEX B - Preferred Materials

B1 Luminaires

B1.1 Luminaires shall be sourced from the following families of luminaires as per the table below unless otherwise agreed with the Lighting Authority.

Luminaire Type	Light Source Type
ASD Highway Diamond Elite family	LED
CU Phosco	LED
DW Windsor Kirium Pro	LED
Indo Air	LED
Phillips Luma	LED
Urbis Ampera	LED

B1.2 Preferred luminaire optics and lumen packages:

ASD Lighting

Model	Ref	Luminaire Details
Micro Highway Diamond Elite	Bucks-A	16 LED M1 optic 3000K 2.11klm
Micro Highway Diamond Elite	Bucks-B	16LED S0 optic 3000K 2.27klm
Mini Highway Diamond Elite	Bucks-C	28LED M1 optic 3000K 4.23klm
Mini Highway Diamond Elite	Bucks-D	28LED S0 optic 3000K 4.48klm
Micro Highway Diamond Elite	Bucks-E	16 LED M1 optic 3000K 1.27klm
Midi Highway Diamond Elite	Bucks-F	52LED M1 optic 3000K 6.53klm
Midi Highway Diamond Elite	Bucks-F2	52LED M2 optic 3000K 6.00klm
Midi Highway Diamond Elite	Bucks-G	84LED M1 optic 3000K 10.90klm
Midi Highway Diamond Elite	Bucks-G2	84LED M2 optic 3000K 10.04klm
Midi Highway Diamond Elite	Bucks-H	68LED M1 optic 3000K 8.85klm
Midi Highway Diamond Elite	Bucks-H2	68LED M2 optic 3000K 8.08klm
Midi Highway Diamond Elite	Bucks-I	100LED M1 optic 3000K 13.03klm
Midi Highway Diamond Elite	Bucks-I2	100LED M2 optic 3000K 11.96klm
Maxi Highway Diamond Elite	Bucks-J	148LED M1 optic 3000K 20.04klm
Maxi Highway Diamond Elite	Bucks-J2	148LED M2 optic 3000K 18.96klm

ASD Lighting Zebra Lanterns

Model	Ref	Luminaire Details
Mini Highway Diamond Elite	Bucks-ZL04	20 LED ZL optic 4000K 4.142klm
Mini Highway Diamond Elite	Bucks-ZR04	20 LED ZR optic 4000K 4.142klm
Mini Highway Diamond Elite	Bucks-ZL06	20 LED ZL optic 4000K 6.024klm
Mini Highway Diamond Elite	Bucks-ZR06	20 LED ZR optic 4000K 6.024klm
Mini Highway Diamond Elite	Bucks-ZL09	36 LED ZL optic 4000K 8.999klm
Mini Highway Diamond Elite	Bucks-ZR09	36 LED ZR optic 4000K 8.999klm
Mini Highway Diamond Elite	Bucks-ZL11	44 LED ZL optic 4000K 11.188klm
Mini Highway Diamond Elite	Bucks-ZR11	44 LED ZR optic 4000K 11.188klm
Mini Highway Diamond Elite	Bucks-ZL12	44 LED ZL optic 4000K 12.201klm
Mini Highway Diamond Elite	Bucks-ZR12	44 LED ZR optic 4000K 12.201klm

B2 Subway luminaires

Luminaire Type	Light Source Type
Designplan Tuscan	LED
Simmonsigns Safeway Subway Light Unit	LED

B3 Illuminated Traffic Signs

Manufacturer	Ref	Description
SimmonSigns	LUA LED 3x1	LED aluminium sign light for use with traffic signs up to 600mm
SimmonSigns	LUA LED 6x1	LED aluminium sign light for use with traffic signs 600mm to 750mm
SimmonSigns	LUB LED (900, 1200 or 1500)	LED Sign light for signs larger than 750mm

B4 Traffic Bollards

B4.2 Un-Lit Bollards

Manufacturer	Ref	Description
Malatite	3Sixty	Reflective highway traffic bollard with NAL RS 50x50 socket and adapter plate
Malatite	DuraFlex	Reflective highway traffic bollard with NAL RS 50x50 socket and adapter plate
SimmonSigns	Weebol NAL	Weebol reflective bollard complete with NAL 50x50 knuckle.
TMP Solutions	EVO-N	Socketed reflective bollard complete with NAL RS 50x50 socket.

B4.3 Solar Powered Bollards

Manufacturer	Ref	Description
TMP Solutions	EVO-S	Socketed EVO-S solar powered bollard complete with NAL RS 50x50 socket.

B4.1 Illuminated Bollards – Only used when specifically referred to in the Lighting Design Brief

Manufacturer	Ref	Description
Simmonsisgns	Simbol with Global Plus base light	Base lit illuminated bollards
Glasdon	Rebound SignMaster	LED base lit Option 3 (Reflective 360 degrees)

B5 Refuge Island Beacons

Manufacturer	Ref	Description
Charles Endirect	AVG/P/N400	AGV4 PoleStar LED Beacon with opal globe
Simmonsigns	ModuCIC	LED Post top Centre Island White Opal Beacon

B6 Belisha Beacons

Manufacturer	Ref	Description
Simmonsigns	Modubel	LED Post top Beacon
Simmonsigns	Midubel	LED Mid Post Beacon
Charles Endirect	AVG/P/F400	AGV4 PoleStar LED Belisha Beacon with amber globe

B8 Columns

B8.1 Shall be of tubular steel construction and comply with the following BS EN40 Design parameters.

Parameter	Value
Mean hourly wind speed - Vref	21.5m/sec
Site altitude	159m
Rationalized Wind Factor (R_{WF})	350N/m²
Rationalized wind loading region	Extra Light
Partial safety factors on loads	Class B
Deflection class	Class 3
Foundation data	Average
Fatigue requirements	Use Highways England CD354

B8.2 There is no preferred list of columns.

B7 Photo Cells

Standard Lanterns – 35/18 Lux

Zebra Crossing Lanterns – 70/70 Lux

Illuminated signs – mini cell 70/70 Lux

B9 Protective Finish

B9.1 Colour of protective coatings columns, signposts and feeder pillars shall be BS4800 10A11 Grey unless stated otherwise in the Lighting Brief

ANNEX C - Inventory Data

C1 Buckinghamshire Council uses Yotta Alloy as its street lighting inventory. The Developer shall, upon completion of the installation compile the following information in the form of a spreadsheet in editable format and submit it to Highways Development Management prior to an inspection being carried out.

Ref	Field	Contents
1	Street Name	
2	Street USRN	
3	Locality	
4	Town	
5	Asset ID Number	
6	Location	o/s, opp, j/w
7	Unit Type	*Column, Sign, Bollard, Pillar, Zebra Beacon, Refuge Beacon*
8	Position (of unit)	*Road Side, Attached to a column, Bridge Mounted, Car Park Area, Central Reservation, Cycle Track, Footpath, Subway, Roundabout, Traffic Island, Wall Mounted*
9	Ownership	*BC, PC, Private*
10	Service Owner	UKPN, SSE, NG, BC, IDNO
11	Energy Account	UKPN, SSE, NG, *IDNO* in *DNO* (eg GTC in NG)
12	Date installed	dd / mm / yyyy
13	Easting	6 figure co-coordinates
14	Northing	6 figure co-coordinates
15	Column Cross section	*Tubular, Octagonal, Hexagonal, Other*
16	Column Material	*Steel, Aluminium, Stainless Steel, Other*
17	Column Finish	*Galvanised, Painted, Other*
18	Column Height	
19	Column Fixing	*Planted Root, Flange Mounted, NAL socket*
20	Column Manufacture	
21	Column Root Protection	
22	Column Protective Coating	*Hot Dipped Galvanised, Hot Hipped Galvanised & Protective Coating*
23	Column Colour	
24	Column Bracket Type & Projection	Single 1.5m, Double 2m, post top
25	Control fixing	7pin Nema, Zaga, Mini cell, DIN rail

Ref	Field	Contents
26	Control ID	
27	Control Switching Level	35/18
28	Control Dimming Regime	D61, 808
29	Control UMSUG code	
30	Control number of	
31	Luminaire number of	
32	Luminaire Make & Model	
33	Luminaire UMSUG code	
34	Luminaire Elevation	
35	Luminaire Mounting Height	
36	Luminaire LED Array Ref	
37	Luminaire output (klm)	
38	Luminaire CCT	2700K, 3000K, 4000K
39	Standard Replacement Luminaire type	A-J, ZLxx, ZRxx
40	Lighting Class	P1-P6, M1-M6, C0-C5
41	Adopted Hard Standing	Y / N
42	Means of Access	*Tower, Ladder, Scaffold, Steps, Folding*
43	*Conservation Area*	Y / N
44	Quantity of Fuses/MCBs	
45	Cut Out Size	
46	No of Phase	
47	Main Isolation	
48	Earth Electrode	Y / N
49	Column Product No	
50	Sign Diagram No(s)	
51	Sign Size(s)	
52	Source of Supply	*Main Isolation point of unit's supply cable*
53	Sub Circuit	*Nearest isolation point of unit's supply cable*
54	Private Supply Cable Type	
55	Private Supply Cable no of cores	
56	Private Supply Cable CSA	