COMHAIRLE CONTAE
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CARLOW COUNTY COUNCIL

Carlow County Council

Public & Exterior Lighting Specification

First Issue

November 2023

Adhering to this specification does not ensure compliance with relevant international and national standards, best practice guidance, or with safety and health legislation. Clients, designers, and contractors should make themselves aware of their statutory duties under Irish safety and health legislation.

Compliance with this specification does not ensure design approval by Carlow County Council.

This specification supersedes previous specifications used within the county. Carlow County Council intends to review and update this specification regularly, however, the latest version of any statutory instrument, standard, standard recommendation, code of practice, and guidance document cited shall always be used.

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Introduction

Carlow County Council intends to ensure that all projects with an exterior lighting element will provide a low-impact, sustainable, energy efficient lighting solution. This document refers to international and national standards, along with codes of practice, and best practice documents that designers must comply with to meet required standards.

Whilst this document does not intend to specify lighting equipment, it does intend to stipulate a minimum performance standard for all the equipment utilised within exterior lighting installations.

This document does not specify a specific lighting category with which designers should comply, rather designers should select appropriate lighting levels from the pertinent standard with which to light their projects and confirm this selection with Carlow County Council prior to undertaking the design. This latitude is to enable the competent lighting designer scope to produce appropriate, compliant, and energy efficient lighting solutions.

Objectives

Lighting is an important addition to the built environment. Lighting gives a sense of safety and security to our residential areas and vibrancy to our commercial centres. Public lighting makes navigating our community easier through the hours of darkness, improves traffic flow and raises general safety.

Developers and designers shall consult the *County Development Plan* to determine which environmental assessments may be required, beyond regular design attention necessary to produce environmentally sensitive designs.

Public lighting infrastructure in the county places a considerable burden on the local authority's resources and therefore it is in everyone's interests that this infrastructure is as energy efficient and maintenance friendly as possible.

Carlow County Council's *Public and Exterior Lighting Specification* lays down how the lighting task should be approached for all exterior applications within the county regardless of whether the lighting is to be taken in charge or not.

This lighting specification supersedes all previous exterior lighting specifications issued by Carlow County Council. The guidance offered for public lighting layouts within *Recommendations for Site Development Works for Housing Areas* is no longer acceptable.

1 General Requirements

All lighting schemes for transport infrastructure, housing, outdoor sports facilities, industrial and commercial developments carried out by developers or their contractors in county Carlow shall comply with the requirements of Carlow County Council, irrespective of whether the lighting is to be taken in charge or not.

This specification sets down appropriate standards and technical specifications which shall be complied with by anyone undertaking public and private developments or undertaking upgrades to the existing network.

The approach to the design process shall be the same regardless of the project being a new build or an upgrade of the existing lighting infrastructure.

All transport and amenity lighting shall comply with the Irish Standard for public lighting *I.S. EN 13201-2:2015* (CEN/CENELEC, 2016). The associated electrical infrastructure shall comply with *I.S. 10101:2020+AC1:2020: National Rules for Electrical Installations*

((NSAI/ETC TC 2), 2020), and with *ESB Networks National Code of Practice for the Customer Interface*.

Lighting designs for major traffic routes and junctions shall follow the guidance provided within *DN-LHT-03038 Design of Road Lighting for the National Road Network* along with the associated *Transport Infrastructure Ireland* design manuals. The associated electrical infrastructure shall comply with *I.S. 10101:2020+AC1:2020: National Rules for Electrical Installations* ((NSAI/ETC TC 2), 2020), and with *ESB Networks National Code of Practice for the Customer Interface*.

All exterior sports lighting, including walking tracks bounding playing fields, shall comply with the Irish Standard for sports lighting *I.S. EN 12193:2018&LC:2019 Light and Lighting – Sports Lighting* (CEN/CENELEC, 2019). The associated electrical infrastructure shall comply with *I.S. 10101:2020+AC1:2020: National Rules for Electrical Installations* ((NSAI/ETC TC 2), 2020), and with *ESB Networks National Code of Practice for the Customer Interface*.

All exterior carparks shall comply with the Irish Standard for carpark lighting *I.S. EN 12464-2: 2007 Lighting of workplaces – Part 2: Outdoor workplaces Table 5.9* (CEN/CENELEC, 2006). The associated electrical infrastructure shall comply with *I.S. 10101:2020+AC1:2020: National Rules for Electrical Installations* ((NSAI/ETC TC 2), 2020), and with *ESB Networks National Code of Practice for the Customer Interface*.

In addition, designers shall observe the general guidance offered in *BS 5489-1:2020 Part 1: Lighting of roads and public amenity areas – Code of practice* (Committee EL/1/2, Road Lighting, 2020). In particular regarding locating columns and the calculation of maintenance factors.

Additionally, designers shall follow published best practice documents from the *Institution of Lighting Professionals*, the *Society of Light and Lighting*, the *Department of The Environment, Heritage and Local Government* and the *Department of Transport* for further guidance on specific lighting applications.

Where special circumstances occur that require deviation from this document, these deviations shall be clearly agreed upon with Carlow County Council in advance of any work commencing on site and as such, must be adhered to for any public lighting installation to be taken in charge by Carlow County Council.

LED luminaires shall only be considered for public lighting applications. Luminaires shall be capable of *CMS* control by replacing the *PECU* with a communications node.

Traffic lights and lighting associated with pedestrian crossings shall have a separate *MPRN* number to public lighting.

Lighting designers shall approach the design task in a holistic manner, sympathetic to the nature and location of the project. Consideration shall be given to the people who will use and live with the lighting installation. Care will be taken, as far as practicable, by the lighting designer to ensure that the impact on flora and fauna will be minimised.

Specifications and requirements for the various individual components that make up a general lighting infrastructure is laid out in *appendixes A* through *I*. Any detail of an individual lighting application not covered should be brought to the attention of Carlow County Council for clarification.

Designers shall use sources with Correlated Colour Temperature (CCT) of 3000K for all applications. For projects that might benefit from a different CCT, the designer shall discuss the choice and reasons with Carlow County Council's Public Lighting section. The use of CCT alone is not sufficient to minimise the impact of lighting on flora and fauna.

1.1 Standards and Guidance

Lighting designers shall refer to the latest versions of the following Regulations, Standards, and Guidance Documents:

S.I. No. 291 of 2013: Safety, Health and Welfare at Work (Construction) Regulations 2013.

S.I. No 299 of 2007: Safety, Health and Welfare at Work (General Applications) Regulations 2007.

Code of Practice for Avoiding Danger from Underground Services. Health and Safety Authority. Latest version.

Code of Practice for Avoiding Danger from Overhead Electricity Lines. ESB Networks. Latest version.

I.S. 10101:2020 National Rules for Electrical Installations (Incorporating Corrigendum 1 2020) Edition 5.

ESB Networks National Code of Practice for the Customer Interface. Version No. 5. April 2021. DOC-030303-AEN.

ESB Networks Housing Schemes: Guidebook for ESB Networks Standards for Electrical Services (Revision 5).

Design of Road Lighting for the National Road Network. DN-LHT-03038. August 2022. Transport Infrastructure Ireland.

Specification for Electrical Work for Road Lighting and Traffic Signs. CC-SPW-01400. May 2019.

Specification for Road Lighting Columns and CCTV Masts. CC-SPW-01300. May 2019.

The Design of Road Restraint Systems (Vehicle and Pedestrain) for Roads and Bridges. DN-REQ-03034. May 2019.

The Treatment of Transition Zones to Towns and Villages on National Roads. DN-GEO-03084. August 2018.

Road Lighting - Part 1: Guidelines on selection of lighting class. S.R. CEN/TR 13201-1:2014.

Road Lighting - Part 2: Performance requirements. I.S. EN 13201-2: 2015.

Road Lighting - Part 3: Calculation of performance. I.S. EN 13201-3: 2015.

Road Lighting - Part 4: Methods of measuring lighting performance. I.S. EN 13201-4: 2014.

Road Lighting - Part 5: Energy performance indicators. I.S. EN 13201-5: 2015.

BS 5489-1:2020 Part 1: Lighting of roads and public amenity areas – Code of practice.

Light and Lighting – Sports lighting. I.S. EN 12193:2018&LC:2019.

Light and lighting - Lighting of workplaces – Part 2: Outdoor workplaces. I.S. EN 12464-2: 2014.

Passive safety of support structures for road equipment – Requirements and test methods. I.S. EN 12767:2019.

Relevant guidance documents available from the *Institution of Lighting Professionals* as appropriate.

Relevant guidance documents available from the *Society of Light and Lighting* as appropriate.

Carlow County Council *Development Plan*

Irish Wildlife Manuals as appropriate to the project.

EU Directives on biodiversity protection and habitat protection as appropriate.

1.2 Appropriate Lighting Design

Adherence to Carlow County Council's *Public and Exterior Lighting Specification*, or approval of the lighting design by Carlow County Council does not imply compliance with any standard, or that the lighting infrastructure is fit for purpose. It will be the duty of the developer to investigate and remedy any issues identified by Carlow County Council or its agents during any phase of design, construction, inspection, or commissioning. Lighting infrastructure shall only be approved, or taken in charge, upon any required remedial work being completed.

Lighting designers shall be aware of their duty to provide appropriate, sustainable, energy efficient lighting solutions in line with the relevant international and national standards, statutory instruments, codes of practice and the codes of conduct of the professional bodies of which they are members.

Where a lighting design has been undertaken by a third party such as a manufacturer, supplier, or agent etc. then a nominated, competent person within the design team shall be responsible for ensuring that the lighting design is appropriate, compliant, and sustainable. Designs submitted by a third party on an advisory basis, without a responsible, competent person underwriting the design will not be accepted by Carlow County Council and will not be taken in charge.

The developer and contractor shall ensure that the lighting design is installed as per the design. Any changes to the lighting design shall be undertaken by the lighting designer and submitted to Carlow County Council, prior to installation.

Carlow County Council intends that all lighting installed be appropriate to the local environment, the task for which illuminance is provided, be energy efficient and sustainable. The lighting infrastructure shall not impact negatively on the local landscape, residents, visitors, or the flora and fauna.

The developer shall provide the lighting designer with any environmental impact assessment, wildlife survey and any other information relevant to allow the lighting designer to provide appropriate measures to mitigate against damage or nuisance caused by light intrusion in an appropriate manner.

The lighting design shall not place luminaires in line with, or directly above windows or the doors of residences.

2 Safety and Health

2.1 The developer shall comply with all the duties laid down in the *Safety, Health and Welfare at Work (General Applications) Regulations 2007*.

2.2 The developer shall comply with all the duties laid down in the *Safety, Health and Welfare at Work (Construction) Regulations 2013.*

2.3 All persons employed on the installation of public lighting must have received appropriate safety and health training in accordance with the *Safety, Health and Welfare at Work Act 2007* and *The Safety Health and Welfare at Work (Construction) Regulations 2013* and training in roadside working in accordance with Part 13 of the *Safety, Health & Welfare at Work (Construction) Regulations 2013* as amended, the *Code of Practice for avoiding Danger from Overhead Electricity Lines* (ESB Networks, 2019), and the *Code of Practise For Avoiding Danger From Underground Services* (Health and Safety Authority, 2016).

2.4 Any person who carries out specific works on public lighting in proximity to ESB networks is to hold an appropriate public lighting *Safety Approval Certificate* confirming that they are trained and competent to carry out such works.

2.5 Account shall be taken of any traffic management measures that may be required during the installation of public lighting schemes. This includes the requirement that a traffic management plan be designed by a competent *Traffic Management Designer* and implemented on site by a *CSCS Signing, Lighting and Guarding* holder.

3 Client and Designer Duties

3.1 Developers and/or their agents shall ensure they comply with their statutory duties defined in the *Safety, Health and Welfare at Work (Construction) Regulations 2013*, particularly those duties detailed in *Part 2, Section 7 (2) and (5)*.

3.2 Designers submitting lighting designs shall ensure they comply with their statutory duties defined in the *Safety, Health and Welfare at Work (Construction) Regulations 2013*, particularly those duties detailed in *Part 2, Section 15*.

3.3 The *Safety, Health and Welfare at Work (Construction) Regulations 2013* clearly states that the *client (developer)* has a statutory duty to appoint a '*competent designer'* to undertake all design work. This statutory duty applies to lighting and associated electrical infrastructure design. The appointed '*competent designer'* must comply with their statutory duties which are clearly defined in *S.I. 291*. These statutory duties also apply to designs that are offered on an advisory basis and regardless of the contractual arrangements between the designer and the developer or client.

3.4 Designers must prepare, record and store written documentation clearly showing how design decisions are arrived at. Under *S.I. 291* the designer must share (if requested) such records with others that have an interest in the project. Carlow County Council clearly has an interest in all designs carried out for installation in its functional area and may request such records from designers.

3.5 Carlow County Council reserve the right to have lighting designers demonstrate their competence to undertake lighting and associated electrical infrastructure designs. Being an affiliate member of the *Institution of Lighting Professionals*, or the *Society of Light and Lighting* is not sufficient on its own to demonstrate competency to undertake lighting design.

3.6 Developers and their agents should be aware that 'designs' offered on an 'advisory

basis' or on a *pro bono* basis must comply with the statutory duties defined in the *Safety, Health and Welfare at Work (Construction) Regulations 2013*.

4 Works to Partial Circuits

4.1 All works to partial circuits will be subject to the full testing and certifying requirements of *I.S. 10101:2020+AC1:2020* ((NSAI/ETC TC 2), 2020).

Should the installer become aware of any defect in any part of the installation that would impair the safety of the new work, the client must be informed in writing thereof. No new work should commence until these defects have been made good.

4.2 Where existing hardware (columns, supply cabinets, etc.) are to be relocated/reused or in any way retained, the contractor must certify that all retained hardware is structurally sound and without damage to the protective coatings.

4.3 All due care must be taken in the protection of existing hardware. Any damage to existing equipment (both electrical and structural) must be reported to the local authority and it is the contractor's responsibility to replace any equipment damaged in the course of their works.

4.4 Prior to the disconnection of any existing public lighting installations, a full *Risk Assessment* shall be undertaken regarding the impact of the interruption of the street lighting provision on all users - pedestrian, cyclist, and vehicular. If deemed necessary, temporary lighting shall be provided.

4.5 Where the interruption of the street lighting provision cannot be avoided by the phased scheduling of works, a written agreement must be sought from Carlow County Council for permission to temporarily power down and re-energise sections of the circuits on a phased basis.

4.6 If granted, the permission referenced above in no way absolves the contractor from his previously stated responsibilities regarding the inspection and testing of the renewed circuits.

4.7 All electrical installation work is to be carried out by a contractor registered with *Safe Electric* or *ECSSA*.

4.8 All electrical waste is to be disposed of in accordance with the *WEEE Directive*.

5 Existing Lighting

Designers shall be cognisant of existing lighting infrastructure bounding or having any impact on their project. They shall include, as a minimum, two columns in either direction from access points.

Should the existing lighting be illuminating a conflict area such as a roundabout, junction, or merge lane, the designer shall include all the lighting for the extent of the conflict area, or at least enough to demonstrate that the existing lighting levels will not be compromised.

Carlow County Council recognise that historical photometry may be difficult to obtain and will accept comparable luminaire photometry if necessary.

6 Lighting Design for New Projects

6.1 Lighting designers shall refer to Carlow County Council's *Public and Exterior Lighting*

Specifications and ensure they comply fully with all requirements.

6.2 Lighting designs shall comply with Carlow County Council's *Public and Exterior Lighting Specifications* even if there is no intention for the lighting infrastructure to be taken in charge by Carlow County Council.

6.3 Lighting designers shall select an appropriate lighting classification using the selection process detailed in *S.R. CEN/TR 13201-1:2014* (CEN/CENELEC, 2015). The lighting designer should then liaise with Carlow County Council to confirm the lighting classification. The selection process shall be recorded and submitted to Carlow County Council.

6.4 Overall uniformity (U_O) has a significant impact on the visual quality of a lighting installation, and a high U_O value has a positive effect on user safety. Therefore, where a lighting classification does not state a value for U_O, the minimum value for U_O shall be taken to be 20%.

6.5 The minimum permitted lighting level with residential developments shall not be less than *I.S. EN 13201-2:2015 P4* with a minimum *Uo* of at least 0.20 at full output.

Dimming by 25% from 00:00 to 06:00 shall be applied to all residential lighting projects. However, should the designer's risk assessment find that dimming is not appropriate, this shall be agreed with Carlow County Council.

6.6 Lighting calculations shall be undertaken in accordance with *I.S. EN 13201-3: 2015 Calculation of Performance* (CEN/CENELEC, 2015).

6.7 Lighting designers shall select an appropriate luminaire based on the luminaire specification in *Appendix A* and on an energy consumption assessment in accordance with the requirements of *I.S. EN 13201-5:2015 Energy Performance Indicators* (CEN/CENELEC, 2015).

Carlow County Council will reject luminaires that they believe to be unsustainable.

Carlow County Council will reject luminaires that they believe to be inefficient energy consumers.

6.8 Lighting designers shall approach the design process in a holistic manner, taking account of lighting levels in the general area and at the access points to the project/development. Maintenance access and longevity of installation shall be central to the design.

6.9 Lighting designers shall pay attention to the *General Principles of Prevention* both for construction and for future maintenance.

6.10 Careful consideration shall be given to future maintenance requirements. In particular access for maintenance crews to the lighting equipment, including safe ingress and egress to the equipment location.

Where access by *MEWP* is difficult, or which would require the lengthy reversing of vehicles, then raise and lowering columns shall be used.

6.11 The design should represent the planned construction phases and should be self-contained within each construction phase.

6.12 No component of the public lighting infrastructure shall stand on, or pass under, private property.

6.13 Consideration shall be given to the protection of persons from striking columns, both

in motorised vehicles and cycles. Column set back guidance offered in *6.1.3* of *BS5489-1:2020* shall be observed.

For guidance, there shall be at least 0.8m clearance from the kerb edge to the face of the column in areas where the speed limit is ≤ 50km/h, including car parks.

For guidance, there shall be at least 0.5m clearance from the edge of a cycle lane to the face of the column.

Lighting columns and pillars represent a potential hazard to cyclists, vehicle drivers, and their passengers. When shared surfaces are used a suitable method of protection from the risk of public lighting column strikes shall be offered that does not conflict with the ethos of shared surface design principles. The designer shall ensure therefore, that sufficient space is allocated within the development to allow for appropriate column and pillar setbacks.

Where appropriate setbacks cannot be achieved, or appropriate remedial measures cannot be taken, then passively safe columns and associated electrical disconnects shall be used in accordance with *I.S. EN 12767:2019*.

6.14 The effects of planned and existing trees and tall shrubs shall be considered during the design process to ensure that they do not block light and cause excessive shadowing. A minimum clearance from the widest part of the mature tree canopy equal to the column height, shall be used to ensure light distribution is not inhibited.

In new developments, the economic and appropriate locating of columns shall take priority over planned tree planting. Whilst the local authority recognises the importance of trees and planting within the streetscape, it shall not be to the detriment of appropriate lighting levels, or to the efficacy of the lighting infrastructure.

6.15 The temperature at which the luminaire photometry was measured, or derived, shall be stated on the design calculation cover. Photometry measured below 15°C is not acceptable.

All other luminaire test values shall be stated at 25°C.

Carlow County Council reserve the right to review *LM80* reports for the chipset used within the luminaire, and *luminaire thermal test reports* before permitting their use.

6.16 For guidance, the following *Environmental Zones* shall be applied:

E1 ~ Rural areas, hamlets.
E2 ~ Villages, residential areas, small towns, close to larger towns.
E3 ~ Larger towns.

Curfew shall be considered as 21:00.

6.17 Lighting designers undertaking sports lighting projects shall design to the appropriate sport and competition level as detailed in *I.S. EN 12193:2018 & LC2019 Light and Lighting - Sports Lighting.* Particular attention shall be given to restricting light intrusion onto neighbouring properties, bounding roads, and to reducing *'skyglow'*. The levels provided in *Table 2* and *Table 3* of *6.10 Obtrusive Light* in *I.S. EN 12193:2018 & LC2019* shall not be exceeded.

6.18 Incorrect design, installation, and maintenance of sports lighting and other applications utilising higher luminaire mounting heights can be a blight on the environs and have a negative effect on the quality of life for residents and the natural environment. Designers shall include appropriate mitigation measures to reduce the

impact of lighting by following the guidelines provided in *Guidance Note 01/21 The Reduction of Obtrusive* Light and any subsequent updates, special care shall be taken to ensure the values given in *Table 3, Table 4,* and *Table 5* are not exceeded.

6.19 Illuminated bollards shall not be used, unless in exceptional circumstances, and only with the pre-approval of Carlow County Council.

6.20 Ground recessed flood lights shall not be used, unless in exceptional circumstances, and only with the pre-approval of Carlow County Council.

6.21 Pedestrian and cycle routes that link areas, form part of permeability strategies, or form parts of overall routes shall be illuminated in line with the lighting levels planned in the area. Pedestrian routes that are by their nature for amenity should not be illuminated, unless with the express permission of Carlow County Council.

7 Lighting Design for Upgrade Projects

No changes may be made to existing lighting infrastructure owned or operated in any way by Carlow County Council without the permission of an appropriate local authority staff member.

No upgrade or luminaire replacement may take place without a lighting design having been completed by a competent lighting designer and approved by Carlow County Council.

The lighting design process for upgrade and renewal projects shall follow the same rules as detailed in section 6 above with additional steps as follows:

7.1 An aboveground site survey shall be undertaken. The survey shall record the following information and be provided to Carlow County Council.

7.1.1 A geo referenced drawing showing the lighting column, customer supply cabinets, pillars and cable access chambers. These locations shall be recorded with at least 1m accuracy.

7.1.2 The geo location and direction of any overhead power lines close to the intended lighting installation, where the public lighting will be installed by any method other than on distribution network poles. These locations shall be recorded with at least 1m accuracy.

7.1.3 A spreadsheet shall be produced showing:

- Column or network pole type.
- Column height.
- Bracket details, including inclination, outreach and uplift dimensions.
- Luminaire lamp type i.e. LED, SON, or SOX.
- The visual condition of the pole or column and any bracket.
- The presence or absence of an interface box on network poles.
- The height and orientation of column doors.
- Any issues regarding column siting, particularly regarding setbacks.
- Any column or service cabinet that is overgrown.
- Any detail that may affect the safe use or retention of the network pole, column, bracket or service cabinet.
- Any detail that may affect the safety of people in the area.
- Any defect that is recognised during the survey as a hazard should be reported immediately to Carlow County Council, providing as much information regarding the defect and the equipment location as possible.

7.2 A lighting classification shall be determined as detailed in 6.3 above. This classification shall be based on the current usage of the road. Regard shall be given

to adjoining lighting levels to ensure lighting levels remain within two steps of each other. If the steps in classifications are greater than two, transition zones will be required.

8 Lighting Carparks

The lighting levels for carparks shall be selected from *Table 5.9* in *I.S. EN 12464-2:2007* (CEN/CENELEC, 2006) and care shall be taken to select the appropriate classification based on vehicular movements rather than the size of the carpark.

Care shall be taken to ensure that light sources are arranged to prevent glare to the car park users, and to minimise nuisance light to neighbouring properties.

The designer shall ensure that an appropriate column set back is achieved, in line with the guidance offered in *6.13* above.

9 Lighting Traffic Calming Features

Designers shall follow the latest version of *DN-GEO-03084* from *TII* when illuminating traffic calming features. Designers should be cognisant that lighting of this nature depends heavily on accenting the feature with contrasting correlated colour temperature (*CCT)*.

10 Lighting Pedestrian Crossings

Designers shall follow the latest version of *DN-GEO-03084* from *TII* when illuminating pedestrian crossings. Designers should be cognisant that lighting of this nature depends heavily on accenting the feature with contrasting correlated colour temperature (*CCT)*.

11 Dimming

Dimming shall be considered for each lighting design, regardless of the application. The designer shall consider the dimming amount along with the hours of dimming, which should be based on the needs of the user, the location and the nature of the area being illuminated. Lighting in areas where there is a risk of anti-social behaviour shall not be dimmed, and the intention not to dim be approved in writing with Carlow County Council.

While the current unmetered tariffs specify dimming percentiles, it should not be taken that dimming by those percentages is appropriate. All designs with a dimming element shall have lighting level calculations showing the achieved lighting levels after dimming.

There are several dimming profiles available, a selection of which are shown in *Figure 1.*

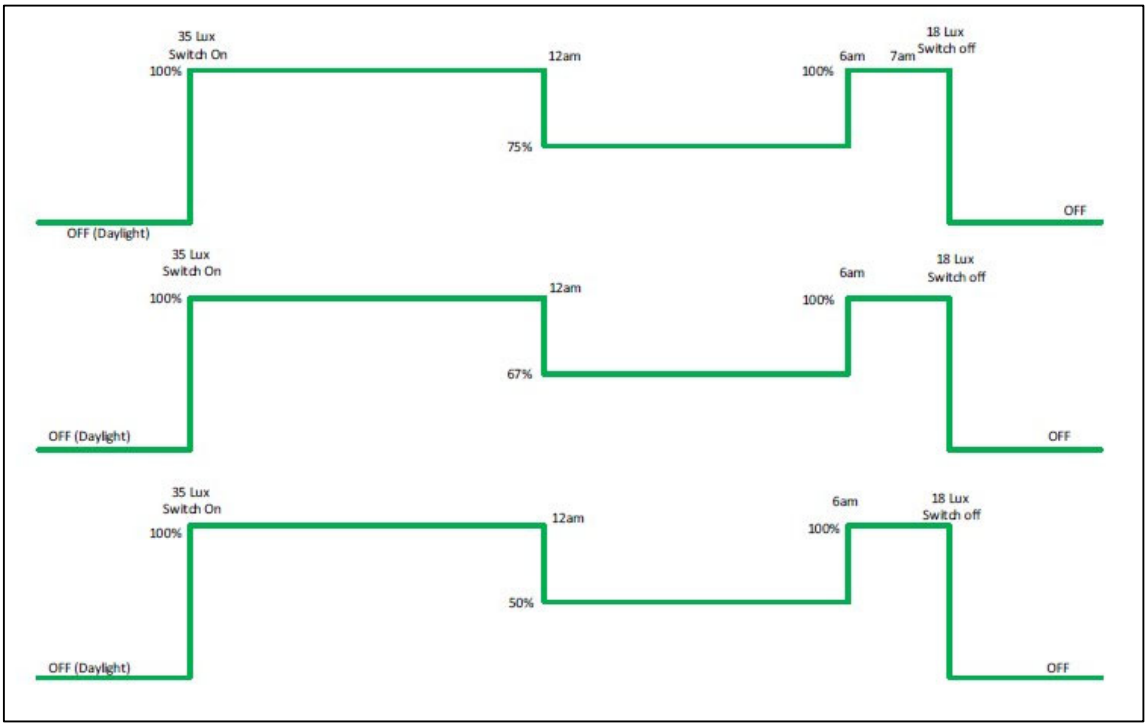

Figure 1: Dimming Profiles

11.1 Dimming Luminance Lighting

Dimming of traffic route lighting shall be done in steps of lighting classes i.e., *M4* dimmed to *M5* in line with the reduction in traffic flow. Care shall be taken that dimming of the lighting does not create steps in lighting classes greater than two with any surrounding lighting. Transition zones will be used if steps between lighting classes are greater than two.

The lighting design calculation shall show the lighting level at full output and for each dimming step included in the design. The designer shall state the lighting classification complied with for each step. The lighting classification type shall remain constant during the dimming regime, for example, an *M* classification at full power shall be retained during all stages of dimming.

Under normal circumstances, the dimming profile *U15* is appropriate for luminance applications.

11.2 Dimming Illuminance Lighting

The dimming profile and hours dimmed may vary with the nature and location that is being illuminated. Care shall be taken that dimming of the lighting does not create steps in lighting classes greater than two with any surrounding lighting. Transition zones will be used if steps between lighting classes are greater than two.

11.2.1 The dimming regime on traffic route conflict areas shall match the main traffic route lighting dimming regime and shall always remain one class above the main traffic route lighting. The lighting design calculation shall be replicated to show each dimming class and state the lighting classification achieved.

11.2.2 Any dimming of standalone conflict zones shall be done in steps of classification level. Care shall be taken that dimming of the lighting does not create steps in lighting classes greater than two classes with any surrounding

lighting. Transition zones will be used if steps between lighting classes are greater than two. The lighting design calculation shall be replicated to show each dimming class and state the lighting classification achieved.

11.2.3 Dimming of residential estates shall be by 25% from 00:00 to 06:00. However, should the designer's risk assessment find that dimming is not appropriate, this shall be agreed in writing with Carlow County Council.

11.2.4 Use of dynamic lighting systems in residential areas shall not be used as the switching of luminaires in such locations can lead to sleep disruption for people living in the vicinity.

Under normal circumstances, the dimming profile *U14* is appropriate for illuminance applications.

11.3 Dimming Lighting in Amenity Areas

Certain areas lend themselves well to lighting controlled by sensors. The sensor control can be used to detect pedestrians and either turn on luminaires or ramp up dimmed luminaires to full output. The designer shall carefully select the times when luminaires are switching and/or dimming so the dynamic lighting does not become a nuisance to neighbours. Areas that could be illuminated in such a manner include, walkways and cycle paths in parks or residential areas, walking paths around sports pitches, some car parks and some types of industrial or commercial sites. The lighting design calculation shall be replicated to show each dimming class and state the lighting classification achieved.

11.4 Dimming Lighting in Surface Carparks

Hours of access shall be considered when dimming lighting levels in carparks. If the car park is in use throughout the night, then dimming below *5.9.1* from *I.S EN 12464-2:2007* (CEN/CENELEC, 2006) shall not be considered. If access is not permitted, then the lighting may be dimmed to a level sufficient for security or turned off completely if the designer believes this to be appropriate.

For surface carparks illuminated to higher lighting levels, then dimming shall be in steps to ensure compliance with a lower, appropriate lighting class derived from *I.S EN 12464-2:2007 5.9*.

12 Light Source Temperature

Generally, light sources with a *CCT* in the order of 3000K shall be used, except in exceptional circumstances, and only with the approval of Carlow County Council.

For traffic routes, the designer shall select a *CCT* of 3000K. In certain circumstances a *CCT* of 4,000K may be preferred by Carlow County Council. This choice will be based on the task, local environment, and other lighting close by. This design decision should be approved by Carlow County Council prior to undertaking the design.

For environmentally sensitive areas, the designer may select a *CCT* between 2000K and 3000K. This choice will be based on the task, local environment, and other lighting close by. This design decision should be approved by Carlow County Council prior to undertaking the design. However, light source colour temperature should not be selected on its own as a method of protecting wildlife.

For urban centres, the designer shall select a *CCT* of 3000K. In certain circumstances a *CCT* of 4000K may be preferred by Carlow County Council. This choice will be based on the task, local environment, and other lighting close by. This design decision should be approved by

Carlow County Council prior to undertaking the design.

For commercial and industrial areas, the designer shall select a *CCT* of 3000K. In certain circumstances a *CCT* of 4000K may be preferred by Carlow County Council. This choice will be based on the task, local environment, and other lighting close by. This design decision should be approved by Carlow County Council prior to undertaking the design.

For sports lighting, the designer shall select a *CCT* of 3000K. In certain circumstances a *CCT* of 4000K may be preferred by Carlow County Council. This choice will be based on the task, local environment, and other lighting close by. This design decision should be approved by Carlow County Council prior to undertaking the design.

For aesthetic flood lighting applications and lighting in the vicinity of historical features, then a source colour shall be selected after testing on site and with the approval of Carlow County Council.

13 Ducting

Electrical cables shall be installed in rigid duct complying with *Appendix E* and be laid in fully coupled, unbroken lengths. An 8kN draw rope shall be provided in each duct.

Cable access chambers shall be provided at both sides of road crossings, at any duct junction, and at any turn that cannot be completed with a gentle bend. A spare duct shall be provided at each road crossing.

14 Electrical Cable

Only *NYCY* cable shall be used. The designer shall undertake appropriate calculations to determine the appropriate cable size, which shall not be less than $6mm^2$. The cable shall comply with *Appendix H*.

15 Design Approval

15.1 All lighting, lighting infrastructure and electrical designs must be approved by Carlow County Council before any associated works commence on site.

15.2 The design approval system is a simple pass or fail process and is intended to encourage sustainable, energy efficient lighting solutions, utilising appropriate modern equipment and technology.

15.3 Carlow County Council provides a check list for designers to complete and submit with their design for approval, shown in *Addendum 1*. The list should be completed along with the required supporting documents. Incomplete submissions will not be approved.

15.4 All exterior lighting and associated electrical infrastructure must be submitted in the following format:

15.4.1 Lighting Reality® (or approved alternative) calculations in electronic format detailing:

- The identity of the lighting designer, both the individual and the company.
- The name of the project.
- The lighting classification designed to at full power, and a second calculation reflecting the designed dimming.
- The combined maintenance factor for the luminaire and how it was derived.

- The ambient temperature of the photometry used.
- The *CCT* of the source used.
- The connected load (Wattage) of each luminaire type, averaged for *constant lumen output (CLO)*.

15.4.2 Lighting Reality® (or approved equivalent) report in PDF format, providing the same information as 15.4.1.

15.4.3 CAD drawing in soft copy format showing the following information:

- The site boundary.
- All landscaping details.
- All services.
- Differentiation of private and public areas.
- Individually numbered columns with icons of a size to allow accurate assessment of the column positions.
- Public lighting ducting layout.
- Individually numbered public lighting pillar and/or cable access chamber locations.
- ESB Networks cabinet locations.
- Individually numbered single line circuit diagrams.
- A separate layout showing the luminaire positions and isolux lines. The minimum isolux line shall be 0.5LUX, with logical increments, dependant on the nature of the project.
- All duct, column foundation or any other detail shall only show Carlow County Council approved versions. Non-approved versions shall not be included in any drawing submitted to contractors.

15.4.4 Technical specifications for the proposed equipment, and if requested, *luminaire thermal test reports* and *LM80* reports.

15.4.5 Photometric data file for each luminaire type specified in *.ldt* or *.ies* format.

15.4.6 Written details outlining the original equipment manufacturer *(OEM)* warranty and the procedure for transferring warranty to Carlow County Council when the development is presented for taking in charge.

15.4.7 Electrical cable calculations for each circuit.

15.4.8 Energy consumption calculations reflecting any designed dimming regime.

15.5 The substitution of *PDF* type files over requested soft copy versions prevent Carlow County Council from fulfilling their statutory duties detailed in *S.I. 291* and are therefore not acceptable.

15.7 Any revisions or alterations to an approved lighting design must be submitted to Carlow County Council for approval before being undertaken on site.

16 Electrical Connection

16.1 Electrical loads for public lighting shall be designed so that a single-phase supply is sufficient and must not exceed *2kVA* per connection point, to allow an unmetered connection to the electrical distribution network.

For larger transport infrastructure, a metered supply will be considered. The designer shall gain approval from Carlow County Council prior to completing the metered electrical design.

16.2 Full and complete electrical cable calculations shall be provided for each circuit. Provision shall be made in the calculation to allow for *constant lumen output* luminaires at 100,000 hours, and power factor correction. The total *kVA* for each public lighting pillar shall be stated.

16.3 All electrical supply circuits shall be sized for an additional 25% for future expansion.

16.4 In all cases, the developer is responsible for arranging and carrying out the connection to the electrical distribution system.

16.5 It is the developer's responsibility to ensure the installation meets all electrical safety requirements and is certified to current electrical regulations.

16.6 The developer shall ensure that the lighting installation is ready for taking in charge promptly after installation. The lighting installation shall not be used for site lighting. If Carlow County Council considers that the installation is too old, then new equipment may be required before taking in charge.

16.7 The developer must maintain the installation and pay all electrical bills prior to being taken in charge.

16.8 The developer will be liable for all costs associated in making good any faults found during the taking in charge process.

16.9 No changes shall be made to existing public lighting electrical infrastructure owned or operated in any way by Carlow County Council, without the express permission of an appropriate council staff member.

17 Protection of Flora and Fauna

Carlow County Council rightly values the diverse wildlife which exists throughout the urban and rural regions. Much of this delicate eco structure is protected by national and international laws and as such, cannot be interfered with.

While research into the effects of light, and types of light is still ongoing, it is agreed that the strip of light evident in street lighting is in effect, a barrier to many species, regardless of the colour temperature of the light source. This includes, but is not limited to nesting areas, insect habitats, bat roosts, bat hunting areas, bat commuting routes, rivers, spawning grounds, and other such habitats.

It is the developer's duty to ensure that any lighting installation will not interfere in any way with protected, or endangered species or their habitats. The designer shall include appropriate measures to protect flora and fauna with their design submission.

Where baffles, louvres, or shields are used, they shall be included in the luminaire photometry to ensure that appropriate lighting levels are maintained. The use of *CCT* in isolation of other measures, is not sufficient to protect flora and fauna.

17.1 Environmentally Sensitive Locations

Special consideration shall be given to the impact of lighting in environmentally sensitive areas to reduce the impact of artificial lighting in an appropriate and meaningful manner. Developers and designers shall consult the *Carlow County Development Plan* and consider appropriate design methodology to reflect the requirements of the plan, along with advice from the *National Parks and Wildlife Services*.

Useful information on reducing light pollution is provided by both the *Institution of Lighting*

Professionals, and the *Society of Light and Lighting*.

The designer shall not apply every suggested measure from the various guidance sources, assuming it will provide appropriate lighting, rather, careful assessment of the application and environs shall be undertaken by competent designers, and effective measures applied.

Designers shall first determine if the development layout is such that impact on sensitive areas such as waterways etc. is minimised. An appropriate lighting level shall be selected to suit the task and to comply with the relevant light level.

An appropriate *CCT* shall be selected, but the assumption that a low *Kelvin* value will have little impact shall not be made. Spill light shall be calculated using appropriate assessment grids on the vertical and horizontal.

17.2 Control Systems

Consideration shall be given to dynamic control systems such as *PIR* or detection cameras, to control dimming and switching of luminaires illuminating walkways and cycleways in environmentally sensitive areas. They shall not be considered in locations where people's sleep patterns may be disturbed by their operation.

18 Post Installation Checks

Spill light level measurements shall be undertaken of the lighting installation at sports facilities, environmentally sensitive areas, and any location where high light levels are required such as external work areas, after installation. These measurements shall be made at appropriate locations surrounding the site, both on the horizontal and vertical planes. These measurements shall be undertaken by an appropriate person, at the developers cost.

Light level measurements may be requested by Carlow County Council, should there be a reason to suspect nuisance light or excessive light pollution. These measurements shall be undertaken by an appropriate person, at the developers cost.

For simplicity, illuminance levels shall be measured in line with *Technical Report 28* from the *Institution of Lighting Professionals*. The recorded light levels shall be provided to Carlow County Council for assessment.

Should inappropriate light spill, light pollution, or nuisance light be apparent, the developer will provide appropriate mitigation measures promptly at their own cost.

Conclusion

Carlow County Council believes that adhering to the standards and specifications identified in this document will result in a sustainable and energy efficient lighting infrastructure that brings value and security to residents and the public using amenities in the county.

Please contact us if there is any aspect of Carlow County Council's Public & Exterior Lighting Specification that requires clarification.

Appendix A Luminaire Specification

1. Luminaires shall be fully compliant with the *Single Light Regulation ~ Commission Regulation (EU) 2019/2020 of 5th December 2019.* The luminaire shall be registered on the *EPREL* website and labelled in accordance with the regulation requirements, as a *containing product*.

2. Luminaires shall be registered on *SEAI's Triple E* and *ACA* registers.

3. Luminaires shall be *CE* marked in line with *Directive 2014/35/EU* or later. Note that *UK Equivalent Certification* is not valid in the Republic of Ireland.

4. Luminaires shall be manufactured in compliance with *IEC 62504:2014 + A1:2018* or later.

5. Luminaires shall be compliant with the following electrical safety standards:

    - *EN 60598-1:2015 + A1:2018*
    - *EN 60598-2-3:2003 + A1:2011*
    - *EN 6038-1:2017 + A1:2017*
    - *EN 62031:2008 + A2:2015*
    - *IEC 61347-2-13:2014 + A1:2017*

6. Luminaires shall be compliant with *EN 62471:2008*.

7. Luminaires shall be complaint with *EN 55015:2013+A1:2015,* and with *EN 61547:2009 COR 2015.*

8. Luminaires shall be compliant with the following performance standards:

    - *EN 62384:2006 + A1:2009*
    - *EN 62386 101:2014/AMD1:2018*
    - *EN 62386 102:2014/AMD1:2018*
    - *EN 62386 103:2014/AMD1:2018*
    - *EN 62386-207:2018*
    - *EN 62707-1:2013 + A1:2018*
    - *EN 62717:2017 + A2:2019*
    - *EN 62722-2-1:2016*
    - *EN 61643-11:2012 + A11:2018*
    - *IEC 62262:2002*
    - *IEC TR 62696:2011*

9. Luminaires shall be manufactured in accordance with the European Directive on Waste Electrical and Electronic Equipment *(WEEE).*

10. The luminaire shall be designed specifically to be used with LED light sources.

11. The correlated colour temperature (*CCT*) of the source shall not exceed 4,000K.

12. The binning of the LED chips shall be within a five step MacAdam ellipse.

13. The luminaire shall be rated to operate at 230V ± 10% at 50 Hertz.

14. Power factor correction shall not exceed 0.9 at 100% lumen output, or 0.8 when dimmed.

15. The luminaire shall utilise constant lumen output (*CLO*), unless the lumen depreciation factor (*LDF*) is less than 98% at 100,000 hours operation, in which case the additional complexity may make *CLO* obsolete.

16. The luminaire shall be fitted with surge protection in accordance with *EN 61643-11:2012 + A11:2018* rated 10kA/1010kV. Surge protection shall be the first component encountered in the circuit to ensure protection for all components within the luminaire.

17. The luminaire, and mounting arrangement, shall be constructed in a robust manner and suitable for Irish climatic conditions in an ambient temperature of -35^{0}C to +55^{0}C. The luminaire shall have a minimum impact resistance of *IK08*.

18. The luminaire body shall be protected against ingress to *IP 66*.

19. The luminaire shall be protected to a level of 1,000 hour salt fog test as a minimum in accordance with *EN ISO 9227*.

20. Except for blanking covers to permit detection, communications, or other such functionality, the luminaire shall be manufactured from die cast corrosion resistant marine grade aluminium alloy in accordance with either: *EN AC 44100,* or *EN AC 44200,* or *EN AC 44300*.

21. The luminaire, and mounting arrangement, shall be powder coated in accordance with relevant industry norms, or EU standard. All externally visible components of the luminaire shall be of the same colour, except for decorative applications.

22. The light source shall be modular and replaceable on site. The module shall be fixed in a manner that maximises heat transfer from the chip and board.

23. The light source shall be protected by an appropriate material and shall be protected against ingress to *IP 66* and have a minimum impact resistance to *IK08*.

24. The original equipment manufacturer (*OEM*) shall ensure that all components within the luminaire are compatible in both performance and thermal management to ensure that lumen depreciation factor (*LDF)* or any other life prediction methodology is not shortened or compromised. This shall include any component, or accessary.

25. The driver shall be *DALI* registered and capable of two-way communication and interaction with a *control and management system* (*CMS*) or shall be capable of being controlled by 1 to 10.

26. The driver shall have over temperature protection.

27. The ingress protection rating of the entire luminaire shall be maintained over the operational life of the product.

28. The luminaire shall be capable of communicating at ground level via either near field communication, or by direct connection to portable IT equipment.

29. The luminaire shall be provided by the original equipment manufacturer *(OEM)* prewired with a minimum 1.5mm^2 flex for mounting heights up to 6m, and a minimum 2.5mm^2 flex for mounting heights above 6m. Larger cables may be required for specialist applications. The cable shall be suitable for the application and comply with *BS 6004*. The cable shall be of sufficient length to permit an adequate drip loop to be provided on luminaire installation. The cable shall have sufficient cores to allow for the safe electrical connection, and for data transmission from ground level to the luminaire. Colour codes of the conductor insulating shall be in accordance with *I.S. 10101:2020+AC1:2020*, or later. Separate cables for power and data transfer may be used provided the luminaire is designed to accommodate such an arrangement.

30. All fixtures, bolts, screws, and all other mechanical fixtures shall be captive and constructed from noncorrosive materials.

31. All covers, or openings, required to be opened during installation or maintenance shall be captive when open.

32. All wiring shall be heat resistant and comply with *I.S. EN 60598*.

33. Electrical connection terminals shall be indelibly marked to indicate all wiring connections and use shrouded screws. Control equipment shall bear a clear circuit diagram to indicate all component connections in a clear and concise manner. Operating voltages shall be clearly marked within the luminaire enclosure.

34. Electrical terminals shall be capable of terminating three core 2.5mm^2 flexible cable.

35. *LDF* shall not exceed 0.1 at 100,000 operating hours in Irish climatic conditions and ambient temperatures.

36. *Lamp survival factor* (LSF) shall be equal to, or less than 1 at 100,000 operating hours in Irish climatic conditions and ambient temperatures.

37. The temperature that photometric data is measured shall be stated and shall not be less than 15^0C.

38. The weight of the entire luminaire assembly shall not exceed 18kg and shall be stated.

39. The maximum projected side area (*windage*) of the luminaire shall not exceed 0.18m^2 and shall be stated.

40. A comprehensive written warranty shall be provided for the entire luminaire covering a minimum period of ten years from date of installation. Full details will be provided in how the local authority can access this warranty if they are taking the luminaire in charge rather than procuring directly.

Appendix B Column and Bracket Specification

1. All columns shall be of the same type within any one scheme. Tubular or octagonal steel columns which comply are acceptable and shall be protected against corrosion by hot-dip galvanising to *ISO EN 1461* (International Organisation for Standardisation, 2015).

   Bespoke or decorative columns will only be permitted by prior agreement of Carlow County Council.

2. All lighting columns shall be designed to the *EN 40* and in accordance with *BD94/07* (British Standards Institute, 2013) for a minimum 25 year life for a *Terrain Category* of TC3 and reference the relevant 10 minute mean wind velocity.

   Column specification and associated windage calculations must include for a 1.5m square sign and assume a 1.5m bracket length, even where the current design does not call for a sign or bracket.

3. The lighting column manufacturer shall be registered with and certified by either *NSAI*, *British Standards Institute of Quality Assurance Services* or *Lloyds Register Quality Assurance Register* for the design, manufacture, supply and verification of road lighting columns and brackets under their quality assessment schedule to *ISO 9001* (National Standards Authority of Ireland, 2015).

   The quality assurance certification shall relate to the specific lighting column material being proposed. Carlow County Council reserves the right to request proof of certification from the proposed column manufacturer.

4. All octagonal columns must be fabricated with longitudinal welding only.

   All tubular columns must incorporate an anti–rotational device.

5. A vertical cable entry slot with smooth edges, rounded at top and bottom and measuring 150mm X 75mm shall be provided in the column root.

   The entry slot shall be in line with the column door opening. The top of the entry slot shall be at 300mm below ground level as shown in *Figure 2*.

   A bituminous coating to a level 250mm above finished ground level shall protect the planted portion and above of both the inside and outside of each column.

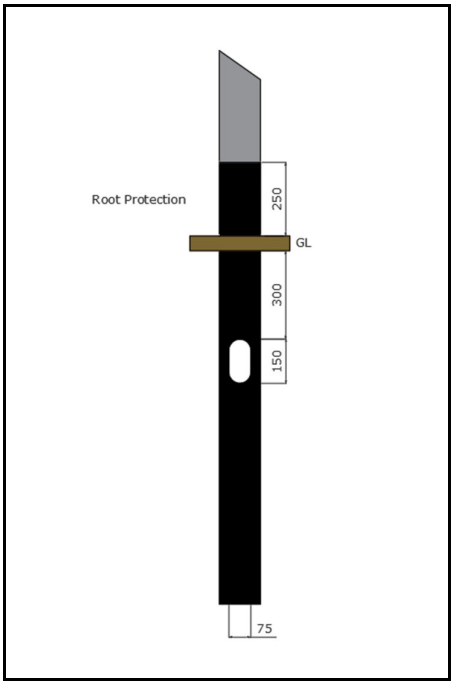

Figure 2: Cable slot detail

6. For octagonal columns, the door opening shall have a welded-in frame with an all-round weather strip. A flat steel door of minimum thickness 3mm secured by two triangular head bolts shall be fitted.

   For all other columns, the door opening shall be plasma cut. Twin bolts shall be used. Receiving sockets shall be adjustable using non-corrosive materials to allow for interchangeable doors.

The locking triangular head bolts shall have a narrow neck under the head to take a retaining washer. The bolt threads shall be lightly greased to prevent seizing or binding. Bolts must be secured to an 8mm nut welded in place.

Nuts held by compression or clipped in place shall not be accepted.

7. All doors shall be of a standard size and be fully interchangeable. They shall not require any site adjustment or modification to fit each column properly. They shall be a minimum of 385mm x 90mm.

8. A baseboard, with a minimum working area equal to the door opening, shall be fitted in each column and shall be treated with intumescent varnish to prevent fire propagation.

   The clearance between baseboard and inside face of door when secured shall not be less than 100mm. The baseboard must be capable of being removed and replaced. Baseboard fixings shall be recessed below the surface of the board so as not to impede the fixing of electrical equipment to the baseboard. An earth terminal shall be provided in a readily accessible position at the bottom of the opening.

9. Columns located in areas inaccessible to standard maintenance equipment must be base-hinged columns as manufactured by Abacus Lighting or approved equivalent. Gear must be accessible by lowering the column only.

   All base hinged columns must be delivered with a standard anti-vandal locking screw as standard.

   The base hinged column must only be capable of being lowered with a universal lever.

10. Where columns are to be installed into parks and green spaces and hinged columns are deemed inappropriate, vehicular access must be provided for maintenance actions. The minimum paved width required for the maintenance truck fitted with a hoist is 3.5m. The paved width shall be laid out in such a manner that the maintenance vehicle does not have to reverse to egress the area.

    The paved path must have sufficient structural strength to support the weight of the truck and the pressure of the truck stabilisers without incurring damage.

11. The use of outreach brackets on new installations is usually not necessary and should only be used where installation geometry is challenging. Columns shall be fitted with a spigot to suit the selected design luminaire.

    Where outreach brackets are required for lighting performance reasons, both the columns and brackets assemblies shall conform to the deflection requirements of *Class 2* as defined in *IS EN 40-3-3* (British Standards Institute, 2013).

12. The removable bracket arms for the columns shall be of steel construction and protected against corrosion by hot dip galvanising to *BS EN 1461* (International Organisation for Standardisation, 2015).

    Bracket arms and column shaft shall be of the sleeve fitting type, with the bracket fitting snugly over the column.

13. For tubular columns, the bracket shall be secured by eight hexagonal headed stainless-steel screws, minimum diameter 8mm. Brackets used for columns greater than 8 metres must have 8mm nuts welded to the outer face of the bracket wall to enable secure fixing.

14. Where there are shared surfaces, the designer must design out the risk presented by columns. If this cannot be achieved, passive safe columns along with electrical disconnect systems of an appropriate type shall be used. The designer must consult with Carlow County Council and approval granted before the system is specified.

Appendix C Column Installation

1. All columns shall be installed and oriented so that the access door faces away from oncoming traffic as shown in *Figure 3*.

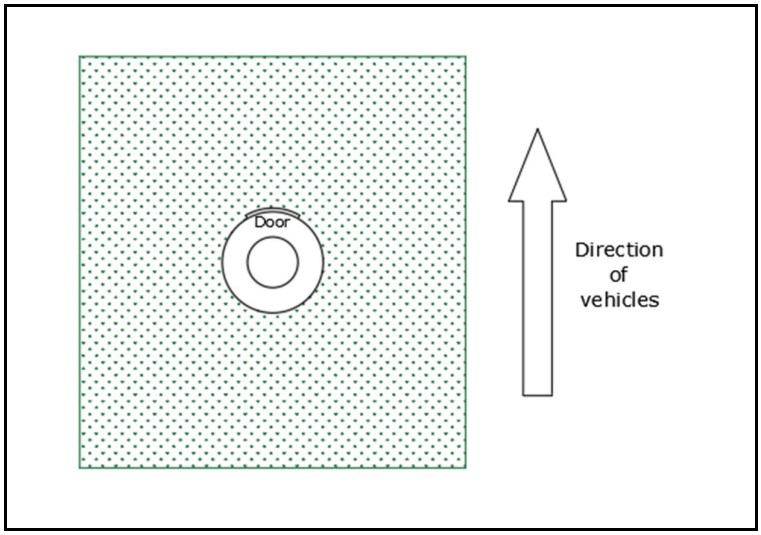

Figure 3: Door positioning

2. Columns must be erected securely and vertically in the exact positions indicated in the design drawings. Columns found to be in positions other than design locations, unless previously agreed with Carlow County Council must be relocated to the design positions.

3. Where columns are to be situated in the vicinity of overhead high tension cables, approval must be sought from the *ESBI Design Office* as to the exclusion zone with regards to the intended column height. Proof of this approval will be sought by Carlow County Council prior to taking in charge.

4. Columns are to be installed in line with the recommended minimum clearances from the edge of the carriageway to the face of the lighting columns in *6.1.3* of *BS5489; 2020*, or the relevant *TII* requirement.

5. Columns shall be erected in line with the recommendations of *EN40-1* regarding planting depths of columns. The contractor shall confirm with the column manufacturer/supplier the recommended depth for the root of the proposed columns.

6. Columns shall be erected by planting their root portions in excavation of suitable size and secured. The excavated hole shall be pumped free of water prior to any filling with concrete.

7. Where sleeves are used, they must have an outside diameter of 400mm minimum for 6m columns. This size may increase with increasing column base widths. Sleeves shall be installed such that the top of the sleeve finishes below the cable entry slot. Sleeves must be of a ridged construction.

8. Where the rooting depths to *EN40-1* are unachievable due to existing services or ground conditions, flange mounted columns may be used only with the prior written approval of Carlow County Council.

   Where flanges are approved for use, they must comply with EN40-1.

   A full set of design calculations for the structural base for the mounting of the flange, shall be undertaken by a competent person and must be submitted for Carlow County Council records.

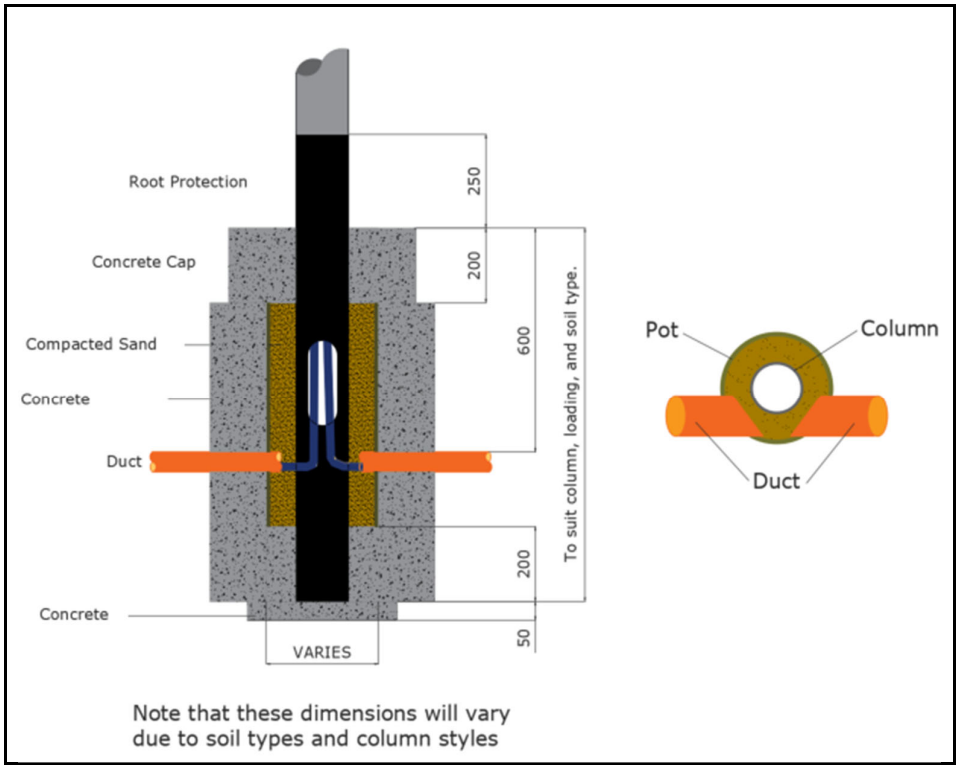

Figure 4: 6m & 8m Column Foundation Detail

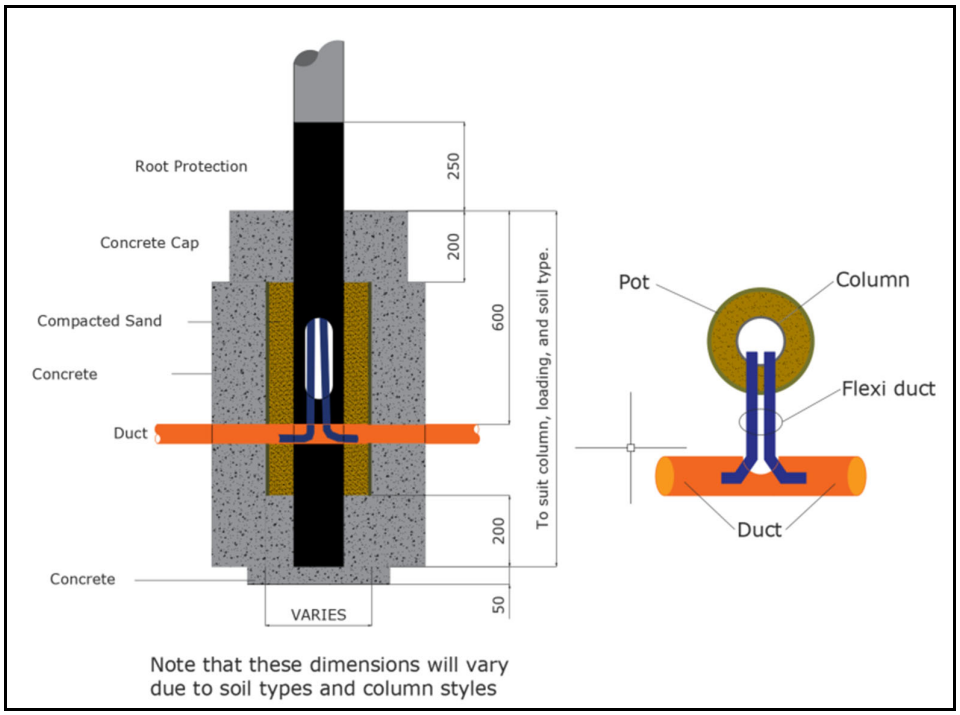

Figure 5: 10m and Traffic Route Column Foundation Detail

9. All columns shall be set such that the centre of the column door is 1.5m above the finished ground level as shown in *Figure 6*.

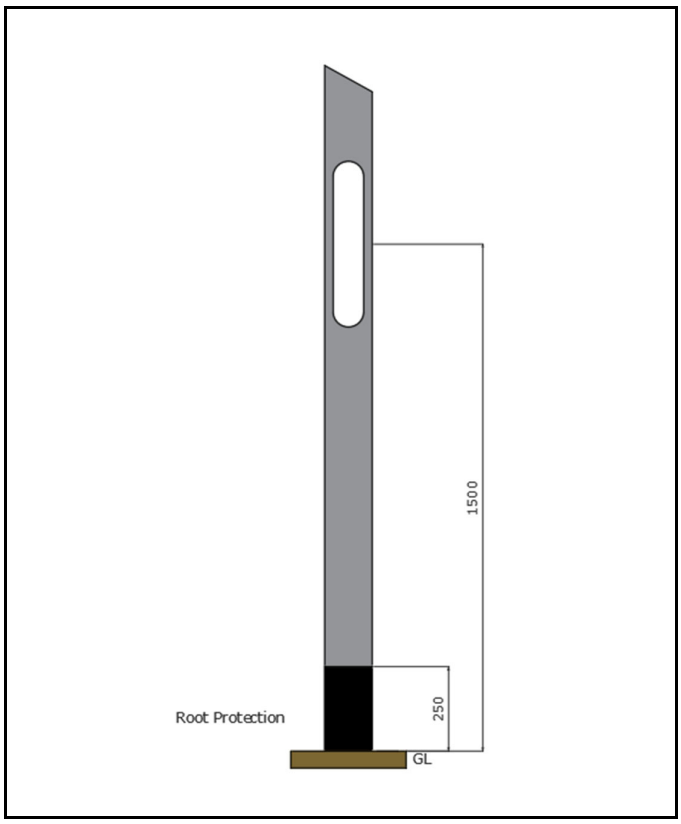

Figure 6: Column door height.

10. Close electrical protection of the column shall be provided by a 25A rated cut-out loaded with a 6A fuse incorporating a *cam lever* single pole disconnection. The cut-out will use a separate neutral and earth.

    The cut-out must provide ingress protection to *IP 21* as defined by *EN 60529.*

    Residual circuit devices or miniature circuit breakers shall not be used.

11. The column shall be earthed from the incoming cable via a $6mm^2$ PVC cable which will be connected to the column by a crimped lug.

12. All components required for connection shall be firmly fixed to the column back board in a tidy and professional manner.

    All conductors shall be stripped to the appropriate length to allow for connection. No exposed conductors shall be allowed.

Appendix D Public Lighting Pillar Specification

1. Public lighting pillars shall be installed in land that is open to the public and never on private property.

   ESB customer service pillars and public lighting pillars shall be installed a minimum of two metres apart as shown in *Figure 7*. If this is not physically possible and only with the explicit permission of ESB Networks and Carlow County Council these may be installed closer together and equi-potentially bonded.

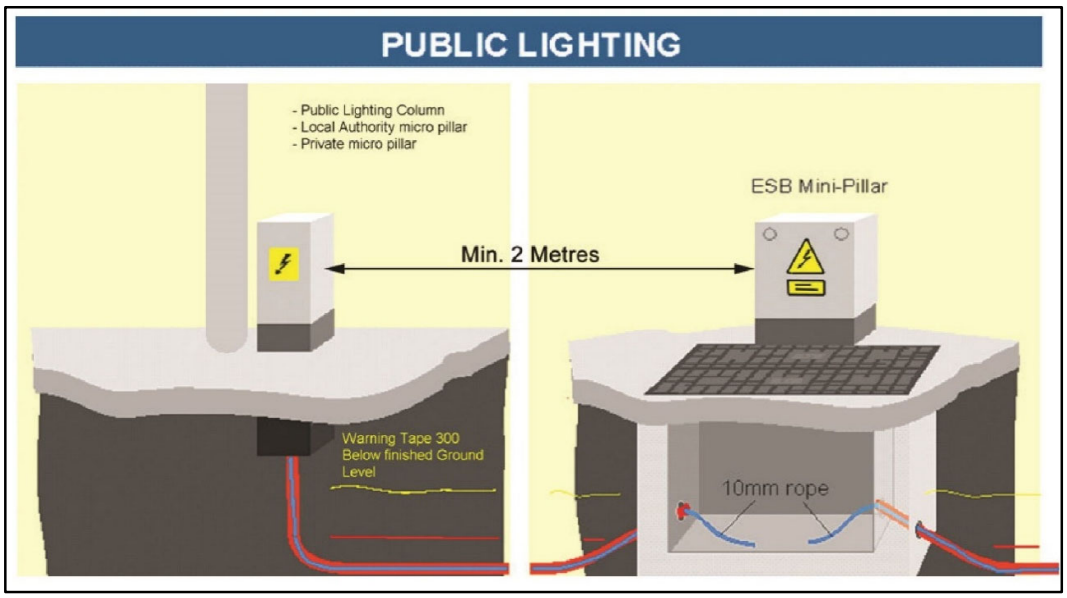

Figure 7: Pillar spacing.

2. Earthing for the customer service pillar should be in accordance with the *ESB National Code of Practice for Customer Interface Version No 5 2021.*

3. The public lighting pillar shall have typical dimensions of 150mm x 250mm x 600mm. Extension plates, or root assembly, typically 320mm deep shall be fitted at the bottom to enable firm cementing into the ground. Photographic evidence of correct installation shall be provided for each pillar and be available if requested by Carlow County Council.

   The extension plate, including the planted portion below ground and 50mm of the above ground shall be protected by a bituminous coating.

4. The public lighting pillar shall be fitted with a single flat plate door nominally 220mm wide x 510mm high, with a triangular, captive head locking bolt.

5. The public lighting pillar shall be vented. The venting shall be such that it protects against direct ingress of rain.

6. The public lighting pillar shall be protected against corrosion by hot dip galvanising in accordance with *BS EN 1461* and shall be properly vented.

   A baseboard, approximately 20mm thick and treated with intumescent varnish shall be mounted in each pillar.

7. All supply pillars shall have a high voltage symbol attached to the front panel.

8. The main over current protective device shall be provided by a 32 amp rated high rupturing capacity type cut-out with a minimum rupturing capacity (short circuit level) of no less than 16KA to *BS HD 60269-2:2013, BS 88-2:2013*.

9. Each outgoing circuit shall be individually fused by means of a 20A HRC cut-out type fuse.

10. The live contacts of all fuse bases should be shrouded so accidental contact with live metal cannot be made when the fuse carrier is withdrawn. Terminals shall have a serrated bore to ensure good contact with all types of conductors. The use of M.C.B.'s shall not be accepted in public lighting columns or pillars.

11. Each public lighting pillar must be earthed using an earth rod and the supply neutralised. The earth rod shall be either a bare copper or hot dipped galvanised iron pipe or rod of at least 16mm diameter. It shall be driven vertically into the soil for a length of not less than 1.2m.

    If ground conditions do not allow driving an earth rod, then a horizontal earth electrode can be used. It shall consist of 4.5m of bare copper or galvanised iron rod of 16mm diameter, or at least 4.5m of bare copper or galvanised steel wire of at least 25mm^2 cross sectional area buried in the soil at least 500mm deep.

    In certain ground conditions, *ESB Networks* may require additional earth procedures. Developers should check with *ESB Networks* to confirm their requirements.

12. Evidence of the correct installation of the earth rod may be requested by Carlow County Council. The developer and/or the contractor should keep photographic, referenced records of the earth rod installation.

13. A main earth terminal shall be mounted on the pillar baseboard, to which the following will be connected:

    - 6mm^2 PVC cable from the earth terminal on the pillar. A crimped lug shall be used for the connection to the pillar.
    - 10mm^2 PVC cable from the earth electrode.
    - 6mm^2 PVC cable from the neutral link.

14. The earthing lead to the earthing electrode shall exit the pillar via the service cable entry opening. The earth electrode connection shall be:

    - Enclosed in a galvanized steel box of 100mm3 approximately, with an inspection cover.
    - Protected against corrosion by a suitable weatherproof tape.
    - All to be buried underground after inspection to avoid damage by vandals.

Appendix E Ducting Specification

1 Ducting shall comply with *I.S. EN 61386-1-22-23-24* and shall be single wall, coloured red and manufactured from high density polyethylene. The nominal external diameter of the duct shall be 107mm with a minimal wall thickness of 5mm. Each length of duct shall be stamped with the legend 'Public Lighting' or 'Street Lighting', in 18mm black lettering repeated at 1000mm intervals. Ducts shall be laid with the legend facing upwards.

2 The duct shall withstand a 750 Newton load rating for 5% deflection.

3 Ducting shall be laid in fully coupled, unbroken lengths and shall be installed to achieve the minimum depths of armoured cable required by *I.S. 10101* latest version, and local authority requirements. Typical depths for the cable are 750mm at road crossings, 450mm under footpaths, and 600mm under grass or other softer materials.

4 Ducting shall be laid in a straight line, close to the line of columns and shall contain a continuous, knot free, draw line of minimum 8kN.

5 Ducting shall be laid on a bed of sand and surrounded with sand. After compacting, the sand bed shall be a minimum of 50mm deep at the bottom of the duct, 25mm at either side of the duct, and 150mm above the duct.

An electrical hazard warning tape shall be laid on top of the sand along the entire length of the ducting at approximately 300mm below finished ground level. The tape shall be made of plastic, coloured yellow, with the legend 'Caution Electric Cable Below'.

The remainder of the trench shall be backfilled to ground to ground level using material free of sharp stones, or stones greater in size then 50mm.

Road crossing ducts shall be adequately protected by a cover of lean mix concrete and at a depth consistent with road construction requirements but shall not be less than 750mm deep.

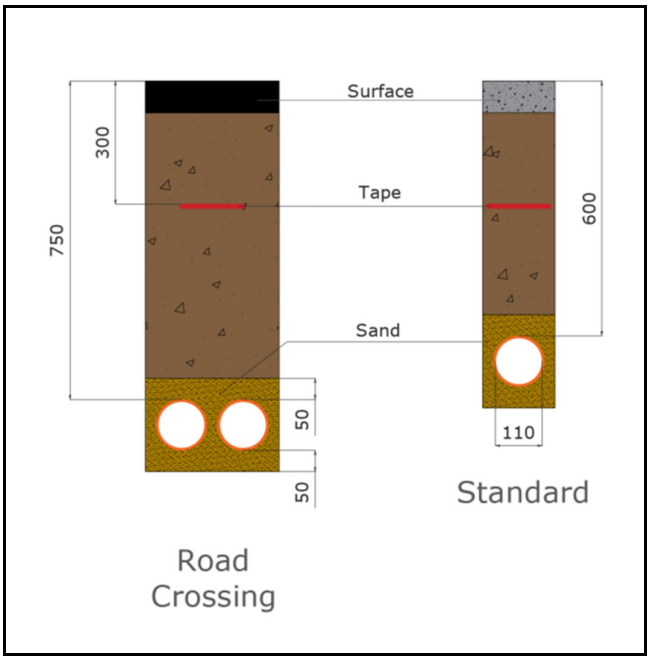

Figure 8: Duct installation detail

6 Duct ends shall be protected from the ingress of rubble or any other material. All ducts shall be installed so that no undue stress is placed on cables when pulled. Ducts shall be aligned as straight as possible horizontally and vertically. Sweeps shall be as gradual as possible.

7 Where ducts must be cut, it shall be with an appropriate tool and cuts shall be such that they do not affect the sealing of joints. The duct shall be completely deburred before installation.

8 The interior of the duct shall be cleaned with an appropriate brush, in both directions, following installation.

9 Following installation, and prior to backfilling, the duct shall be tested by drawing a cylindrical mandrel through. The mandrel shall be 300mm long and have a diameter than is 10% smaller than the internal diameter of the duct, or 10mm smaller, whichever is smaller.

10 Immediately after cleaning and testing, each shall be fitted with a continuous draw rope of 10mm diameter, free of knots, and with a minimum 8kN breaking strength.

A surplus of 2m of draw rope shall be left neatly coiled at each end of the duct. The ends of the draw rope shall be secured in a manner that prevents accidental withdrawal of the rope.

The ends of the duct shall then be closed off with purpose made caps or bungs to prevent ingress of water or foreign material.

11 Flexible duct is not acceptable as a substitute to rigid duct and is only appropriate in the following instances:

- When linking columns to rigid duct.
- For runs less than 2m in length.
- Where tight turns are required and there is insufficient space for cable access chambers.

12 Cable access chambers shall be provided at the following locations:

- At the intersection of duct runs.
- At the divergence of duct runs.
- At both sides of road crossings.
- At both ends of ducting under shared surfaces, with a single access chamber in front of each column.
- At any location where bends are equal to, or greater than 90 degrees.
- At any location where proprietary 'duct bends' cannot be used due to constricted space.
- At either side of any substantial change in installation, at either side of a bridge for example.
- At substantial changes in height.

13 Prefabricated chambers of plastic, or similar material shall not be used.

14 Public lighting ducting cannot pass under private property.

Appendix F Cable Access Chamber Specification

1. Access chambers must be provided at all access points for road crossings, acute bends in duct runs, duct junctions, and under shared surfaces. Chambers shall be deep enough that ducts shall not rise or fall on their approach. D400 covers are to be used on all access chambers, regardless of whether the locations are trafficked or not.

2. At road crossings and under shared surfaces spare ducting shall be provided. Ducting setback in relation to road edge will vary depending on the set back of rooted lighting columns.

3. Access chambers shall be 450mm square as a minimum. Larger sizes may be required when numerous public lighting supply cables pass through, or where the maximum bend radii of the cables demand a larger area.

4. High strength engineering bricks or cast in situ concrete or standard concrete blocks shall be used to construct the manhole chambers directly under the cover and frame. Prefabricated chamber boxes shall not be used without prior approval of Carlow County Council.

5. The chamber cover manufacturer shall be registered with and certified by either *NSAI*, *British Standards Institute of Quality Assurance Services* or *Lloyds Register Quality Assurance Register* for the design, manufacture, supply and verification of chamber covers under their quality assessment schedule to *ISO 9001*.

6. The cover shall be lockable in place. There shall be provision for replacements of bolt and nut if damaged.

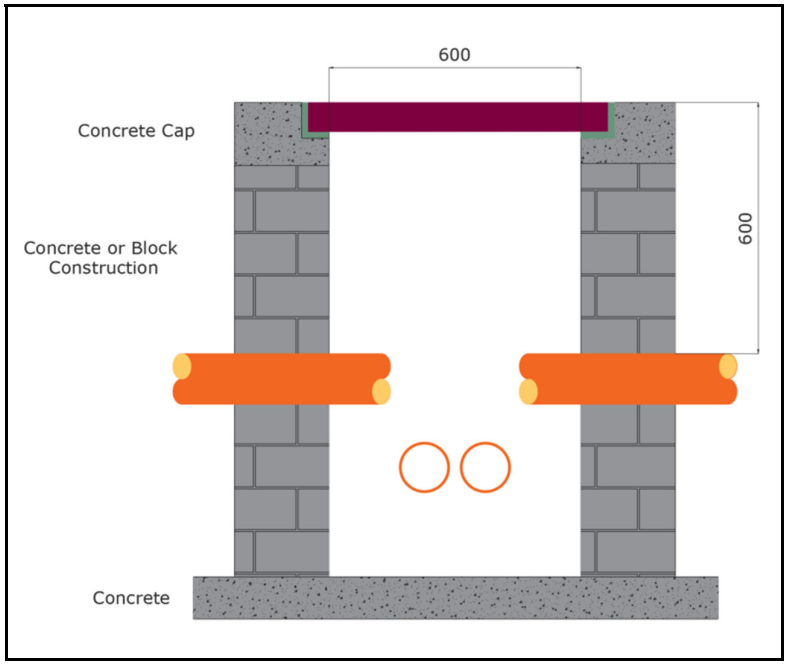

Figure 9: Cable access chamber

Appendix G Electrical Design

1. The electrical services design for the scheme shall be undertaken to comply with the relevant sections of I.S. 10101:2020+AC1:2020.

2. A detailed cable design shall be undertaken to match the calculated electrical load which would typically allow up to nine luminaires to be supplied per phase. An additional capacity of 25% shall be included for future extensions.

   The provision of earth loop/fault level calculations and circuit disconnection (fuse rupture times) shall be undertaken by the electrical contractor.

   Public lighting schemes requiring cable lengths in excess of 200 meters require careful design to meet the earth loop impedance requirements of *I.S. 10101:2020+AC1:2020*.

3. It is the duty of the installation contractor to ensure that disconnection/fuse rupture times shall be in compliance with those set out in *I.S. 10101:2020+AC1:2020*.

4. The contractor shall be responsible for the planned installation meeting the requirements of the *National Rules for Electrical Installations*. In particular, that the maximum volt drop is not exceeded, that the equipment installed is of sufficient rating for the prospective fault current, that the disconnection time is satisfactory, that the cables are of satisfactory current carrying capacity for the load under running and starting conditions and that the protective devices discriminate fully.

5. Miniature Circuit Breakers (MCB's) shall not be used in columns or pillars, except where stipulated by the National Code of Practice for the Customer Interface.

6. The main supply point switch fuse shall be a *BS 88 HRC* fuse rated appropriately to the number of downstream circuits.

7. The fuses and circuit breakers shall have a minimum rupture capacity of *16kA*. All outgoing circuits shall be individually fused by means of a *6A HRC* cut-out type fuse.

8. Space shall be allocated for the ESB supplied cut-out and isolator as per the *ESBN National Code of Practice for Customer Interface.*

9. Close protection of street lighting lanterns to be provided by a *25A* rated cut-out loaded with a *2A* fuse incorporating a cam lever double pole disconnection rated to *IEC 60947*.

   The cut-out shall comply with a minimum degree of protection of *IP21* internally and *IP42* externally and be moulded in a material which conforms to *BS 7654*.

   All terminals shall be formed from solid brass and be electroplated for temperature rise stability. Terminals shall have a serrated bore to ensure good contact with all types of conductors.

10. Connector (Link) blocks shall be used for the termination of all conductors of underground cables in columns. The Connector blocks shall conform to *BS 7657:2010* and rated *100Amp* for use on live and neutral connections. Each block shall incorporate five serrated cable bores (terminals) each capable of accepting cable sizes up to $35mm^2$. The metal terminal block shall remain captured within its moulding when the cover is removed.

    Connector blocks shall be solidly mounted on the column baseboards. Conductors shall not share the same terminal where spare ways are available in a connector block.

11. Switching control of public lighting systems shall be achieved by means of photocell control. Each individual lantern shall be switched "ON" from dusk to dawn. 35_{LUX} switch on and 18_{LUX} switch off.

12. The PECU shall be designed to fit the NEMA socket provided on each lantern.

Appendix H Electrical Cable Specification

All electrical cables shall comply with the requirements of *I.S. 10101* latest version.

All cables to be installed in ducting shall be armoured. Cable loading will be derived by appropriate calculation methods by a competent designer but will have a minimum conductor size of 0.6mm^2.

Cable can be either: 2 core *NYCY* for single phase and 4 core NYCY for three phase. *SWA* cable shall not be used.

Electrical cable specifications are to be as follows as a minimum:

- Only armoured cable can be installed underground.
- *NYCY* cable to *DIN VDE 0276 – 603* (*0.6 / 1kV*).
- Glands shall be used in accordance with manufacturer's instruction to provide an earth with when using NYCY.
- Cable joints are not permitted.
- Only one cable incoming, and one cable outgoing shall be used, maximum of two, shall be installed in a column. This means that a supply circuit cannot normally be split to provide a spur, except in limited circumstances as designed by a competent person.
- The bending radius of the cable shall never be less than the manufacturer's specified limit. The minimum bending radius is normally 8 x total diameter of the cable.
- Underground cables shall be protected for the entire run by ducting, column foundation sleeves and cable access chambers. No section of cable shall be in contact with the soil or ground.

Appendix I Taking in Charge

1. It is the developer's responsibility to ensure that the lighting infrastructure installed is safe and fit for purpose.

2. Carlow County Council will not take in charge any lighting infrastructure that does not meet the minimum standards and specifications laid down in this document, national codes of practise, international standards, or statutory requirements.

3. A full inspection of the public lighting infrastructure may be undertaken by a representative or agent of Carlow County Council, the cost of which will be borne by the developer. Should any deficiencies be found, they must be put right at the developer's cost before the lighting will be taken in charge.

4. Carlow County Council shall not be liable for any maintenance or energy costs incurred prior to taking public lighting infrastructure in charge.

5. Lighting equipment shall not be operated prior to inspection and approved permanent connection. It must not be operated as site lighting.

6. Temporary connections shall not be undertaken.

7. The developer or the designer/contractor should compile the following information essential for the Council's inspectors to complete their task and submit it, prior to inspection:

   Copy of approved original design submission and approval of any changes.

   As-constructed geo referenced CAD drawing in soft copy format showing the following information:

   - Street Names.
   - House numbers.
   - Individually numbered column locations. The icon scale should be such that set back can be accurately assessed.
   - Ducting locations.
   - Cable access chambers.
   - Individually numbered micro pillar locations.
   - ESB cabinet locations.
   - Individually numbered single line circuit diagrams.
   - Private areas not to be taken in charge shown hatched/shaded.

Addendum 1 Designer Checklist

Please complete the following checklist and attach all required documentation.

1	Project name:		
2	Project location:		
3	Applicant name:		
4	Applicants contact details	Phone	
		Email	
5	Planning Permission reference:		
6	Lighting designer name:		
7	Lighting designer contact details	Phone	
		Email	
8	Lighting Class selected		

Please confirm the following has been attached: ✓

9	Technical specifications for the proposed equipment including TM 21 and LM80 report	
10	Written details of warranties and access to warranty procedure	
11	Voltage drop calculation for each circuit	
12	Energy calculations reflecting the designed dimming profile	
13	Designers risk assessment report	
14	Lighting Reality® (or approved alternative) calculation in soft format	
15	Lighting Reality® (or approved alternative) Report in PDF format	
16	CAD drawing in soft copy format	

Showing: ✓

A	The site boundary	
B	Differentiation of private and public areas	
C	Landscaping features such as trees	
D	Individually numbered column locations	
E	Ducting run locations	
F	Individually numbered micro pillar and/or cable access chamber locations	
G	ESB cabinet/pillar locations	
H	Individually numbered single line circuit diagrams	
I	All other services	

Signed _____

Print _____

Date _____