

Table - Minimum co-efficient of Retro-reflection (RA)

Candelas per Lux per Square metre

Minimum co-efficient of Retro reflection is given in below

Observation Angle	Entrance Angle	White	Green
0.1	-4	400	56
0.1	30	120	13
0.2	-4	250	35
0.2	30	80	9
0.5	-4	135	17
0.5	30	55	6.5

2.6 Aluminum Target Board

Target boards shall be fitted to each signal head supplied. The target boards shall be constructed using type 5005 aluminium alloy with a minimum thickness of 1.6 mm.

2.7 Supply and install LED luminaire to light up the pedestrian crossing including wiring and controls as per the specifications.**Description**

Work shall consist of supplying and fixing LED fittings in accordance with these Specifications and with the details shown on the drawings or as directed by the Engineer and shall be approved prior to the installation.

The work shall also include installation of Connector boxes inside columns, connect power supply to lights and control gear using 3x1.5mm²Cu/PVC/PVC and all necessary fixtures and fastenings, brackets, testing and all the process necessary to complete the work.

The offer shall comprise the following components.

- LED light Fittings
- Connector boxes inside columns with 6A 2P MCB
- Three core cables 3x1.5mm²- min. 10m per pole
- All accessories for fixing

APPROVED BRANDS

All equipment shall be reputed branded and purchased from local agents. Approved brands are as follows.

- MCCB/MCB's/ RCDs (Moulded Case Circuit Breakers/Miniature Circuit Breakers)

Hager, Merlin Gerin, ABB., F & G, Moeller, Cabtree, or equivalent purchased from local agent.

- Surge Protective Device

Hager, F & G, ABB or equivalent purchased from local agent.

- Internal/ underground Cables

ACL, Kelani or equivalent

- Feeder pillar Enclosures

Elsteel, K.I.K. Lanka (Pvt) Ltd, Pubudu Engineering (pvt) Ltd, Richardsons Projects (pvt) Ltd, Bentota Power Generators (Pvt) Ltd, OS Project (Pvt) Ltd. (Orange) or similar product

- Contactors

Merlin Gerin, ABB, Telemecanique or equivalent purchased from local agent.

- Cable Glands:

Comet, Hensel, Comex or equivalent purchased from local agent.

- Timer

Grasslin or equivalent

2. LIGHT FITTINGS

Completeness of fittings shall include LED drives, luminaries, fixing accessories etc.

2.1 SYSTEM PARAMETERS AND SERVICE CONDITIONS

1. Nominal Voltage – 400/230V
2. System Highest Voltage – 415/240V
3. System Frequency – 50 Hz
4. Average Ambient Temperature – 300C
5. Maximum Relative Humidity – 90%

2.2 APPLICABLE STANDARDS

- A. IEC 60598-1:1999 – Luminaire –General Requirements and Tests
- B. IEC -2-3:1999 –Particular Requirements – luminaires for Roads and Street lighting
- C. IEC/PAS 62722-1:2011 – Luminaire Performance –Part 1: General Requirements
- D. IEC 62031:2008 – LED modules for General Lighting – Safety Specifications
- E. IEC 62384:2011 – DC or AC supplied electronic control gear for LED modules – performance Requirements
- F. IEC 60529:2001 – Degrees of Protection provided by enclosure (IP code)
- G. IEC 61000-4-4: 1995 – electromagnetic Compatibility (EMC): Testing and Measurement technics – Electrical fast transient / burst immunity test
- H. IEC 61000-4-5: 1995 – electromagnetic Compatibility (EMC): Testing and Measurement technics – Surge immunity test
- I. IES LM-79-08 – Approved Method: Electrical and Photometric Measurements of Solid State Lighting Projects
- J. IES LM-80-08 – Approved Method: Measuring Lumen Maintenance of LED Light Sources
- K. EN 13201 - Road lighting

2.3 TECHNICAL REQUIREMENTS

2.3.1 Requirements of the Luminaire

Luminaire	Minimum Useful Output (Lumens)	CCT (K)	Colour Rendering Index
LED	5000	4,000-4,300	70 or more

1. LED luminaires shall be as follows.

Photometric distribution shall be sufficient to cover the pedestrian crossing and the footwalk of both sides of road. The useful output of lumens to input power ratio shall be more than 120. Average light level in the road shall be 50lux and uniformity (lowest to the average) ≥ 0.4 shall be proven through a software before installation (earned through two fittings per crossing). The luminaire shall be proposed considering the applicable standards. Glare ratings shall be taken in to consideration as per the applicable standards.

2.3.2 LEDs

- LEDs made to LM-80 and high resistance to temperature and UV

- Average minimum life time of the fixture shall not be less than 50,000hrs
- Lamp lumen depreciation of LED lamp shall be 70% for the average expected life time
- Fixture should be equipped with specially designed heat sink to meet the excellent performance, durability and efficiency of LED

2.3.3 Luminaire Housing and Refractor

1. Support Housing: Shall be made of die-cast aluminum (or appropriate) shielded with protective coating(s) and shall comply with requirements of IEC 60598-2-3 in conjunction with IEC 60598-1, such that adequate resistance to dust and moisture, impact/vibrations and corrosion is achieved.
2. Lens (clear front cover): Flat optic cover made from injected molded high impact acrylic plastic or tempered glass and shall be impact resistant.
3. Color of the body: Gray

2.3.4 Lamp Control Gear

1. Power Factor shall not be less than 0.95
2. Total Harmonic Distortion shall be complied with IEC 61000-3-6(Harmonics)
3. The lantern control gear shall fully comply with IEC 60598-2-3 in conjunction with IEC 60598-1 and IEC 6137-2-1 and all its inclusive parts referring specific control gear (as applicable)
4. Control gear shall also comply with performance requirements specified in IEC 60923 and/or IEC 62384 as applicable. It's also comply with IEC 60342-2.

The driver or lighting module(s) should be able to independently replace without damaging the luminaire.

6. The proposed control gear shall be complied with EN 55015 for radio disturbances, and all other requirements.

2.3.5 Protection

1. Protection against surges: Surge protection devices shall be provided to protect against surges up to 6kV (class II)
2. Ingress Protection : IP66

2.3.6 Plug and Connector Socket

A readily accessible IP 65 plug and socket with the 'Live' and 'neutral' connections clearly and indelibly marked shall be provided. Both male and female connector shall be supplied with 3 core copper insulated wire as per the BS standards with minimum 1.5mm² cross section.

2.3.8 Information to be supplied with the Offer

1. Details which are necessary to ensure proper installation, use and maintenance and detailed product catalogues in English specifying the reference numbers for products quoted shall be furnished with the offer
2. All details in English necessary to ensure proper installation use and maintenance of luminaires and control gear.
3. Instructions related to safety in English
4. Complete dimensional drawings
5. Technical details including following but not limited to the following:
 - Photometric Measurements (Rated lumens, intensity distribution(polar curves), intensity table for horizontal and vertical angles, zonal lumens)
 - Colorimetric Measurements(CCT, CRI)
 - Electrical Measurements (test voltage, test current, efficacy, lamp wattage, power factor)
6. Life test reports
7. Lumen depreciation curves
8. Duly filled schedules of technical/non-technical particulars for the luminaire
9. Evidence of performance with regards to manufacture, supply and utilization of the particular luminaire technology in large scale projects
10. ISO 9001:2008 quality assurance certification

2.3.9 Sample

One sample shall be submitted as per the requirement. Failure to supply a sample shall be a cause of rejection of the offer.

2.3.10 Inspection and Testing

All light fittings shall be subjected to inspections after delivery and randomly selected sample(s) from the lot will be tested to any of above requirements if requested in an accredited independent testing laboratory which is acceptable. Cost pertaining to the testing shall be borne by the supplier.

3. INSTALLATION

Luminaires shall be fixed to the signal light arm of the traffic signal pole to light up the pedestrian crossing. The bidder shall facilitate the mounting of the luminaire to the traffic signal pole's arm and prior approved by the Engineer.

The manufacturer shall provide a means of ventilating the structure poles at the top to allow a flow of air through the poles to keep the interior of the poles dry. Ventilation shall be placed in a location wherein it will not be visible from normal viewing angles.

3.1 Internal Wiring

Internal wiring in between the terminal block in the lamp and the components in the base of the mast shall be PVC insulated and sheathed cable of 300/500V grade, manufactured to BS 7671:2001. All cabling inside the lighting mast shall be of double insulated Cu/PVC/PVC conductor cable of minimum cross section of $3 \times 1.5 \text{mm}^2$ -10m per pole-for the connection between the light fitting and its individual protection 6A 2P Miniature Circuit Breaker.

3.2 Connector Boxes

All cable termination accessories required by the wiring shall be contained within the mast together with the terminals for same, earthing lug and the 6A 2P Miniature Circuit Breaker protecting the lamp circuit. The equipment, completely wired and mounted on a separate mounting board shall be included inside a connector box.

Connector Boxes should be rust free, water tight, dust proof enclosures suitable for coastal areas, with provisions for cable connecting by means of 60A Bakelite connectors. Class of protection should be IP65.

If an insulating material is not used to fabricate connection boxes, each box should be mounted on a board, made of class I timber and bolted to the pole.

Each light shall be connected to the earth inside each connection box and then earthed well using earth electrodes, 50mm dia. GI pipe of length 1800mm. Number of rods required to obtain the necessary resistance shall be determined by the contractor. Testing of earth resistance after installation shall be done by the contractor in the presence of the project Electrical Engineer/Technical officer. All costs for testing shall be borne by the contractor.

All internal wiring shall be according to IEE Wiring Regulations: 18th Edition or latest.

4. OPERATION

General

The luminaires shall be controlled by a timer switch and photo cell to on and off. The required space for the control circuit shall be decided by the bidder since the control circuitry is to be mounted inside the same feeder pillar which controls the signal lights.

4.1 Equipment to Install

4.1.1 Contactors

AC contactors should be suitable for frequency 50/60Hz, rated operation current 50A TP under AC-1 duty. Should be suitable for making/ breaking electric circuits at a long distance. Relevant standards are IEC60947-4-1 & GB14048.4.

4.1.2 Miniature Circuit Breakers

Miniature Circuit Breakers shall be in accordance with BS EN 60898 and BS 4752 for use on 230V single phase supply of 400V three phase supply as appropriate. Minimum short circuit current rating shall be 10kA and they shall be type C or equivalent. Current Rating should be Single Phase 16A

4.1.3 Rotary Switch

The power switching to the lamp circuits to be possible by following three methods.

- Programmable timer
- Manual operation
- Photo-electric device (if connected)

Each of the above modes shall be selectable by means of a rotary switch located within the feeder pillar.

4.1.4 Timer

These shall be of Analogue type conforming to relevant international standards and with maximum protection.

Timers shall have,

- An analog interface(Clock face)
- Ability to program daily
- Minimum setting unit: 15 minutes

Time range: 24 hours

Switching Capacity: 16A, 250V AC

- Approximate Lamp load: 1.3W
- Approximate Power Consumption at 230V(AC): 2VA
- Battery backup with quartz version of 150 hours
- Battery charging Time: 70 hours
- Protection Class: II
- Standards: EN 60730-1, EN 60730-2-7

And work under,

- Rated voltage: 230A AC, 50 Hz/130V DC

4.1.5 Internal Wiring

All cable termination accessories required by the cable loop-in, loop-out method of wiring shall be contained within the Feeder Pillar together with the terminals for same and the Circuit Breakers protecting the system. The equipment, completely wired with cables of suitable size and mounted on a separate mounting board shall be included in the Feeder Pillar. Internal wiring shall be PVC insulated and sheathed cable of 300/500W grade, manufactured to BS7671:2001.

5. WARRANTIES

Manufacturer Warranty for LED lamps shall be minimum 5 years comprehensive and for all other accessories should be minimum one year from the date of acceptance. Bidder shall furnish a warranty ensuring replacement of any or all parts of the proposed luminaires beyond the above mentioned manufacturer's warranty period within one month.

3.0 General Requirements

- 3.1 All equipments shall be supplied in new condition except in so far as it has to be tested in the course of manufacture.
- 3.2 Vertical & horizontal poles should be as per the drawings provided.
- 3.3 For all equipments an acceptance test shall be carried out prior to installation.

- 3.4 These tests which shall be conducted at the site shall be in accordance with accepted good practice and all to the satisfaction of the Engineer.
- 3.5 Installation and commissioning will be carried out at the site as specified in accordance with accepted good practice and all to the satisfaction of the Engineer.
- 3.6 All Equipments shall be suitable for the climatic conditions and use of public roads in Sri Lanka.
- 3.7 Technical Specifications of the all items should be submitted by the bidder with tender document.
- 3.8 All vertical and horizontal mounting traffic signal heads should supply and install by the contractor. Drawing and specifications attached.
- 3.9 All the brackets for installation of traffic signals should be supplied by the contractor.
- 3.10 Selected contractor should maintain the newly installed signal light units free of charge for one year period from the date of commissioning and especially pedestrian detection camera system should maintain free of charge for two year period as mentioned in **section 2.3.**
- 3.11 The system should be state of the art with microprocessor controlled architecture along with solid state switching techniques. The Controller should have industry standard techniques with compatible software to operate/maintain the system. Amature Controllers using devices such as Programmable Intégrated Circuits (PICs) are not acceptable since they could not be maintained by a third party. The Controller should be either Internationally Standard Branded Controllers or designed with Programmable Logic Controllers (PLCs) with manufactures software.

The construction of the controller housing shall be in accordance with the requirements of BS 505:1971. The control panel box shall be securely fixed to a concrete foundation such that the cabinet is aligned true to the vertical and cannot be rocked from side to side. The panel shall be weatherproof with steel housing and shall be locked with a Warning sign displayed on the door. Control Panel Cabinet shall give access to control equipment unit, main power supply unit, solid state relay units (SSR) etc.

- 3.12 The signal sequence should comply with the current pattern operating in Colombo and the basic features of the system including heads should comply with international standards.
- 3.13 The cantilevered 3 aspect signal heads should have a diameter of 300mm. (Red/Amber/Green)
The pedestrian Red Man / Green Man heads should also be 300mm.
All the heads should be with low power and high bright LEDs.
- 3.14 All the system parameters in the system should be able to control via a Lap Top Computer or by Hand held terminal.

- 3.15 Rugged push button units should be installed.
- 3.16 Staging/ Phasing patten changes -
The proposed controller should have the facility to alter/amend the staging/phasing pattern upon installation at site. It is preferable that this to be done at site on low traffic hours while the controller is running on standby mode. The necessary software for this purpose should be handled over to CMC free of charge.
- 3.17 The hardware and software should be able to facilitate flashing Amber facility with the signals.
- 3.18 Count down heads should be fixed with secondary heads on cantilever poles on each arm. Count down timing should be displayed during the red time and the green time.
- 3.19 Cables – The underground multi core cables should be armored type with 1.5 – 2mm² copper conductors. There should be an electrical termination top cap on top of each pole for the case of maintenance of Traffic Signal heads.
- 3.20 Electrical Installation shall comply to BS 7671:2018 requirements for Electrical Installations IET wiring Regulations.
- 3.21 Tenderer should submit his past experience in the similar types of projects. Following information should be submitted with the tender.

- Name of project
- Place of the project
- Letter of acceptance
- Total value of the project
- Letter of recommendation

3.22 As Built drawings, all related software, programmes shall be submitted, after completion of the project.