

PART IV

ROAD LIGHTING AND ILLUMINATED TRAFFIC SIGNS

23. SPECIFICATION

23.1. Applications

This specification shall apply to any road lighting system and illuminated traffic signs being installed as part of a new road that is to be adopted for the purpose of road lighting maintenance by the Roads Authority.

23.2. Lighting Requirements

The developer is required to provide a system of road lighting where this is a condition of the road consent.

23.3. Maintenance Period

The Roads Authority is prepared to accept lighting units and illuminated signs from the date of commissioning for the supply of energy only.

Any work carried out or material supplied by the developer will be maintained by him for a period of 12 months from the date of commissioning as certified in writing by the Engineer. The twelve-month maintenance period will include for the replacement of any faulty equipment supplied by the developer and the restoration of any faulty workmanship found during this period or at the final inspection prior to issuing the final certificate.

Any expense incurred by the Roads Authority during the maintenance period as a result of the developer failure to carry out the requirements above will be fully charged to him.

23.4. Lighting Installation - Design

The proposed lighting installation shall be designed to the requirements of the Engineer and are in accordance with the appropriate parts of the British Standards BS 5489:1992 Road Lighting and European Standard BS EN 13201. See also **paragraph 8.11**.

Road lighting design may need adjustment as the exact lighting need cannot always be appreciated until the construction stage and therefore the Engineer reserves the right to amend the approved layout following discussions with the developer.

Cable conductor cross sectional areas shall be marked on the site design plans for each circuit.

The lighting design shall use the following outputs for Lighting Design Lumens within the calculation.

70W SONT - 6700lm	35W CDM-T – 3300lm	57W PLT(4p) – 4300lm
42W PLT – 3200lm	60W CPO – 6900lm	

Other values where required can be obtained from the Roads Authority Lighting Section.

23.5. Record Drawings

During progress of the works the developer shall prepare record drawings showing the electrical work as installed indicating actual cable routes and ducted road crossing as well as lighting columns and supply pillar positions.

The drawings shall be prepared to a scale of 1:500 unless otherwise agreed and the developer shall supply the Engineer with AutoCad drawings (Version 12 or above). One paper copy to be provided in the supply pillar.

The above drawings shall be provided before or at the time of final commissioning.

Where available plans are held electronically these will also be requested.

23.6. Overhead Power Line Conductors

The Developer shall ensure strict observation of clearances required by Scottish Power between their overhead power line conductors and road lighting equipment. In particular the Developer shall indicate on all site drawings submitted to the Engineer the proposed or actual position of all overhead power line conductors.

23.7. Compliance with Regulations

Work on the installation will be to the satisfaction of the Engineer. Facilities will be given to him during the progress of the work to carry out any inspection, check, or test he may deem necessary at the developer expense.

The developer shall be responsible for notifying the Engineer when ducting is being installed, (prior to backfill), or columns erected, so that depths may be checked. Failure to notify the Engineer may result in the excavation of trial pits to confirm depth, at the developer expense.

The whole of the works shall be carried out in accordance with the approved drawings unless otherwise agreed in writing by the Engineer.

The Developer shall be responsible for ensuring that only suitably qualified personnel carry out the installation. Personnel shall be authorised in writing as competent under G39 (see below)

The Developer shall ensure that all work is carried out in compliance with the Health and Safety at Work Act 1974, the Electricity at Work Regulations 1989 and the Electricity Association Engineering Recommendation G39.

The whole of the works shall comply with, but not be limited to British Standard BS 7671:2004 Requirements for Electrical Installations (IEE Wiring Regulations Sixteenth Edition), BS 7430:1991 Code of practice for Earthing, ILE Code of Practice for Electricity Safety in Highway Electrical Operations.

A PVC covered green/yellow earth wire (cable size to be specified by the Engineer) shall be connected to the earth block ready for connection to the Regional Electricity Companies service cut-out at any new or upgraded supply points.

23.8. Materials

All material supplied by the Developer shall comply with the relevant British Standard Specification unless otherwise required by this document and be in new (unused) condition.

A list of manufacturers for all material to be used on the works shall be submitted for approval by the Engineer prior to work commencing. The Engineer may request samples of materials being considered.

The developer shall be responsible for the supply, delivery and correct storage of all material required for the complete lighting installation.

23.9. Electrical Supply

The Developer shall be responsible for the cost of any new electrical supplies or variations to existing supplies or cable networks as well as the cost of any alterations required to existing lighting column positions. Where the road lighting installation requires to be connected to any existing Roads Authority

lighting column or supply point only the Engineer is authorised to make the necessary connections at the developer's expense unless otherwise agreed in writing.

23.10. Installation Testing

The Developer shall be responsible for the testing of the installation as described in Part 7 of BS 7671:1992.

Tests to be carried out by the developer.

1. Visual inspection
2. Continuity
3. Insulation resistance
4. Polarity
5. Earth fault loop impedance
6. Earth electrode resistance (If required by the Engineer)
7. Load and operational test

The above test shall be witnessed by the Engineer's representative at the developers cost unless otherwise approved by the Engineer in writing. The Developer shall provide all labour, instruments and apparatus that may be required and pay for the cost of any electrical connections required for the test. Where satisfactory test results are obtained the Developer shall commission and leave in service such parts of the installation as the Engineer directs.

A copy of the test results shall be provided as well as notification of each individual unit or section of the installation as it is commissioned in such a form as to be easily identifiable in relation to the original drawings. Upon satisfactory completion of the tests, the Contractor shall issue a signed Completion and Inspection Certificate to the Engineer within three working days. The installation will not be accepted as complete until such Certificates are issued. The final test and inspection shall include the submission of the as fitted drawings for the installation, providing the appropriate number of keys for columns and control cabinets as well as the final Completion and Inspection Certificate.

23.11. Road Openings

Any work carried out on a public road, as part of the road lighting installation will require the Developer to obtain the necessary road-opening permit from the appropriate Roads Authority.

The Developer is responsible for ensuring the safety of any services, pipes, culverts or other plant belonging to the statutory authorities whether on public or private roads or within the development. Any damage or consequential costs shall be the responsibility of the Developer.

The Developer is responsible for the immediate permanent reinstatement of any existing road surfaces excavated as part of the lighting installation.

Where works obstruct a footway the Developer shall provide a safe alternative route, properly signed, guarded and lit.

MATERIALS SUPPLIED BY CONTRACTORS

23.12. Supply Pillars

The supply pillar shall consist of two parts, an outer shell (Pillar) constructed from a minimum 3mm stainless steel (grade 304) and an inner housing (Enclosure) containing the electrical control gear constructed from G.R.P. or other similar material acceptable to the Engineer, and comply with the following:-

PILLAR

- (a) Not Used
- (b) The Pillar shall be designed to prevent the ingress of water, snow or foreign bodies and shall have a minimum ingress protection as specified in BSEN 60529 of IP54.
- (c) The top of the Pillar shall be angled to shed water to the rear of the enclosure.
- (d) Access to the Pillar shall be by means of a hinged door opening to a full 180° at the front.
- (e) The Pillar shall be lockable with a minimum of two locks of a vandal resistant type covered for protection when not in use. At least one key per installed pillar shall be provided to the Engineer.
- (f) Earthing provision will be provided on both the door and body of the cabinet. The earth shall have a minimum 8mm diameter brass earth bolt with 2 brass washers and 2 half nuts.
- (g) The Pillar shall have a root with adequate allowance for cabling and have a planting depth of 300mm ± 50mm. Refer to lighting standard drawing **LTG006**.
- (h) A full size back board of varnished marine plywood at least 12mm thick or other approved non-hygroscopic material or purpose designed equipment mounting system shall be provided.
- (i) Feeder pillar external dimensions above ground shall not exceed WIDTH 610mm, HEIGHT 1000mm, DEPTH 350mm, unless otherwise approved by the Engineer in writing.

ENCLOSURE

Refer also to lighting standard drawing **LTG001**

- (j) The Enclosure shall have such dimensions as to allow it to be installed within the Pillar without obstruction to the Pillar door. The Enclosure shall have a hinged door locked in a suitable manner that requires the use of a tool to gain access.
- (k) The enclosure door shall be suitably marked with a durable warning sign indicating "**DANGER ELECTRICITY**".
- (l) Electrical components shall be mounted on a backplate using standard DIN rail Symmetrical profile to BS 5825:1980.
- (m) The bottom face of the enclosure should have a detachable plate with Ferrules, or be plain suitable for drilling and glanding to accommodate all outgoing 2 core and earth PVC\SWA\PVC steel wire armour cables and the incoming supply cables from the Scottish Power cut-out. Unused drilled holes to be blanked off.
- (n) Suitable glands shall be provided for each installation to suit the particular number and type of cable being used. Unused gland positions shall be suitably sealed.
- (o) The enclosure and its components shall be suitable for use on a 230 volt single phase 50HZ supply for use with inductive discharge lighting loads operating at 0.85pf

- (p) The double pole switch isolator and contactor, shall be suitable for use in switching discharge lighting loads up to 63A unless otherwise agreed by the Engineer in writing.
- (q) No diversity factors shall be applied and all conductors and insulation shall be suitable for maximum loading, the neutral conductor being the same cross-sectional area as the phase throughout. The minimum size of the main conductor shall be 16mm².
- (r) Contactors shall be silent in operation and shall be of the electromagnetically operated electrically maintained type with arc control devices and neutral link. The contactor shall be rated with an AC 3 utilisation Category and also have readily replaceable contacts. Auxiliary coil circuits shall be separately fused and suitable for operation at 230V 50Hz.
- (s) The fused distribution board shall be capable of providing 4 x 230v x 50 hz single phase and neutral outgoing circuits with 1 auxiliary circuits and 2 blank ways for additional circuits where required. The actual type and rating of protective devices shall be indicated on the Lighting drawings submitted for Road Construction Consent.
- (t) All outgoing main circuits shall be wired to a marshalling area where the panel main earth termination shall also be located and provision of an earth bar is required.
- (u) The auxiliary control circuit shall be suitable for operation on 230V 50 Hz supply. Automatic control shall be achieved by means of a time switch or photocell as specified by the Engineer.
- (v) Labelling shall be provided to enable ready identification of all protective, switching and isolating devices and all outgoing circuit terminals, with warning notices regarding isolation, and the presence of voltage, appropriately positioned. Outgoing circuit breakers and their respective outgoing terminals in the marshalling chamber shall be labelled with numbers appropriate to the number of circuits.
- (w) Internal wiring between the Scottish Power Cut-out, contactor and out going or fuses shall be single core PVC double insulated at least 16mm² unless otherwise specified.
- (x) The earth continuity conductor linking the Scottish Power earth terminal, supply pillar earth terminal and outgoing cable earth conductor shall be at least 16mm² PVC insulated or sheathed green and yellow.
- (y) Other internal wiring for control purposes shall be at least 1.5mm² copper conductor PVC double insulated single core cable.
- (z) Drawing No. **LTG007** shows a wiring diagram for a Feeder Pillar with Time Swich Control.
- (aa) Drawing No. **LTG006** shows a Feeder Pillar foundation detail.
- (ab) A hard plastic wallet shall be provided on the inside face of the enclosure to store record drawings.

23.13. Underground Ducted Cable

The cable shall have copper conductors, PVC insulation, with steel wire armour and PVC sheathed, 600/1000 volt grade and conform with BS 6346, unless otherwise specified by the Engineer. Cables larger than 16mm² shall be to BS 5467:1989.

Cables shall be 3 core (2 core and earth) with all conductors of equal cross sectional area. The cores shall be colour coded in accordance with BS 7671:2004 for single phase installations the cable insulation colours shall be **Brown, Blue and Green/Yellow**.

The outer cable sheath shall be **Violet** in colour unless otherwise approved in writing by the Engineer.

Note: Sleeving cable ends to indicate cable colours is not acceptable

23.14 Internal Wiring Lighting Columns

Internal wiring from the cut-out to the lantern control gear shall be flexible multi core copper cable, 300/500 volt grade, PVC insulated PVC sheathed and shall comply with BS 6500.

As a minimum 1.5mm² cable should be used for columns up to and including 8metres high, columns above 8metres high should be wired using 2.5mm². Cables should be rated to the supplied load.

The earth continuity conductor between the Cut-out and column earth terminal shall be a copper conductor of at least 6mm² PVC insulated or sheathed coloured green and yellow.

23.15. Earth Rods

The Material used and the construction of the Earth Electrode shall be such as to withstand damage due to corrosion.

The rod shall be copper covered (not sheathed) Low Carbon Steel.

Rods shall have a nominal dimension of 9.5 mm dia and minimum length of 1200 mm.

Earth mats may be used as an alternative.

Earth Road clamps shall have high corrosion resistance and good mechanical strength capable of clamping a copper earth conductor up to 35 mm² cross section. Earth rods shall only be installed in areas to be adopted as part of the public highway network such as footways or service strips.

23.16. Fused Cut-outs

Fused Cut-outs shall have a vandal resistant moulded case with phase, neutral and earth terminal provided and be suitable for loop in loop out 3 way cabling systems as appropriate using three core wire armoured cable (2 core and earth). The top of the Cut-out shall be such that there can be no ingress of moisture. With the fuse in position no live metal work shall be exposed and when removed the phase terminal shall be shrouded.

Cut-outs shall be double pole type, unless otherwise specified.

Incoming and outgoing cable terminals shall be capable of accepting up to 16mm² conductors unless otherwise specified.

Fused Cut-outs shall comply with BS7654 and be CE marked, with Ingress protection to IP4X

The Cut-out shall be supplied with a fuse, BS88 type, of the correct rating for the electrical load being supplied.

All Cut-out parts must be fully interchangeable.

Where special tools are required for cable terminals then at least 10 tools, and no less than 1 tool per 10 Cut-outs installed, shall be supplied to the Engineer.

23.17. Time Switches

Time switches shall be electronic in operation with a battery reserve of 10 days in the event of power supply failure.

Be capable of switching 5A inductive load at 230V 50Hz.

Be suitable for the geographic location of use 56° N.

23.18 Underground Cable Ducts For Footways, Service Strips, Road Crossings Etc

Ducts shall be PVC 100mm internal diameter colour violet.

Ducts shall be a single wall corrugated conduit with high crush resistance and flexibility. The inner surface shall have a low coefficient of friction and be free from burr, which could damage cable sheaths. Colour shall be UV stabilised for colour stability and weathering properties. Pigments shall be of a high purity resistant to soil acids. The duct material shall not become brittle at low temperatures.

Ducts shall generally comply with British Standard DD200:1991 "Draft Development for Pliable Non-Rigid Conduit and Fittings for Direct Burial Underground (type DB)".

23.19 Not used

23.20. Circular Section Lighting Columns

The lighting column manufacturer shall be registered with and certified by either British Standards Institute Quality Assurance Service or Lloyd's Register Quality Ltd for the manufacture, supply and verification of lighting columns under their Quality Assessment Schedule.

The contractor shall liaise with the column manufacturer to ensure that the columns installed satisfy all requirement of BS EN 40.

Nominal Height (m)	Effective Windage Area (m sq)
5	0.1
6	0.1
8	0.15
10	0.225

TABLE 17
Maximum Windage Areas

(f) For the purpose of design calculation, Clause 3.1, BS EN 40-3-1:2000, "Dead Loads" the following maximum lantern masses shall be included relative to nominal height of column as detailed in **Table 19**.

Nominal Height (m)	Mass (Kg)
5	7
6	7
8	10
10	15

TABLE 18
Maximum Lantern Masses

(g) In addition to the above, columns of 4m nominal height and above shall be designed to support a traffic sign mounted at a clearance height of 3m above ground level with a surface area 0.6m square.

- (h) The structural design of lighting columns shall also be verified by testing in accordance with the criteria detailed BS EN 40-3-2: 2000.
- (i) A type test certificate as detailed in BS EN 40-3-2: 2000 shall be supplied on request.
- (j) Lighting columns shall be protected against corrosion.
- (k) A chain of 2mm nominal diameter shall be fitted internally between the door and column. The chain shall be sufficiently long to allow the door to rest freely on the ground and against the column in an upright position with the column correctly planted allowing unrestricted access to the base compartment. The chain shall be securely fixed to the metalwork of the column.
- (l) Brass earthing terminals shall be provided on the column and column door, size M8 x 30mm long complete with two brass hexagon nuts and two plain brass washers. These shall be welded or brazed to the access door and inside walls of the base compartment and shall be fitted with a distinctive and durable metal label marked: **SAFETY ELECTRICAL CONNECTION - DO NOT REMOVE.**
- (m) The base compartment(s) shall be fitted with hardwood or other substantially non-hygroscopic material baseboard not less than 90mm wide and 15mm thick securely fixed internally to accommodate the cut-out assemblies, control equipment, service cables etc.
- (n) The base compartment shall have weatherproof access doors fitted with tamper-proof and corrosion resistant locks of similar pattern. When the door is secured the bolt head shall be completely recessed into a 16mm diameter access hole. Doors shall be interchangeable for similar columns without adaptation and be to the following dimensions where applicable: 8m mounting height and above - 600mm x 115mm
- (o) Door keys shall be provided on the basis of one per twenty columns.
- (p) The cable way shall be located below the base compartment door opening
- (q) The column planting depth shall be indicated on the column by a white line, as indicated in **Table 20**.

Nominal Height (m)	Planting Depth (m)
5	0.8
6	1.0
8	1.2
10	1.5

TABLE 19
Column Planting Depths

- (r) The door position should be at right angles to the bracket outreach, if fitted and sited such that an operator working at the door is facing oncoming traffic on the nearside of the road.
- (s) On 8m and 10m columns an anti-rotating device shall be provided additional to the bracket clamping screws. Two rows each of four 12.5mm minimum OD Stainless Steel Allan screws equally spaced shall clamp the bracket.
- (t) The double bracket column shall have a base compartment with two doors to house two sets of control gear, time switch and service Cut-out. An anti-rotating device shall be provided additional to the bracket clamping screws. Two rows each of four 12.5mm minimum OD stainless steel Allan screws equally spaced shall clamp the bracket.

23.21. Lanterns Complete with Lamps and Control Gear

All equipment must be in accordance with BS 4533 and the appropriate part of BS5489 \ BS EN 13201 and comply with the following:-

- (a) The upward light ratio of all lanterns shall be < 0.15 . All lanterns shall have a minimum degree of protection as specified by BS EN 60529 category IP65.
- (b) Lanterns for group B side entry mounting shall have an entry suitable for a spigot size of 34mm OD x 80mm length. Lanterns for Group B post top mounting shall be suitable for 76mm dia. spigot. Lanterns for group A side entry mounting shall have an entry suitable for a spigot size of 43mm OD x 100mm length.
- (c) For Group B lighting the preferred method is spigot post mount, (76mm dia) use of side entry shall be agreed by the Engineer prior to installation.
- (d) The lanterns offered shall be of a type acceptable to the Engineer.
- (e) The engineer reserves the right to request drawings of the lanterns offered together with its full specification including the IP rating from the developer.
- (f) Photometric design data for each type of lantern proposed suitable for use with computer aided road lighting design software may be requested by the Engineer. This software is required to be supplied on a compact disk in TM14 format.

23.22. One Part Photo-electric Control Unit for Road Lighting

The unit shall be in accordance with BS 5972:1980 Specification for photoelectric control units for road lighting and comply with the following:-

- (a) The unit shall be suitable for use with NEMA sockets and shall be capable of satisfactory operation on a nominal 230V +/- 10% 50HZ supply.
- (b) The unit must be covered by a minimum 5 year in service guarantee offering free replacement in the event of failure.
- (c) The control circuit shall be of the electronic type, rated for a 1 kw/0.85pf lagging discharge lighting load.
- (d) The unit shall be calibrated to switch ON at 70 lux and switch OFF at 35 lux i.e. negative ratio 2:1. A time delay to avoid spurious switching shall be incorporated in the circuit.
- (e) The unit base shall have the facility to record the month and year of installation.
- (f) The unit shall be suitable for mounting on a surface with a temperature of 120°C.

23.23 Not Used.

INSTALLATION

All operations including existing lighting equipment must be supervised by Roads Authority Lighting section. All costs incurred in such supervision shall be charged to the Developer.

23.24. Column Erection

The Engineer may indicate the exact location of columns on site. Columns shall be erected in a true vertical position, seated on a stone flag, rock or other hard material. Concrete backfill shall be used to support the column well rammed and compacted around the root up to the cable entry port.

The column shall be placed in a hole excavated with steep sides leaving a minimum of 100mm clearance all round the root for the full depth of the excavation. Column excavation depths will be provided for the particular columns to be used on individual sites by the Engineer.(see **Table 20.**)

Columns erected in areas which are not to be surfaced such as grass verges shall have concrete installed for the full planting depth of the column with a ducted entry provided to the cable entry slot. Concrete at the finished surface level shall be formed into a square 600mm x 600mm x 80mm deep with the surface sloping away from the column at a 1:40 gradient.

Where columns have separate bracket arms then these shall be fitted prior to erection. Brackets shall be at right angles to the door opening such that when erected the door faces away from oncoming traffic. Where not possible the door facing direction shall be agreed with the engineer prior to installation.

Fixing screws shall be greased prior to installation and then tightened with a suitable tool to ensure a firm grip of the bracket but not so far as to damage the screw threads in the column.

Post top columns shall be erected so that the door faces away from oncoming traffic, or as otherwise directed by the engineer.

The developer shall ensure that all columns are in a true vertical position on completion of the Development.

Drawing No. LTG005 shows steel column foundation detail, backfill shall be to the HAUC specification for openings in Highways as published by HMSO (1992).

23.25. Column Removal or Re-Siting

No existing column shall be removed or repositioned without the agreement in writing of the Engineer.

No columns shall be removed or repositioned without verification that the supply cables are properly disconnected and the service is dead.

Metal columns, which are removed and not required on site, shall be conveyed to a Depot or disposal agent as directed by the Engineer. Any scrap value of disposed columns shall be to the credit of the Roads Authority.

Concrete columns, which are removed and not required on site, shall be conveyed to a Depot or disposed of by the Developer at his expense, as directed by the Engineer.

Columns shall be removed completely with no part of the column left in the ground. Holes left by column removal will be backfilled and reinstated as per the HAUC Specification for openings in Highways as published by HMSO (1992).

23.26. Supply Pillar Erection

The Engineer may indicate the exact location of supply pillars on site.

Prior to erection any separate supports provided shall be correctly fixed to the pillar.

The pillar shall be erected in a true vertical position and at the correct ground level for the particular pillar in use. A minimum 100mm clearance is required between the bottom of the door and finished ground level. No cables must be exposed when the pillar is in its finished position at ground level.

The pillar shall be placed in a hole excavated with steep sides leaving a minimum clearance of 150mm all round the base of the pillar for the full depth of the excavation. Concrete mix shall be used to bed the pillar ensuring access for all cables.

All particular requirements requested by Scottish Power are to be carried out by the developer.

Supply pillars shall have clear access with the door opening within the footway or service strip area without swinging into carriageway or private areas.

Where supply pillars are erected in soft areas such as service strip then a hard standing shall be provided with minimum dimensions of 1200mm wide by 900mm deep directly in front of the pillar. Hard standings shall be constructed to footway standards.

Drawing No. **LGT006** shows Feeder Pillar foundation detail, backfill shall comply with the HAUC Specification for openings; Highways as published by HMSO (1992).

23.27. Wall Mounted road lighting Installation

Wall brackets shall be mounted on a flat sound wall at a height indicated by the Engineer and fixed with suitable stainless steel wall fixings.

A wall mounted supply box shall be installed no less than 1.9 metre and no more than 2.1 metre above finished surface level adjacent to the wall. The supply box shall have a hinged lid and a tamper proof key to allow access. This box may be mounted on the surface or recessed. Where the supply box is wall mounted then an MICC black plastic sheathed cable shall be installed properly clipped and glanded between the box and the wall bracket. A galvanised conduit of at least 32mm diameter shall be installed between the box and to 50mm below ground level, and where the box is recessed also between the box and the wall bracket.

Drawing No. **LGT002** shows detail for a wall mounted supply box.

Details of wall brackets for luminaires shall be submitted for approval by the Engineer prior to installation.

23.28. Underpass and Pend Installation

Due to the individual requirements of underpass and pend lighting, arrangements will be made with the developer in each case where it is required.

Following agreement regarding the style and nature of the lighting cross sectional elevations will be required showing the positions and means employed to service the units.

23.29. Ducting and Cable Installation within Development

All cabling shall be installed in 100mm dia. Violet flexible ducting with smooth bore unless otherwise specified by the Engineer.

Duct trenches shall be excavated to the lines on the drawings or as arranged on site. The depth of excavation shall be such that ducts laid under verges, footways, paths on open ground shall have a cover of 450 mm and under carriageway of 800mm. Normally excavation depths will be 600mm in footways etc, and 1000mm in carriageway.

The duct shall be bedded and covered by a 100 mm thickness of lightly compacted graded sand in carriageway, (50mm in footways). Drawing No. **LTG008** shows reinstatement detail.

Any ducts installed for future use not having a cable pulled through it shall be corded and easily identifiable on site. The location of corded ducts are to be indicated on record drawings.

Cable shall be looped in and out of each column. No underground jointing will be permitted.

Warning tapes are to be provided.

All cables shall be laid in footways, footpaths or service strips unless otherwise approved by the Engineer in writing. Cables must not be laid in private property e.g. house gardens. Cable routes should be at the rear of the footway or service strip in line with and just to the front of the lighting columns.

Duct lengths are to be continuous.

Duct tracks shall be left open for inspection by the Engineer prior to backfilling.

The Engineer reserves the right to carry out compaction tests at the Developers expense.

The Engineer reserves the right to have test pits dug at the Developers expense.

23.30. Not used.

23.31. Looped Cable Terminals

Cables terminated in columns or wall bracket supply boxes, shall be fitted with a fused. Cut-out. Adequate means shall be provided for clamping the cable armour of the incoming and where appropriate outgoing cables for maintaining continuity of earthing using the Cut-out brass earth plate ferrules or compression gland. The brass earth plate shall be connected to the column or supply box earth stud and the internal Cut-out earth terminal using 6mm² earth continuity conductor. The three cores of the looped cable shall be connected to the appropriate terminals within the Cut-out Cables terminating in supply pillars shall have the cable armouring adequately clamped to maintain continuity of earthing and be earthed to the earth stud inside the supply pillar.

Where cable loops have no column base in which to terminate at the time of installation then sufficient length shall be coiled underground to make the connection later. The cable shall be capped and sealed in an approved manner with the position clearly marked for future identification.

Where any of the three cable entries of the Cut-out are not used, these shall be sealed so as to maintain the IP rating of the cut-out.

Cut-outs shall be installed at the highest position suitable on the backboard.

23.32. Internal Wiring of Columns

The cable between the Cut-out and the lanterns shall be taken from the top of the Cut-out and will include an earth wire from the Cut-out to the lantern body earth terminal.

Cables shall only be stripped back enough to allow termination without excess bare copper being exposed. All interconnections must be made at terminals and no joint shall be allowed in the wiring. All separate metal work shall be earthed and taken to the earth stud inside the column base. An earth continuity

conductor at least 6mm^2 shall be provided between the cable armour/Cut-out earth terminal and column earth.

23.33. Lantern attachment to Columns

Lanterns shall be attached to the column spigot using the screws provided. Screws shall be tightened uniformly and without undue strain to ensure a good fixing.

Side entry lanterns shall be mounted in line with the spigot. Spigot mounted lanterns shall be mounted in a true vertical position. Lanterns shall not be fitted to columns prior to erection.

23.34 Earthing

The earthing of the installation shall comply with BS 7671:1992.

The developer shall ensure that throughout the installation all metallic parts other than the current carrying conductors are bonded to form a continuous path by way of the armouring to the Regional Electricity Company earth connection.

An earth rod is required at the last or penultimate lighting column on each separate cable run where there are more than three lighting columns.

The earth rod shall be driven vertically into the ground no closer than 0.5 metres from the column within the confines of the cable track adjacent to the column until it is at least 300 mm below the finished surface level.

A suitable earth clamp shall be used to attach a 16mm^2 earth cable from the rod to the earth stud within the lighting column through the cable entry slot. Earth rods must be left exposed until approved by the Engineer.

A weatherproofing tape shall be applied to protect the earth clamp.

23.35. Painting

After erection and the necessary cabling work is completed all equipment, where required, shall be painted as detailed below. All wall brackets and supply boxes shall be painted where required, prior to erection as detailed below.

Painting shall be carried out generally to BS EN ISO 12944:1977 Protective Coating of Iron and Steel Structures or ILE Technical Report 26 Painting of Lighting Columns, unless otherwise directed by the Engineer.

Two coats of paint will be applied; a primer undercoat first followed by a gloss finish. Gloss to BS 4800 colour 10 C 39 suitable for external use.

Note: Aluminium column shall not be painted unless requested.

23.36 Not Used

23.37 Traffic Sign External Light Units

All external lighting units shall comply with BS 873 and Chapter 11 of the "Traffic Signs Manual".

All units shall in addition be:-

- (a) Constructed with die cast aluminium, finished in traffic grey, steel bodies being rust proofed prior to finishing.
- (b) Fitted with polycarbonate light panels.
- (c) The aluminium body casting shall incorporate the outreach arm and have an outreach of 300mm ± 50mm.
- (d) Fitted with stainless steel screws, nuts and washers.
- (e) Fitted complete with LEDs or twin fluorescent tubes which are capable of single tube/lamp operation
- (f) Capable of being fitted with photo-electric control if required.
- (g) The units shall be inconspicuously marked with the name/trademark of the manufacturer, BS 873, month and year of manufacture.
- (h) Have ingress protection to IP65.
- (i) Have a detachable gear tray.

23.38 Traffic Bollards

Internally illuminated bollards with a flexible UV stabilised plastic top shall comply with the relevant British Standards regarding design construction, safety and interchangeability.

The bollard termination box with the light source mounted below ground level shall be designed to contain the light sources and all necessary control equipment and be provided with a panel of suitable transparent material adequately fixed into the box. The box shall be manufactured in a non-corrosive material acceptable to the Engineer. The box shall be rated to IP67 as defined in BS5420 in service and shall be provided with a readily re-sealable access cover. All gaskets will be one part recessed to avoid damage during normal maintenance operations.

All bolts for the fixing of the re-sealable access cover or the bollard body will not penetrate the box internally. All materials necessary to maintain the above IP rating for the sealing of the cable entry shall be supplied with each bollard.

The light source shall be LEDs

All circuit components should be on a tray, which can be safely removed without disturbing the supply cabling. The plug/socket for the component tray must connect in the following order earth/neutral/live and disconnect in the reverse order.

Two lead-in tubes approximately 500mm in length suitable for 6.0mm², 3 core cable shall be provided in rear of the bollard base to allow a heatshrink seal between the bollard and the outer cable sheath.

A suitable means of terminating a maximum of 2 incoming 3 core 6.0mm² cables within the base of the bollard shall be provided.

Bollard tops shall be interchangeable with other manufacturers' units.

The Bollard top shall be secured to the illuminated base using four shear pins.

23.39 Traffic Sign Pole

The Traffic Sign Pole is to be manufactured in accordance with BS873 Part 7 (1984) and supplied with the following detail;

- a) A height of 3.25m from ground level to the top of the shaft and a planting depth of 600mm. Door aperture and cable entry hole to be dimensioned and positioned in accordance with BS873 - Part7.
- b) The column shall be protected against corrosion as per Appendix L1.
- c) A chain of 2 mm nominal diameter shall be fitted internally between the door and column. The chain shall be sufficiently long to allow the door to rest on the ground with the column in its operational position.
- d) Earthing terminals shall be provided on the column and door. The earth shall have a minimum 8mm diameter brass earth bolt with 2 brass washers and 2 half nuts and fitted with a distinctly and durably marked metal label marked: - **SAFETY ELECTRICAL CONNECTION - DO NOT REMOVE.**
- e) All steel fixings including chains, locks and associated bolts shall be approved stainless steel or galvanised.
- f) Post Caps shall be manufactured from, steel, plastics and steel caps shall be finished as specified in BS873: Part 6. All open-ended posts shall be provided with post caps. Post caps shall be shaped to shed water to the outside of the post end shall be provided with a means for securing the post cap to the post.