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Specification for Road Works Series 1400 - Electrical Work for Road Lighting and Traffic Signs

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Standards

About TII

Transport Infrastructure Ireland (TII) is responsible for managing and improving the country's national road and light rail networks.

About TII Publications

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Document Attributes

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For all documents that existed within the NRA DMRB or the NRA MCDRW prior to the launch of TII Publications, the NRA document reference used previously is listed above under 'historical reference'. The TII Publication Number also shown above now supersedes this historical reference. All historical references within this document are deemed to be replaced by the TII Publication Number. For the equivalent TII Publication Number for all other historical references contained within this document, please refer to the TII Publications website.

ELECTRICAL WORK FOR ROAD LIGHTING AND TRAFFIC SIGNS

Contents

Electrical Work for Road Lighting and Traffic Signs

1401 General

1 Materials equipment and workmanship required under the Contract shall comply with the National Rules for Electrical Installations published by the Electro-Technical Council of Ireland and in particular the External Lighting Installations requirements and the rules and regulations of the electricity supplier providing the supply. Other relevant requirements are contained in the Safety, Health and Welfare at Work (Electricity) Regulations 1992. The Contractor shall take into account as appropriate Engineering Recommendation G.39 'Model Code of Practice covering Electrical Safety in the Planning, Installation, Commissioning and Maintenance of Public Lighting and Other Street Furniture' and any supplementary reference documents included in Appendix 14/7.

2 The following definitions shall apply:

(i) A Road Lighting Unit shall consist of the following as described in the Contract: column, bracket, wall mounting, Electrical Equipment as defined in (iv) below and wiring excluding electrical supply cable.

(ii) A Lit Sign Unit shall consist of a traffic sign requiring an electricity supply and Electrical Equipment and wiring as in (i) above.

(iii) The term Lighting Unit applies to both Road Lighting Units and Lit Sign Units.

(iv) Electrical Equipment for Lighting Units shall include the following as described in the Contract: luminaires (lanterns for Road Lighting Units), photoelectronic controls (PECs), shorting plugs, lamps, time switches, ballasts, ignitors, starters, capacitors, cut-outs, fuses, fuse holders and miniature circuit breakers (MCBs).

(v) The term luminaire applies to all Lighting Units; however as the term 'lantern' is defined in BS 4533: Section 103.1 as 'a luminaire designed for road lighting' and is used throughout BS 5489, 'lantern' is used in the Specification when only Road Lighting Units are referred to.

(vi) The network is the electrical distribution system installed by the Contractor from the electricity supplier's interface to the Lighting Units.

3 Each network shall operate on a single-phase 230 V or three-phase 400 V, 50 Hz electricity supply as described in Appendix 14/2.

4 The Contractor shall make arrangements and provide facilities for the electricity supplier for the service connections and commissioning of the network.

1402 Site Records

1 When required in Appendix 14/1 the Contractor shall, on the completion of the electrical work, show on a set of drawings or transparencies or other suitable medium supplied by the Employer, the position and identification mark of equipment requiring electrical connections, ducts, underground cables and joints and the type and depth of cables.

2 Locational measurements shall be taken of the underground equipment to the nearest 150 mm from the nearest edge of the carriageway or fence line. Offsets to cables and ducts shall be recorded at 20 m intervals along their line. Offsets shall be defined longitudinally by distance from a permanent highway feature, a marker post or other defined fixed point.

3 The Contractor shall keep a daily record of the work in sufficient detail, including the type and drum number of underground cables, to enable site records to be completed. A copy of the daily record shall be provided by the Contractor on the next working day for retention and use by the Employer's Representative.

4 The Contractor shall supply to the Employer's Representative one master and two prints of the 'as-built' drawings of traffic signal installations immediately upon completion of the installation work.

1403 Location of Lighting Units and Feeder Pillars

1 The position of Lighting Units and feeder pillars is described in Appendix 14/2. The exact location will be agreed on site before commencement of any associated ground work.

The Contractor shall be responsible for recording the actual location.

2 In cases where the location of an item has been determined as indicated above and it is impossible because of underground obstruction to install the item then any excavation shall be backfilled and reinstated to its original condition.

1404 Change of Lighting Arrangements

1 No Lighting Unit shall be switched on or off, dismantled, resited or removed without prior approval of the Employer's Representative.

1405 Temporary Lighting

1 The standard of temporary Lighting Units shall conform to the Clauses in this Series and Appendix 14/3.

2 The Contractor shall ensure that any temporary lighting he provides does not cause glare to traffic using any roadway and minimises obtrusive light affecting occupants of surrounding property and that it complies with the requirements in Appendix 14/3.

1406 Radio Interference

1 Electrical equipment shall be installed so that levels of radio interference given in BS 800 are not exceeded. The recommendations of the British Standard Code of Practice CP 1006 for the control and suppression of radio interference shall be complied with.

1407 Luminaires

1 Where described in Appendix 14/4, luminaires fitted with integral control gear shall have a fuse holder adjacent to the terminal block with a cartridge fuse protecting each set of control gear and also be protected by a fuse fitted externally.

2 Lanterns shall:

(i) comply with BS 4533, and be as described in Appendix 14/4;

(ii) be fitted in accordance with manufacturers' instructions with no gap between the lantern and the shoulder of any bracket arm;

(iii) have degree of protection rating IP 54 to IS EN 60529 unless a higher rating is specified in Appendix 14/4;

(iv) be fitted with a PEC socket located in the canopy unless otherwise specified in Appendix14/4;

(v) meet the structural design and aesthetic approval requirements of Clause 1302.

3 Traffic sign luminaires shall comply with BS 873 : Part 5, Appendix 12/1 and the following:

(i) External lighting luminaires shall be correctly positioned to meet the luminance requirements of the sign.

(ii) Mean sign luminance shall be Category 1 of BS 873 : Part 5 unless otherwise stated in Appendix 12/1.

(iii) Impact strength shall be Category 1 of BS 873 : Part 5 unless otherwise stated in Appendix 12/1.

1408 Lamps

1 Lamps shall be compatible with the luminaires used. Evidence of compatibility may be required by the Employer's Representative.

2 The luminous flux of a lamp after 100 hours of burning multiplied by the lamp flux maintenance factor for the projected lamp life shall be taken as its light output for road lighting design, unless otherwise stated in Appendix 14/4.

3 Lamps shall not be fitted until columns, brackets and sign posts have been erected and the luminaires have been installed.

Lamps for Road Lighting

4 Low pressure sodium vapour lamps shall comply with BS 3767 and high pressure sodium vapour lamps shall comply with IS EN 60662.

5 High pressure mercury lamps shall comply with IS EN 60188.

6 Other lamps as detailed in Appendix 14/4.

1409 Photoelectronic Controls (PECs)

1 Photoelectronic controls (PECs) shall comply with IS 428. They shall have differential switch on – switch off levels as described in Appendix 14/4. They shall be designed where possible so that in the event of a fault occurring in the unit they cause the load to be switched 'on'.

2 PECs shall:

(i) be secured to the:

(a) lantern canopy;

(b) top of pole located close to feeder pillar;

(c) top of sign post;

(d) internally illuminated sign housing;

(e) luminaire of externally illuminated sign;

(f) any other location as given in Appendix 14/4;

(ii) include a delay device to prevent the lamp being switched in response to transient changes in light conditions;

(iii) be indelibly marked with:

(a) the manufacturer's identification mark; and

(b) the model number; and

(c) the switch on level;

(iv) be provided with a gasket or grommet to maintain the required degree of protection;

(v) be installed to the manufacturer's instructions.

3 Except where group switching is involved each lantern shall be fitted with an individual PEC, unless otherwise specified in Appendix 14/4.

4 Where described in Appendix 14/4, circuits shall be group switched as specified therein.

1410 Shorting Plugs (Dummy PECs)

1 Shorting plugs shall:

(i) be interchangeable with PECs;

(ii) have the line and load terminals permanently connected internally; and

(iii) be clearly distinguishable from PECs.

1411 Time Switches

1 Time switches shall:

(i) be electrically or electronically driven;

(ii) have an electrically wound spring or battery reserve of not less than 12 hours unless otherwise described in Appendix 14/4;

(iii) be equipped with a solar dial suitable for the geographic location or equivalent means of setting and seasonal adjustment;

(iv) have 2 switched on/off periods per 24 hours;

(v) be capable of switching a 10 A inductive load current at 230 V.

1412 Ballasts

1 Unless otherwise specified in Appendix 14/4 ballasts shall comply with IS EN 60920 and IS EN 60921 or IS EN 60922 and IS EN 60923 as appropriate and be for 230 V operation.

2 The terminals shall be indelibly marked to indicate all wiring connections.

1413 Ignitors for Discharge Lamps

1 Unless otherwise specified in Appendix 14/4, ignitors shall not be incorporated in the lamps.

2 Compatibility between ignitor, lamp and ballast shall be established to the satisfaction of the Employer's Representative.

3 Ignitors shall be of the timed cut-out type which in the event of a lamp failing to strike shall cut-out after a period of time thereby ensuring protection of the control gear.

1414 Starters for Fluorescent Lamps

1 Starters shall comply with IS EN 60155 and shall be incorporated in the electrical equipment where applicable.

1415 Capacitors

1 Capacitors shall comply with IS EN 61048 and IS EN 61049 and be supplied complete with fixing clips, discharge resistors, and either sealed-in cable tails or shrouded terminals.

2 Capacitors shall correct the lamp circuit power factor to not less than 0.85 lagging.

1416 Cut-outs, Fuse Holders, Fuses and Miniature Circuit Breakers (MCBs)

1 Cut-outs, fuse holders and MCBs shall have moulded drip-proof housings with a minimum degree of protection IP 22 rating to IS EN 60529. Cut-outs shall comply with Electricity Supply Industry (ESI) Standard 12-19 unless otherwise stated in Appendix 14/4.

2 Terminals shall be sufficient in number and adequate in size for the conductors as described in Appendix 14/4. They shall be clearly labelled to differentiate circuits and phases.

3 When fuse holders are intended to be used as isolating devices, special tools or protective measures shall not be necessary to extract them.

4 Fuse links shall comply with the requirements of either BS 88, BS 646 or BS 1361. They shall be of high breaking capacity type and be of a value specified in Appendix 14/4 to protect the circuit.

5 Miniature circuit breakers shall be in accordance with IS EN 60898 and IS EN 60947-2 for use on 230 V single phase supply or 400 V three phase supply as appropriate. Their short circuit current rating and type shall be as described in Appendix 14/4. Thermal or magnetic excess current tripping devices if used shall be provided with a mechanism to ensure that the contact cannot be held closed against a fault.

6 Where MCBs are intended to be used as isolating devices, a 'lock off' facility should be provided.

1417 Base Compartment Fixing Arrangements

1 Electrical equipment described in Clauses 1412, 1413, and 1415 shall be contained in a separate compartment in the lantern housing. Electrical equipment described in Clause1416 shall be installed within the base compartment of the columns and fixed in accordance with manufacturers' written instructions with corrosion resistant fixing screws.

1418 Feeder Pillars

1 Feeder pillars shall be constructed as described in Appendix 14/4. They shall comply with IP 34 of IS EN 60529. They shall include a full size back board of varnished (intumescent) marine plywood at least 15 mm 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 root.

2 The distribution MCBs or fuse boards shall have sufficient spare capacity to accommodate at least one extra circuit. (One three phase spare way on a three phase distribution unit and one single phase spare way on a single phase distribution unit). All components secured to the back board shall be neatly arranged and securely attached ensuring that there shall be at least 25% spare space on the back board.

3 The pillar doors shall be fitted with tamper-proof locks, all locks being identical in pattern and two sets of keys shall be provided, unless otherwise stated in Appendix 14/4. All hinges and locks shall be of stainless steel to BS 6105 or BS 970 : Part 1 unless otherwise stated in Appendix 14/4.

4 Distribution boards where used shall be provided with an external earth, phase barriered and colour coded. 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.

5 Circuit details and labelling shall be provided in each feeder pillar as described in Appendix 14/4.

6 The main earthing terminal in each feeder pillar shall be connected to earth as described in Appendix 14/4.

7 Unless otherwise stated in Appendix 14/4, feeder pillars shall be mounted on a 150 mm thick foundation of mix ST2 concrete. After completion of the cabling the feeder pillar base shall be filled to 25 mm below the door with rounded coarse aggregate conforming with BS 882 graded aggregate 14 mm to 5 mm.

8 A durable warning sign indicating 'Danger 400 Volts' or 'Danger 230 Volts' as appropriate, in 5_cm high letters (or other size as specified in Appendix 14/4), shall be fixed to the front of the pillar where applicable. Each pillar shall have a permanent label fixed externally which identifies it as a public lighting pillar.

1419 Wiring

1 All wiring and installation of components within the column, post or Lit Sign Unit shall be as described in Appendix 14/4 and Appendix 14/5.

2 Unless otherwise described in Appendix 14/4 wiring between the terminal block in the luminaire and the components in the base of the column or sign unit shall be PVC or XLPE insulated and sheathed stranded copper cable to BS 6004 of 300/500 volt grade. Phase and neutral copper conductors shall be not less than 2.5 mm2 in cross-sectional area.

3 Where electronic ignitors are used with remote control gear, single core stranded copper cable shall be used.

4 The final connection between equipment mounted in the base compartment and the cut out shall be made using PVC or XLPE insulated and sheathed single core stranded copper cable of a minimum cross-sectional area of 2.5 mm2.

5 All cables shall be correctly colour coded. Sleeving at terminations is acceptable for this purpose only in the circumstances permitted by the National Rules for Electrical Installations.

6 Unsupported lengths of cable shall be kept to a minimum and shall not be allowed to come into contact with components by their freedom of movement. Where there is more than one cable they shall be secured together at one metre intervals throughout the unsupported length. Vertical cables within posts or columns shall be adequately supported along their length at the top of the cable run.

7 On double bracket columns the wiring shall be as specified in Appendix 14/4.

8 Wiring shall wherever possible be housed inside columns, wall brackets and posts or stiffening members. Where it is external it shall be as described in Appendix 14/4. Connections between conduit and sign housings, switchboxes and other components shall be waterproof and be smooth internally.

9 All unused cores in cables shall be cut to a minimum length, long enough to connect to the furthest working-off point within the unit and shall be cut to equal length. The ends of the cores shall be tied together and sealed with self-amalgamating waterproof jointing tape. The unused cores shall be coiled and strapped in a suitable unobtrusive position and their destinations indicated by a label.

1420 Earthing

1 All earthing and bonding shall comply with the requirements of the National Rules for Electrical Installations and with any additional requirements specified in Appendix 14/4. Circuit protective and equipotential conductors shall be installed as shown on the drawings in the Contract and shall be green/yellow PVC or XLPE insulated or sleeved. Where bolted connections are required, these conductors shall be terminated in accordance with manufacturers' instructions in correctly sized purpose made lugs. Such connections shall be made with non-ferrous nuts, bolts and washers.

2 The circuit protective conductor shall be of equal cross-sectional area to the associated circuit conductor except where it is contained within a composite cable when its cross-sectional area may be reduced as permitted in the National Rules for Electrical Installations.

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

4 A separate circuit protective conductor of not less than 2.5 mm2 cross-sectional area shall connect all metal enclosures of all electrical components to the main earth terminal.

5 All extraneous conductive parts, as described in the National Rules for Electrical Installations shall, where required in these Rules, be bonded to the main earth terminal in accordance with these Rules and as required in Appendix 14/4. Earth electrodes shall comply with the requirements as specified in Appendix 14/4.

1421 Underground and Ducted Cable

1 Unless otherwise specified in Appendix 14/4 cables shall be in ducts and be PVC or XLPE insulated and sheathed, 600/1000 V grade with steel wire or aluminium strip armouring to BS 6346 or BS 5467 or of the type NYCY to VDE 0271. All conductors shall be of equal cross-sectional area when installed in ducts. The Contractor shall provide to the Employer's Representative evidence that each cable length delivered to Site has been tested at the place of manufacture and complies with the testing requirements of the relevant specification.

2 Service ducts shall comply with Clause 501 and Appendix 5/2 and be installed in accordance with Clauses 502, 503, 504, 505, 509 and 512.

3 Cable covers where used for protection of underground cables shall comply with BS 2484 and shall be installed as described in Appendix 14/4. When cable covers are installed, marker tapes are not required.

4 Cable trenches shall be excavated to the lines described in Appendix 14/4 and in accordance with Clause 602. Unless otherwise specified in Appendix 14/4 the depth of excavation shall be such that cables laid under verges, footways or open ground shall have a minimum cover of 600 mm and under carriageways of 750 mm or 300 mm below formation whichever is the greater depth.

5 Cables shall be laid without sharp bends and kinks and in accordance with any particular requirements in Appendix 14/4. If required, additional protection and support shall be provided as described in Appendix 14/4.

6 Where cables are laid across or within 500 mm of filter drains they shall be contained within a duct. The duct shall be surrounded with 75 mm of mix ST2 concrete.

7 Cables following the same route shall unless otherwise described in Appendix 14/4 occupy the same trench with a clearance of 50 mm between the outer sheath of the cables.

8 Power supply cables, other than those associated solely with the communications system, shall not be installed within 500 mm of communication cables, or within 300 mm of telecommunication cables, unless otherwise described in Appendix 14/4.

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

10 Cables shall not be bent to a radius of less than that required by the National Rules for Electrical Installations or less than the radius recommended by the manufacturer, whichever is greater.

11 Sufficient length of cable shall be allowed for its termination. When termination does not proceed immediately following the installation of the cable, its end shall be sealed against the ingress of moisture. If such cable ends are buried, their positions shall be marked with a permanent marker block consisting of a 300 mm square x 225 mm deep precast concrete block having a mark as described in Appendix 14/4 indented into its top surface and recorded on the site records.

12 When duct or trough alignments differ from those of the trench the transition from one to the other shall not exceed 1:30 horizontally or vertically.

13 Cables laid directly in trench shall, unless otherwise specified in Appendix 14/4, be both bedded on and covered by a 100 mm thickness of lightly compacted graded sand or equivalent material passing a 2 mm BS sieve. Class 8 material complying with Table 6/1 and compacted to the requirements therein shall then be deposited to a thickness of 175 mm prior to further backfilling in compliance with sub-Clause 16 of this Clause.

14 A yellow, self-coloured PVC or polythene plastic tape for cable marking, not less than 0.1 mm thick and 150 mm wide with the wording "Street Lighting Cables Below" printed along the full length so as to occupy not less than 75% of its available length and occurring at least at 1 m intervals, shall be laid approximately 250 mm above any power supply cable. Where several cables are laid in one trench, only one line of marker tape need be installed.

15 Where cables are required to be laid in ducts the Contractor shall swab through the duct prior to drawing in the cables and a further draw rope. On completion of cabling, ducts shall be left with a draw rope in place and re-sealed with split plugs, or suitable alternative material, to adequately seal the ducts against the ingress of foreign matter. Where cables are laid in troughs they shall be covered with sand, or equivalent material, passing a 2 mm BS sieve up to the level of the cover.

16 Backfilling to cable trenches shall comply with Clause 602 and shall whenever practical be undertaken immediately after the specified operations preceding it have been completed. The Contractor shall backfill above the cable marking tape, duct or trough with Class 1 or 2 material complying with Table 6/1 and compacted to the requirements therein, except that he shall:

(i) spread and compact the material evenly without dislodging, disturbing or damaging cables, ducts or troughs; and

(ii) not use power rammers within 300 mm of cables, ducts or troughs.

17 Where described in Appendix 2/2, buried cables shall be taken up and removed by the Contractor. Conductors shall be disconnected from the equipment in which they are terminated, the terminal screws and glands retightened, and the cable withdrawn clear of the equipment.

18 Unused cores in cables shall be dealt with as described in sub-Clause 1419.9.

19 Unless ducts terminate at cabinets or mounting posts or columns, their ends shall be marked as described in Appendix 5/2, with marker blocks complying with sub-Clause 11 of this Clause and location posts so that their location can be clearly identified without exploratory excavation.

1422 Cable Joints

1 Joints shall be made using jointing kits complying with BS 6910 : Part 1 which shall be installed in compliance with BS 6910 : Part 2.

2 Prior to any cable laying, the Contractor shall furnish to the Employer's Representative evidence of the jointer's competence in the use of the adopted cable joint kit. A record shall be kept to enable cable joints to be identified with the jointer responsible for the work.

3 Cable joints shall be made only where described in Appendix 14/4. The approval of the Employer's Representative is required for the provision of additional joints and they shall not be used for cables situated in a duct or trough.

4 The Contractor shall notify the Employer's Representative before jointing commences so that he may have the opportunity of inspecting the whole of the jointing operations. Jointing shall only be carried out when all materials to be used in the jointing are free from visible signs of moisture and joints shall be left protected from the weather during the curing period.

5 Joints shall be adequately supported at all times. Backfilling shall not take place until the completed joint is in a fit condition to withstand any stresses which may be imposed upon it.

6 Where described in Appendix 14/4, a cable joint marker block, as described in sub-Clause 1421.11 shall be placed over the cable joint.

1423 Cable Terminations

Cables Protected by Steel Wire Armouring

1 Cables protected by steel wire armouring shall comply with the following:

(i) Cables shall be individually terminated and secured at switches, cut-outs and other electrical apparatus by means of an armour securing clamp or an aluminium compression type gland complying with BS 6121 : Part 1 and a gland plate, all as described in Appendix 14/4.

(ii) The armour securing clamp or compression gland and plate assembly shall incorporate at least one non-ferrous earthing terminal.

(iii) All glands shall be shrouded overall with PVC sleeves and the conductor shall be terminated with cable lugs.

(iv) An anti-oxidant mastic or paste protective coating shall be applied to all aluminium conductor terminals where they are exposed to the atmosphere.

(v) Phase connections shall be clearly indicated by an agreed colour marking system as required by the National Rules for Electrical Installations.

Cables Protected by Copper Screening

2 Cables protected by copper screening shall comply with the following:

(i) The outer sheath installation shall be stripped back as far as necessary to terminate the conductors.

(ii) Protective copper screening conductors shall be teased out and neatly braided and terminated using a non-ferrous crimped-on cable lug which should be connected to the lighting column earthing stud.

(iii) Phase connections shall be indicated as described in sub-clause 1423.1 (v).

(iv) The terminations of each cable shall be protected by a heat-shrink sleeve extending from the original outer sheath to the individual made-off conductors. This sleeve shall extend over the outer sheath and the individual conductor by at least 50mm.

1424 Inspection and Testing to be Carried Out by the Contractor

1 Every Lighting Unit, and network on completion and before being energised, shall be inspected and tested to verify that the requirements of the National Rules for Electrical Installations have been met. The method of testing shall be such that no danger to persons or property or damage to equipment can occur even if the circuit tested is defective.

2 The following tests shall be carried out in the sequence indicated below and recorded on a Schedule, the format of which shall be agreed with the Employer's Representative, and, unless otherwise agreed, be submitted to him immediately after completion of all the tests, including those on Lighting Units, within each network:

(i) For Lighting Units (b), (d), (f), (g) apply.

(ii) For networks (a), (b), (c) (where necessary), (e), (f), (g), (h), (j), (k) apply.

Standard methods of testing are given in the National Rules for Electrical Installations. The details of testing shall be agreed with the Employer's Representative.

(a) Cable sheath insulation test.

(b) Continuity of protective conductors including main and supplementary equipotential bonding.

(c) Earth electrode resistance.

(d) Insulation resistance at a test voltage of 500 V to be not less than 1.0 M ohm.

(e) Insulation resistance at a test voltage of 500 V to be not less than 6 M ohm.

(f) Insulation of the site-built assemblies.

(g) Polarity, including the continuity of circuit conductors.

(h) Earth fault loop impedance at every cut-out.

(j) Operation of residual current devices.

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

3 The Contractor shall give not less than 7 days' notice to the Employer's Representative of his intention to carry out any of the tests specified and the Employer's Representative shall be given the opportunity to witness such tests.

4 The Contractor shall furnish the Employer's Representative with two copies of a certificate verifying compliance with the relevant National Rules for Electrical Installations upon satisfactory completion of the inspection and tests.

1425 Preparation and Finish of Metal and Other Surfaces

1 Preparation and finish of enclosures and fixings shall be in accordance with the requirements in Appendix 14/6.

1426 Inspection and Testing to be carried out by the Contractor - Photometric Testing

Inspection and Testing to be carried out by the Contractor - Photometric Testing

1 The Contractor shall verify the performance after all lamps have operated for a minimum of 100 hours by taking illuminence [Lux] measurements on the road surface after dark over not more than 10% of the total road length at locations to be agreed in writing by the Employer's Representative [Specialist responsible for the design of road lighting]. The Contractor shall take a range of the representative measurements at each location chosen, and record the results in an agreed format.

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