

Part B Equipment and Material Specification

1.0 *The Application of This Specification*

- 1.1 This Specification shall apply to highway electrical equipment installed on any road, link path, cycle route, or any element thereof, constructed or installed as part of a residential development, industrial estate, Retail Park or any area which is intended for adoption by the Council.

2.0 *British Standard and British Standard European Specifications*

- 2.1 The current British Standard or British European Standard Specifications shall apply in respect of all materials referred to in this specification, including their storage and installation. Materials shall, where appropriate, be stamped with a third party verified product certification mark e.g. CE mark, together with the appropriate reference number.

3.0 *Testing*

- 3.1 Testing of the electrical installation is deemed to be the responsibility of the Developer and shall be carried out in accordance with the current, relevant, British Standard or British European Standard Specifications by a competent person.
- 3.2 Where a British Standard or British European Standard Specification requires that materials are tested to ensure compliance with the relevant specification, then an approved independent testing laboratory shall carry out such testing.

4.0 *The Effects of the Works on Existing Highways*

- 4.1 Wherever electrical works associated with a new road, link path or cycle route are to be carried out in an existing highway the Developer shall establish, in advance of the commencement of works, the full requirements of the Highway Authority. It is advisable to undertake this exercise at least 8 weeks in advance of the intended starting date so that, if required, agreements under Section 278 of the Highways Act, 1980 can be prepared otherwise delays may be experienced. Concurrently, the Highways & Engineering Division can advise on the Highway Authority's requirements in respect of the method of working, traffic control and signing.

- 4.2 The Developer's attention is drawn to the need, on his part, to ensure compliance with the requirements of the New Roads and Street Works Act, 1991. Before excavating in any existing highway, Developers shall obtain any necessary licence(s) and must establish whether there is any existing statutory undertaker's plant which will be affected. Developers are advised of the need to comply with the requirements contained in the publication "Health and Safety at Work Act – Avoiding Danger to Underground Services" [HS(G)47]. Any apparatus located are to be protected at the Developer's expense and no pipe or cable shall be disturbed without the approval of the statutory undertaker. Traffic management, incorporating appropriate safety measures, shall be carried out in accordance with Chapter 8 of the Traffic Signs Manual. Any works that will affect the traffic flow of the adopted highway or any excavations to be carried out on the adopted highway requires the issuing of a Traffic Management Act (2004) notice to the Council's Network Management Section.
- 4.3 Highways in the vicinity of the works shall be kept free from mud, dust and debris as far as is reasonably practicable. Where contamination of a highway is unavoidable, appropriate signage and regular cleaning will be required.
- 4.4 Noise and vibration caused by the works shall be minimised by the best practicable means. It shall be the Developer's responsibility to ascertain and ensure compliance with any specific requirements in this regard.
- 4.5 Existing public highways shall not be used for the stockpiling and storage of materials and plant.
- 4.6 In the event of default on the part of the Developer in respect of any of the foregoing sub-sections, or any damage caused to an existing adopted highway, the Developer shall be entirely responsible for the costs of rectifying the results of such default or damage and for meeting the costs of any claims which may result from the default, damage or rectification and/or repair.

5.0 Non-compliance with the Specification

- 5.1 If the Developer fails to comply with any requirement of this specification, adoption of the works will be prejudiced unless and until the non-compliance is rectified.
- 5.2 Where the Developer has entered into a Section 38 agreement, non-compliance may result in the default procedures being invoked.

6.0 Street Lighting Specification

- 6.1 All materials and workmanship shall be in accordance with this specification and to the satisfaction of the Street Lighting Manager.

- 6.2 The installer of the lighting installation must be NICEIC or ECA registered, be HERS accredited and experienced in the installation of public lighting equipment and qualified to provide official completion and test certificates.
- 6.3 Where works are carried out to an adopted lighting installation e.g. as part of works under a Section 278 agreement, any new lighting units installed must be brought into use before the disconnection and removal of any existing lighting units. Where this is not practicable, the Developer shall arrange for temporary lighting to be installed in order to maintain the existing lighting levels.
- 6.4 Any street lighting equipment that is damaged during the course of the works shall be replaced on a like for like basis at no cost and to the satisfaction of the Vale of Glamorgan Council.

7.0 *Lighting Columns and Brackets and Traffic Sign Posts for Illuminated Signs*

7.1 Columns and brackets shall:

- ❖ Be constructed and comply with all relevant parts of BS PD 6547 and BS EN 40 and the particular requirements of this specification, and should be extruded aluminium type from a 6000 series aluminium alloy. Columns to be designed to Terrain categories I and II unless otherwise specified.
- ❖ Only be purchased from manufacturer's who are registered with either BSI Quality Assurance or Lloyds Register Quality Assurance Ltd, for the manufacture, supply and verification of lighting columns and bracket arms under their Quality Management Schemes to BS EN ISO 9000:2000. Certificates of Conformity will be required in support of all columns used.
- ❖ Passively safe rated by crash testing carried out to BS EN 12767:2007 (and UK annexe to the standard).
- ❖ Have a standard design life of at least 50 years.
- ❖ Have a high content of recycled material and be fully recyclable at life end.

7.2 All columns and brackets shall carry a vinyl waterproof unique identification mark bonded inside the door opening which indicates as a minimum, the name of the manufacturer/supplier, column code/drawing number, terrain category, maximum basic wind speed, upper altitude level, maximum horizontal deflection, maximum lantern data (length, mass and surface area) and sign data (surface area, mass, position above ground and offset from column axis).

- 7.3 Columns to be extruded in one piece to form a continuously conical tapered shape, with no welds or joints within the construction. The column appearance shall be of a machine finish. Aluminium Brackets – Any Brackets and connections to be manufactured from alloy 6063 or 6082 T6 and brushed to match the column finish. All welding must be undertaken in accordance to BSEN 288-4 :1992 welding procedures. Welding materials and consumables will comply with BS2901 part 4.
- 7.4 The column root to be protected with a grey co-polymer (thermoplastic) thermally bonded to the outer and inner surfaces of the column root section and cause no ground or water course pollution. In the case of bracket columns, a further coat of non-slip grip material (thermoplastic grip) will be added to ensure adhesion to the earth below ground level. The base of the column shall have a high-density plastic protector fitted to prevent damage to the root protection during installation. The cable inlet duct shall be fitted with a subterranean cable protection sleeve to prevent cable chaffing. The cable entry will be a minimum size of 175 x 175 mm in accordance with the current BS7671 requirements.
- 7.5 Column doors shall be fitted with standard triangular lock to ensure easy access by authorised personnel and be a flush fitting anti-vandal type and provided with two stainless steel triangular-headed locks. The locking mechanism shall be lubricated with grease immediately following installation and if necessary prior to the end of the defects correction period. The earthing terminal shall comprise a stainless steel bolt, complete with nut and two washers incorporating a “Safety Electrical Connection Do Not Use” label.
- 7.6 Column base compartments shall afford easy access to cable terminations and wiring and be fitted with hardwood backboard with slip nuts to enable adjustment of internally mounted equipment on the hardwood backboard itself. The mounting rail will also have a separate earth connection located below the adjustable slip nuts.
- 7.7 Column planting depths to be as specified by BS EN40 and the column manufacturers’ requirements.
- 7.8 Columns to be of a rooted type unless specified to the contrary. For areas of made up ground or where a column may require occasional removal to allow access for wide loads, then Flange plate columns to be specified as agreed with the Street Lighting Manager.
- 7.9 Internal column wiring to conform to the requirements of BS7671 and double pole isolator also to be fitted.
- 7.10 Where it is known that lighting columns are to be used to support additional loads such as traffic sign plates, flower baskets, banners/flags and decorations then the column must be designed to carry the additional load. Written confirmation from the column manufacturer must be provided by the Developer and submitted to the Street Lighting Manager for approval prior to installation works taking place.

7.11 It should be noted that the column types may vary for conservation and prestige areas where a certain theme may be required. If a bespoke design is required then the manufacturer must provide a load test certificate and an independent load test certificate to verify the loading that the bespoke column/bracket has been designed for. The proposed unit must be submitted to the Street Lighting Manager for approval prior to installation works taking place.

8.0 Selection of Street Lighting Columns on Major Roads/Main Traffic Routes

8.1 Lighting Columns to meet the requirements indicated in 7.0 and additionally:

- ❖ Where brackets are required they shall be integral with the column ('hockey stick' type) and the projections kept to the absolute minimum and be of 5 degree uplift. The lighting columns shall typically be 8, 10 or 12 metre mounting height.
- ❖ Where a separate bracket is fixed to a column (subject to the Street Lighting Managers approval), the assembly of the column shaft and bracket shall incorporate a mechanical locking system in addition to high tensile socket headed securing screws and it shall be possible to fix the bracket in any of 4 x 90° positions relative to the door opening. When correctly fixed, the design of the bracket shall not allow any movement of the bracket either vertically or horizontally with respect to the column. At the point of interconnection, the cross-section of the bracket shall, preferably, equal that of the column shaft. Brackets shall blend with their columns, in material, finish and colour and shall be as short as practicable.

9.0 Selection of Street Lighting Columns on Residential Roads

9.1 Lighting Columns to meet the requirements indicated in 7.0 and additionally:

- ❖ Unless stated by the Street Lighting Manager, in residential roads the preferred method of mounting lanterns is post top. However, where brackets are required they shall be integral with the column ('hockey stick' type). On other road types where a separate bracket is fixed to a column (subject to the Street Lighting Managers approval), the assembly of the column shaft and bracket shall incorporate a mechanical locking system in addition to high tensile socket headed securing screws and it shall be possible to fix the bracket in any of 4 x 90° positions relative to the door opening. When correctly fixed, the design of the bracket shall not allow any movement of the bracket either vertically or horizontally with respect to the column. At the point of interconnection, the cross-section of the bracket shall, preferably, equal that of the column shaft. Brackets shall blend with their columns, in material, finish and colour and shall be as short as practicable.
- ❖ For cul-de-sacs, small residential areas and roads containing bungalows, five/six metre mounting height post top columns to be installed. This is dependent upon the British Standard lighting levels being achieved.
- ❖ Drop down type columns are to be installed on footpaths and areas that are inaccessible to vehicles. Aluminium or Stainless steel columns to be specified for this type of column (determined by the Street Lighting Manager).

10.0 Selection of Traffic Sign Posts for Illuminated Signs

10.1 The construction and protection details for sign columns shall be identical to those for lighting columns as detailed in 7.0 and additionally no plastic coated sign posts will be acceptable.

11.0 Ground Works and Installation of Street Lighting Column and Traffic Sign Posts

- 11.1 The Developer shall excavate and provide concrete GEN1 complying with BS 8500 and BS EN 206, foundations of sufficient thickness to firmly locate the post in the ground having regard to the ground conditions encountered and the post manufacturer's recommendations. Any concrete foundation shall be finished 150mm below finished surface level. See standard detail drawing.
- 11.2 Where ground conditions are poor or where agreed with the Street Lighting Manager, the Developer shall install a sleeve foundation comprising a pipe set vertically in the ground into which the post is set.

- 11.3 50mm diameter PVC service ducting tubes shall be incorporated in all post/lighting column foundations terminating at the cable entry slot to enable the supply cable to enter the post/column. The ducts are not required for the distribution network operator but shall be orange for a private supply service. A stranded polypropylene or equivalent rot-proof material draw rope of 5KN breaking load shall be left through the ducting tube to enable the electricity supply cable to be drawn through.
- 11.4 Lanterns and brackets (where required) shall not be attached to the column until 24 hours after the concrete foundations are laid.
- 11.5 Any damage caused during installation to the protective system applied by the post manufacturer shall be made good immediately following post erection or when the lantern is fitted.
- 11.6 Where it is necessary to provide flanged base rather than rooted posts, the Developer shall submit details of the concrete foundation and fixing details to the Street Lighting Manager for approval prior to any work being undertaken on site.
- 11.7 All posts shall be provided with identification numbers as detailed on the approved plan. The number shall comprise a 75mm high black numeral on a white rectangular background. The number shall be located approximately three meters above ground level (two metres on roads with little pedestrian usage) and facing oncoming traffic.

12.0 Lanterns

12.1 Lanterns shall be:

- ❖ Manufactured from marine grade aluminium, totally enclosed and shall conform to BS 4533 and BS EN 60598 and have a minimum degree of protection rating of IP 65 to BS EN 60529 for the optical compartment. Where a separate gear compartment exists, this shall have a degree of protection of at least IP 43. Where heritage or decorative lanterns are proposed the type of material used shall be approved by the Street Lighting Manager.
- ❖ Fitted with a photo-electric control unit (PECU) socket located on the canopy for the installation of a one-piece electronic PECU or have a miniature two-part electronic PECU installed by the manufacturer as agreed by the Street Lighting Manager.
- ❖ Fitted with integral electronic control gear. Note: dimmable electronic control gear to be used on all non-LED luminaires.
- ❖ Luminaires to have the correct matrix number as determined by the designer of the scheme.
- ❖ Installed in accordance with the manufacturer's instructions with no gap between the lantern and the shoulder of any bracket arm. The lantern shall also be installed at the correct design tilt and horizontal alignment and to ensure that the design 'IP' rating is maintained. All fixing bolts shall be mechanically tight. Where a torque setting is recommended for the fixing screws/bolts, a torque wrench shall be used to ensure that the requirements are met.
- ❖ Provided with vandal-resistant (polycarbonate or similar) glazing for those lanterns mounted below 8m.
- ❖ Post top mounted where possible to do so however, consideration may be given to the use of side entry.

12.2 Light source to be preferably LED type as approved by the Street Lighting Manager. If this is not possible, a suitable white light source to be utilised.

12.3 Side entry lanterns shall have a positive locking device so as to prevent the lantern turning on its axis.

12.4 The lamps, reflectors, refractors and bowl shall be clean and free from obscuring film after installation and the lamp shall be correctly positioned within the lantern. The bowl or any access panel should be seated uniformly on the gasket seal and the toggle catches secured so that the whole of the unit is dust and weatherproof to the appropriate IP rating.

- 12.5 The upward wasted light ratio [UWLR] of lanterns shall not exceed the recommended maximum for the environmental zone within which the development is located.
- 12.6 In order to assist with future maintenance, the Council requires that the lanterns used on roads which are covered by this specification shall be agreed in the first instance with the Vale of Glamorgan Council's Street Lighting Manager.

13.0 LED Luminaire Specification

13.1 Luminaire:

- ❖ The luminaire shall be of a modular design with tool-less access to all compartments including the tool-less operation for replacing LED modules and power supply.
- ❖ The luminaire shall be constructed of LM6 marine grade aluminium (or 360 grade aluminium). Plastic or GRP will not be accepted.
- ❖ The luminaire shall operate normally in temperatures from - 40 to 60 °C.
- ❖ The luminaire including the LED modules and driver compartment must have an ingress protection of IP66 or higher to BS EN 60598 and impact resistant to IK08.
- ❖ Column mounting – the luminaire must be capable of side entry 30-60mm diameter & post top fitment of 60-76mm diameter. Adapters are permitted, and they shall be included within the overall cost of the luminaire.
- ❖ The luminaire shall be purpose designed for LED light sources; luminaires originally designed for non-LED sources will not be accepted.
- ❖ The luminaire shall be capable of being mounted 0 to 5 degrees inclination, positive and negative inclination.
- ❖ The PECU receptacle shall be a standard NEMA socket affixed to the luminaire.
- ❖ The luminaire should operate at 230V +10% / -6% at 50 Hertz.
- ❖ The luminaire shall comply in all respects with the latest edition of British Standards and European Norms, be suitable for use on road lighting as defined by BS5489 -1:2013 and subject to the approval of the Vale of Glamorgan Council's Street Lighting Manager.

13.2 Visual Performance:

- ❖ At least three photometric distributions shall be available for each model suited to narrow, standard or wider roads.
- ❖ Uniformity of the lighting footprint should not be affected if individual LED's fail.
- ❖ The maximum Correlated Colour Temperature of the luminaire must not exceed 5000 °K.
- ❖ The luminaire manufacturer must be able to supply SP ratios.

13.3 Efficiency:

- ❖ The luminaire thermal management value must exceed a minimum of 84,000 hours.
- ❖ The LED lumen depreciation at 84,000 hours shall be no more than 15% based upon data from the LED chip manufacturer.
- ❖ The power supply driver factor must be a minimum of 0.92.
- ❖ The maximum stable operating temperature for the LED Junction (Tj) must not exceed 60% of the maximum rated junction temperature for the LED Tj inside the fixture during operation in a 20 °C ambient environment.
- ❖ UMSUG codes must be available for all luminaires and driver settings at the time of installation.
- ❖ The luminaire should be International Dark Sky Association or similar approved.
- ❖ Drive current should not exceed 350mA.
- ❖ Luminaire lumen efficacy shall be a minimum of 100 lumens / Watt (obtained from LM79 test data) with Colour Rendering Index (Ra) of 70 or above.
- ❖ Each LED shall be mounted beneath a lens providing photometric footprint based on overlay methodology and should provide a glare index of at least G1 for P / S class roads.
- ❖ The light output ratio shall be in excess of 90% with an upward light output ratio of no more than 0.5%.
- ❖ LED drivers must be electronic type, contained within the lantern housing, conform to BS EN 61347-2-9:2001, be IP65 rated and all terminals shall be shrouded to IP2X.

13.4 Testing:

- ❖ Accredited Independent Test Data must be provided for the luminaire, preferably to IES LM-79 Standards or similar and for the LEDs, preferably to IES LM-80 or similar. The luminaire must be laboratory tested and capable of withstanding Surge Suppression of 10 strikes @ 5000A and 6KV minimum.

13.5 Maintenance:

- ❖ The luminaire shall be designed for a minimum of 10 years of maintenance free operation with a written guarantee, supported by the Manufacturer's ultimate Parent Company or backed by a financial bond or similar financial surety, made out to the Employer for at least 10 years. The warranty will be reviewed by the Vale of Glamorgan Council's Legal department.

14.0 Traffic Sign Luminaires

- 14.1 Traffic Sign luminaires shall comply with BS EN 60598-1, BS 4533-102.1 and EN 60598-2-1 and shall provide a light distribution in accordance with BS EN 12899-1:2007 part 1 (mean illuminance E3 lighting class and uniformity class UE2).
- 14.2 Control gear shall be suitable for operation on an electrical supply of 230 Volts, 50Hz ac.
- 14.3 Gear trays shall be provided with a means of electrical isolation and/or disconnection by means of a cable restrained plug and socket which ensures that the earth terminal is the last to disconnect and the first to reconnect without removal of the gear tray.
- 14.4 Control gear for the lamps shall be securely attached to a galvanised steel gear tray, by means of stainless steel nuts, bolts and shake proof washers to ensure sound earth continuity and easy replacement.
- 14.5 The light source to be LED type.
- 14.6 Luminaires shall be supplied complete with a miniature one-piece electronic photocell unit for dusk to dawn operation.
- 14.7 Traffic sign luminaires shall be obtained from Manufacturers approved by the Street Lighting Manager.
- 14.8 No sign light units to be fixed to street lighting columns.
- 14.9 Traffic signs to be fed via private cable from the nearest street lighting column or from an adjacent item of road furniture.
- 14.10 Internal illuminated sign wiring to conform to the current requirements of BS7671.
- 14.11 Double pole isolators to be installed.

15.0 Bollards

- 15.1 Light source to be LED type.
- 15.2 All Bollards apart from those situated on traffic signal islands where the signal lamp is above the bollard shall be solar powered. A solar panel shall be integrated at the top of the sign which in turn powers the LED unit situated behind the regulatory traffic symbol.
- 15.3 The bollard to be passive safe and complying with BS EN 12767.
- 15.4 The sign material shall be retro – reflective DG3 type.
- 15.5 Bollard shall be affixed to the traffic island via cast – in cages or similar fixings in accordance with manufacturer’s recommendations.
- 15.6 The bollard to be illuminated throughout the hours of darkness.
- 15.7 All bollards situated on traffic signal islands containing a traffic signal shall be non- illuminated.
- 15.8 The solar powered bollard to be illuminated to L1 performance category between 40 and 150 cd/m² as indicated in BS EN 12899.
- 15.9 Internal illuminated sign wiring to conform to the current requirements of BS7671.

16.0 Beacons & Indicator Lanterns

- 16.1 The Beacon and Indicator globes to be one - piece polycarbonate and mounted 3.1 metres above ground level. Anti-vandal galleries to be fitted to keep globe in place.
- 16.2 No Beacon or Indicator Globes to be affixed to street lighting columns unless specifically designed for that purpose.
- 16.3 Light source for Beacons and Indicator Poles to be LED type.
- 16.4 The Beacons and Indicator Poles to be fed via private cable from the nearest street lighting column or from an adjacent item of road furniture.
- 16.5 Internal wiring to conform to the current requirements of BS7671.
- 16.6 Double pole isolators to be installed.

17.0 School Patrol Warning Units

- 17.1 The School patrol warning signal unit to be TSRGD diagram 4004 and constructed of extruded aluminium to provide a robust vandal resistant shell with punched apertures and anti-glare polycarbonate lenses with a maximum weight of less than 5kg.
- 17.2 The unit shall contain a programmable Bluetooth electronic controller.
- 17.3 The operating times of the School Flasher unit shall be determined by the Council's Traffic or Road Safety Group and programmed by the Street Lighting Section.
- 17.4 The light source for the School patrol warning signal unit shall be high performance LED's with a life expectancy in excess of 100,000 hours.
- 17.5 School Patrol Warning Signals to be fed via private cable from the nearest street lighting column or from an adjacent item of road furniture.
- 17.6 Internal illuminated sign wiring to conform to the current requirements of BS7671.
- 17.7 Double pole isolators to be installed.

18.0 Lamps

- 18.1 Highways which are considered to be traffic routes shall generally be lit using LED, Cosmopolis lamp or similar approved white light source.
- 18.2 Highways which are located in residential areas should be lit using LED where possible to do so. If it is not possible to use LED, Cosmopolis lamps to be specified.
- 18.3 All lamps shall comply with the appropriate British or European Standard i.e. BS or BS EN and shall be manufactured within the E.U. by a manufacturer approved by the Street Lighting Manager.
- 18.4 All lamps shall be marked to show their suitability for operation at the standard supply voltage provided by the DNO.
- 18.5 Lamps used in traffic sign luminaires shall be LED.
- 18.6 Lamps shall be guaranteed for at least 2 years or 8,000 hours of operation. Where lamps have been in service for a period in excess of 2 years, the Developer shall install a replacement lamp prior to adoption.
- 18.7 Lamps shall be compatible with the lantern used and must not be fitted in the lantern until the lantern has been correctly fixed to the column/bracket.
- 18.8 Lamps shall be marked with the date of installation.

19.0 Photo – Electric Control Units (PECU's)

19.1 Photo-electric control units shall:

- ❖ Be provided for all lighting units including illuminated traffic signs.
- ❖ Comply with BS 5972 and be manufactured to a quality level of ISO9000 or equivalent.
- ❖ Provide class 2 protection against electric shock and shall be a one-part unit to fit a NEMA socket or grommet fixing.
- ❖ The detector unit shall be constructed to provide a minimum protection to IP67 against the ingress of dust and moisture and shall be secured to the lantern with an effective weatherproof seal of at least IPX4.
- ❖ Be fully electronic with a switching mechanism capable of controlling a reactive lighting load of 10 amps on a 240V 50 Hz supply.
- ❖ Be designed, in so far as is practicable, to fail in the “on” mode. If a triac or other semi-conductor switching device is fitted, a method of ensuring that the load remains switched to the on state must be provided in the event of an overload destroying the device.
- ❖ Have a minimum guaranteed life of 6 years from their date of manufacture and this date shall be indicated on each individual unit to the Street Lighting Manager’s satisfaction. The guarantee shall not be insurance based and shall be based on testing and component mean time between failure rates. The supplier shall, when requested, provide such supportive testing records and/or written evidence, to support such life-expectancy claims. Any units failing within the guarantee period shall be replaced, free of charge, by the Developer, on a one-to-one basis inclusive of all costs associated with their replacement.
- ❖ Be manufactured by a manufacturer approved by the Street Lighting Manager.
- ❖ Energy consumption shall be 0.25 watts or less.

19.2 The switch “on” / “off” ratio to be 1:0:5 (i.e. 35 Lux “on” / 18 Lux “off”). All units must be indelibly marked with the switch setting, the manufacturer’s identification mark, model number and the date of installation.

20.0 Electronic Ballasts

20.1 Electronic ballasts shall be:

- ❖ From a manufacturer approved by the Street Lighting Manager, for use in highway electrical equipment and shall be suitable for operation at the standard supply voltage provided by the DNO.
- ❖ Suitable for use with the lamp used. The terminals to which the lamp and supply connections are made shall be clearly marked.
- ❖ Mounted in the gear tray fitted to the lantern with terminals shrouded so that no live metal parts are exposed.

20.2 All electronic ballasts shall have the ability to be dimmed and remotely monitored.

21.0 Cut-Outs, Isolators, Fuse Holders and Fuse Links

21.1 Cut-outs and fuse holders shall have moulded drip-proof housings.

21.2 Cut-outs for cable terminations shall:

- ❖ Comply with BS 7654.
- ❖ Have sufficient separate terminals for all live, neutral and earth conductors. They shall be clearly labelled to differentiate circuits and phases.
- ❖ Incorporate a fuse carrier and be designed primarily for use in street lighting columns and suitable for terminations or looped services.
- ❖ Be complete with any necessary extension box, glands or clips to enable the cable to be terminated and the steel wire armouring to be properly fixed and connected.

21.3 Cut-outs on private supply cables shall incorporate a lockable double pole isolator.

21.4 Fuse links shall be cartridge fuses complying with the requirements of BS 88. They shall be of high breaking capacity type and be of a value appropriate to the circuit requirements.

21.5 Circuit breakers to comply with the requirements of BSEN 60898 and the type selected shall be suitable for the installation.

22.0 Wiring and Earthing

- 22.1 Wiring within the electrical unit shall have copper cores and shall be PVC/PVC sheathed 300/500V grade to BS 6005 unless otherwise agreed with the Street Lighting Manager.
- 22.2 Blue Arctic 3 core flexible cable meeting the requirements of BS7919 Table 44, VDE 281 or equivalent and Class 5 flexible plain copper conductors to BS EN 60228:2005, to be utilised on street lighting columns. 2.5mm² 3 core Blue Arctic cable to be utilised on column mounting heights between ten and twelve metres. 1.5mm² 3 core Blue Arctic cable to be utilised on column mounting heights up to and including eight metres.
- 22.3 The conductors between the DNO cut-out and the double pole isolator shall be made using double insulated 'tails' – minimum 6.0 mm² csa.
- 22.4 Circuit protective and main protective bonding conductors shall comply in all respects with the current requirements of BS 7671.
- 22.5 A main protective bonding conductor shall have a cross-sectional area not less than half the cross-sectional area required for the earthing conductor of the installation and not less than 6 mm² (BS7671, Section 544.1.1). Where PME conditions apply, the earthing conductor of a street electrical fixture shall have a minimum copper equivalent cross-sectional area not less than that of the supply neutral conductor at that point or not less than 6 mm² (BS7671, Section 559.10.3.4) whichever is the smaller.
- 22.6 All earth conductors shall be insulated with green and yellow PVC.
- 22.7 All street lighting and other electrically supplied street furniture shall be earthed and bonded in compliance with BS 7430.
- 22.8 A permanent label to BS 951, with the words "Safety Electrical Connection – Do Not Remove" shall be permanently fixed in a visible position as stated in BS 7671 Section 514.13.1.
- 22.9 All installations shall comply with the current Vale of Glamorgan Council's Street Lighting wiring specifications and standard details (Refer to Part C).

23.0 Electricity Supplies

- 23.1 Lighting units shall, wherever possible, have individual phase supplies from the DNO. The supply service at nominal 230V, AC 50Hz, single – phase shall terminate at a cut-out which complies with Electricity Supply Industry Standard 12-19.

24.0 Private Underground Cables.

- 24.1 When authorised for use by the Street Lighting Manager, private underground cables shall be:
- ❖ PVC or XPLE insulated, steel wire armoured, PVC sheathed with stranded plain copper conductors, 600/1000V grade to BS 5467. All conductors shall be of equal cross sectional area and of such size as to carry the designed load and ensure that the voltage drop at the lamp column terminals shall not exceed 6% of the voltage at the supply points.
 - ❖ three core line, neutral and earth unless agreed with the Street Lighting Manager. The cable shall be special "Street Lighting Cable" and marked as such. The core colours are to be brown (line), blue (neutral) and yellow/green (earth).
 - ❖ Be manufactured by a 'BASEC'-registered manufacturer.
 - ❖ Looped between lighting units, feeder pillars, illuminated signs etc. with no underground jointing being permitted. Illuminated signs or bollards shall be fed by cables from lighting columns or feeder pillars. Under no circumstances must cable feeding a lighting column be looped through a sign or bollard.
- 24.2 No more than three cables shall terminate at a lighting unit and no more than two at an illuminated sign or bollard.
- 24.3 All cables to be run through a ducting network and cable ducts shall be laid on a bed of sand 100mm deep and covered with a sand layer of equal depth. A yellow, self-coloured PVC or plastic tape, not less than 0.1mm thick and 150mm wide with the wording "STREET LIGHTING CABLE" printed along the full length occupying not less than 75% of its available length and occurring at least at 1m intervals, shall be laid within the backfilling material approximately 250mm vertically above the cable or duct line.
- 24.4 The Street Lighting Manager shall be advised, at least 7 days in advance, by the Developer of any proposed installation of cable or cable ducts in order that inspection of the cable or duct may be undertaken before it is covered.
- 24.5 Cables shall be individually terminated and secured at switches, cut-outs and other electrical apparatus by means of an armour cable gland complying with BS 6121. All glands shall be shrouded overall with PVC sleeves.
- 24.6 All cable terminations shall be provided with a non-ferrous label or tag onto which is indelibly marked the cable size and the origin or destination of the cable run.

24.7 Earth electrodes shall be provided at the end of every circuit if more than three units are connected to that circuit. Also, earth electrodes are to be installed on every third unit and if necessary, at additional points in order to obtain the necessary test results. They shall comply with Engineering Recommendation G12/2 published by the Electricity Association. The earthing system components shall comply with BS7430 the rods shall be cast gun metal with phosphor bronze bolts. The terminal point shall be protected by a purpose-made inspection pit complete with a heavy duty cover and frame.

25.0 Ducting System

25.1 The type of ducting system to be fully ducted in accordance with the requirements of the Street Lighting Manager. The Developer must, prior to installation, submit samples of ducting to be used for approval by the Street Lighting Manager.

25.2 All private cables shall be installed in a ducted system which shall have draw chambers installed at major changes of direction and at the ends of each road crossing.

25.3 Twin ducting shall be installed on every road crossing.

25.4 In fully ducted systems, the arrangement of ducting and cable access chambers shall be so constructed that any cable can be installed or replaced without the need for any further excavation in the carriageway or footway.

25.5 Cable ducts shall be a minimum of 100mm nominal diameter in accordance with the recommendations in BS 7671. They shall be pliable, non rigid, plain, high or medium density, smooth bore polyethylene with a minimum wall thickness of 5mm or twin wall duct to BS EN 50086, Parts 1 to 4:1994 so as to conform to the requirements of the British Standard for impact and compression resistance to achieve a minimum bulk density of 2300 kg/m². Ducting shall be coloured orange with the legend "STREET LIGHTING" painted in 9mm lettering along the length of the duct at intervals of not more than 1m. When laid, the wording shall be uppermost and all lengths will be jointed or sleeved to give a continuous smooth bore.

25.6 Ducts should be impervious to water, impact resistant, capable of being laid at temperatures down to -10⁰C and sufficiently flexible to follow undulations in the trench bottom. They shall be of sufficient strength to not require concrete surround or granular or selected backfill at the depths laid.

25.7 Under no circumstances are other service providers permitted to use the street lighting conduit/chambers for their own use and access.

25.8 Where ducts are installed for use by the DNO they shall be installed in accordance with the DNO recommendations.

- 25.9 Ducts shall be swabbed through prior to drawing-in the cable(s). On completion of the cabling the duct shall be left with a pigmented stranded polypropylene or equivalent, rot-proof material draw rope of 5KN breaking load and having a design life of not less than 20 years. Ends of ducts not terminated at an access chamber shall be sealed to prevent the ingress of water.
- 25.10 Access chambers shall be brick built using 112mm Class B Engineering brickwork and a suitable soak away.
- 25.11 Access chambers (minimum dimensions 450 x 450mm) can be modular and of sufficient size to enable easy access to the cables having regard to their depth. The units shall be manufactured from high-density polyethylene, stackable and with preformed cut-outs for the cable duct entries. The preferable type of chamber is brick built, however modular types can be used at the Street Lighting Manufacturer's discretion. The Developer shall submit details of the type/manufacturer of the access chambers proposed for use for approval by the Street Lighting Manager.
- 25.12 Chamber covers and frames shall be manufactured from ductile iron to BS EN 124 and shall be at least class B125. All covers and frames shall be designed to carry the loading appropriate to the installed location. Cover frames shall be fully bedded on mortar and accurately set for level and position, if necessary on a 225mm thick brickwork plinth, and aligned with the nearest adjacent kerb or building.
- 25.13 Excavation around chambers and manholes shall be backfilled with fill material complying with BS 1377 Part 2, properly compacted. Where mechanical compaction is impracticable, the excavation shall be backfilled with GEN1 concrete complying with BS 8500 and BS EN 206 and of 150mm minimum thickness

26.0 Trenches for Cables and Cable Ducts

- 26.1 All excavations shall be made with vertical sides unless otherwise approved by the Council's Street Works Manager. The sides of trenches and pits shall be adequately supported at all times so as to maintain the stability of the adjacent ground. Support shall conform to BS 6031 Section 3 Temporary excavations, trenches, pits and shafts.
- 26.2 Trenches shall be excavated to the appropriate depth in order to give a minimum conduit depth to surface level of approximately 850mm to invert for carriageways, 775mm to invert for verges and 550mm to invert for footways.
- 26.3 Adequate precautions shall be taken to prevent water collecting in excavations. Whenever water collects in an excavation it shall be pumped out and the bottom of the excavation allowed to dry before cable or duct laying commences.
- 26.4 Backfilling shall be undertaken immediately after the laying, inspection and surrounding of cables or cable ducts using fill material complying with BS 1377 Part 2.

26.5 The reinstatement of all trenches shall conform to the appropriate section of the New Roads and Street Works Act, 1991; The Developer shall spread and compact the backfill material evenly so as not to dislodge, disturb or damage the cable or cable duct. No power rammers shall be used within 300mm of any cable or cable duct.

27.0 Feeder Pillars

27.1 The location of feeder pillars shall be agreed with the Street Lighting Manager on site prior to installation. Where the feeder pillar is sited in soft landscaping areas and it is not possible to park a vehicle immediately adjacent, the Street Lighting Manager may require the construction of a hard standing for use by maintenance vehicles.

27.2 Feeder pillars shall be constructed from not less than 3mm thick steel. They shall be sealed to minimum IP65 on the doors and IP45 on the vent louvers. They shall include a full size backboard of varnished marine plywood at least 15mm thick or other approved non-hygroscopic material. Alternatively, a purpose-designed equipment mounting system may be used. The entry for cables shall be via the roof.

27.3 Doors shall be fitted with tamper-proof locks, all locks being identical in pattern. The locking mechanism shall be lubricated with grease immediately following installation. Two sets of keys shall be provided to the Street Lighting Manager prior to the adoption of the installation.

27.4 Where directed by the Street Lighting Manager, ventilation shall be provided to prevent the build-up of condensation and in such cases the feeder pillar shall be protected by vermin-proof screens.

27.5 Protection against corrosion shall be by hot-dip galvanising to BS EN 60439-1.

27.6 All doors are to be provided with an earthing strap.

27.7 The Developer shall submit details of the feeder pillars which are proposed for use in the installation to the Street Lighting Manager for approval before work on the installation commences.

27.8 Feeder pillars shall be mounted on a 250mm thick foundation of concrete GEN1 complying with BS 8500 and BS EN 206. They shall be rooted or provided with fixing bolts to enable the unit to be securely located. After completion of the cabling, any void under the feeder pillar base shall be filled to 25mm below the door with rounded aggregate, maximum size 14mm, and sealed overall with a cold pour compound of an approved type to prevent the ingress of moisture from below. A spare 100mm diameter cable duct shall be provided through the concrete surround from the base of the feeder pillar.

- 27.9 For feeder pillars sited in grassed areas, a 600mm width of hard surfacing shall be laid with the surface flush with the ground across the width of the feeder pillar in front of the door. The other sides of the feeder pillar shall be similarly surrounded with hard surfacing 200mm. in width. All hard surfaced areas shall slope away from the feeder pillar.
- 27.10 The feeder pillar shall be as specified by the Street Lighting Manager and sufficient to accommodate the following:
- ❖ The incoming supply cable including cut-out.
 - ❖ A lockable double pole isolator [if not included in the cut-out].
 - ❖ Any contactor and/or photocell relay.
 - ❖ A distribution board for all highway electrical feeds including sufficient spare capacity to accommodate at least one extra circuit.
 - ❖ All necessary fuses/mcb's.
 - ❖ Provisions for a meter
 - ❖ At least 25% spare space on the backboard upon completion.
- 27.11 Where larger (double door) feeder pillars are required the following additional equipment shall be installed:
- ❖ RCD
 - ❖ Interior light
 - ❖ 13A Socket
- 27.12 Distribution fuse boards shall be stainless steel type. They shall be fitted with the same number of live and neutral bus bar terminals as there are outgoing circuits plus at least one spare way.
- 27.13 A circuit diagram and label showing details of interconnection of equipment and the connection of cables to and from the pillar, all indelibly drawn or engraved on a material not subject to damage by the environment or normal use, shall be securely fixed internally to each feeder pillar after completion of the installation.
- 27.14 An earthing system shall be provided in each feeder pillar. It shall accept the incoming earth facility from the supply authority onto an earthing bar or terminal strip and interconnect all outgoing cable earth connections and the bonding of the feeder pillar. The earthing facility shall accommodate up to 25mm² conductors. Where required by the Street Lighting Manager, a suitably rodded external earthing system shall also be provided, independent of and in addition to, any earthing system provided by the incoming supply authority/company.
- 27.15 All feeder pillars shall be fitted with a durable warning sign, fitted externally and in a prominent position, indicating "DANGER 230 VOLTS" as appropriate and a 'lightning flash' in black on yellow.
- 27.16 International protection of internal equipment, once the panels have been removed, shall be IP2X or IPXXB.

27.17 Internal wiring to conform to the current requirements of BS7671.

27.18 All pre-wired pillars to be initially tested by the manufacturer in a testing facility that conforms to EN 50191. Evidence of certification to be provided by the manufacturer.

28.0 *Electrical Equipment Fixed to Buildings*

28.1 Where approval has been given by the Street Lighting Manager for highway electrical equipment to be fixed to buildings the following Clauses apply.

28.2 Cables fixed to the surface of a building shall be PVC sheathed cables or other alternative approved by the Street Lighting Manager. The colour of the cable sheath shall be such as to blend with the colour of the building or structure. Surface cables shall be protected by means of galvanised steel conduit or cable shield up to 2.5m above ground level. Mains supplies shall be terminated in mini feeder pillars sited in the highway and the conduit made off into this.

28.3 All terminations of surface cable are to be completed using glands of approved manufacture.

28.4 The use of junction or termination boxes suitable for its purpose and the environment shall be restricted to those locations adjacent to the wall brackets where it is necessary to terminate the surface cable and to provide a heat resistant flexible cable [within a flexible conduit if necessary] from the box to the lighting unit.

28.5 Cables shall be supported on the building surface using approved saddles, the spacing of which shall conform to the recommendations of BS 7671.

28.6 The dimensions of the base plate of wall brackets must be kept to a minimum, having fixed centres generally not greater than 200mm in the vertical or horizontal planes. All brackets shall be fixed with 4 bolts of sufficient size for the anticipated loadings. Fixing details and calculations of loading from a Structural Engineer must be submitted to the Street Lighting Manager prior to approval being given for the installation to take place. Independent test certificates for the fixings shall be submitted after installation.

28.7 The internal surfaces of all fixing holes drilled into walls or other structures shall be sealed with an approved sealant prior to the insertion of the fixing bolts.

28.8 All wall brackets shall be installed to provide the designed mounting height of the lantern above ground level.

28.9 Electricity supply cables shall be terminated in a weatherproof control box of minimum size to accommodate the cut-out and any control or isolation equipment.

28.10 Wiring between the control box and the wall bracket shall have a minimum conductor size of 1.5mm². All cable glands shall be fitted with PVC shrouds.

28.11 Control boxes shall be constructed of galvanised steel or corrosion resistant alloy, ABS or GRP and sealed to a minimum IP54 rating. Doors shall be fitted with tamper-proof locks. The control box shall incorporate a backboard of hardwood or other non-hygroscopic material onto which the control equipment, service cable and cut-out can be firmly fixed.

29.0 Remote Monitoring or Central Management System (CMS)

29.1 Where the Council specifies the provision of Remote Monitoring or a CMS the Developer shall ensure that all equipment installed is compatible with that system and will allow for full control and monitoring of the proposed street lighting installation.

29.2 The Developer shall ensure, through practical testing of the site equipment and the office based CMS, that full control and monitoring of the street lighting installation is possible. These tests shall be concluded to the satisfaction of the Street Lighting Manager before the street lighting installation will be considered for adoption.

30.0 Permanent Traffic Signs

30.1 The provision of appropriate traffic signs on new developments will be a requirement for adoption. Any provision must comply with the 'Traffic Signs Regulations and General Directions (Statutory Instrument No. 3113, 2002)' or any subsequent Regulations current at the time of construction, and be to the satisfaction of the Council's Traffic Group, who will advise whether signs need to be illuminated.

30.2 Where traffic signs are required to be illuminated, they should be supplied from a private cable network, usually from the nearest street lighting column. However, details of the method of providing the electricity supply shall be submitted to the Street Lighting Manager for approval.

30.3 The Developer shall consult the Street Lighting Manager regarding the type of illumination i.e. internal or external, to be used and all light sources shall be of an LED type.