

## **SPECIAL CONDITIONS FOR STREET LIGHT WORK**

1. The work of the streetlight section shall be carried out by Electrical Contractor having “C” Class and above Registration holder from Gujarat State R & B/PWD/MES/CPWD/ANY OTHER STATE PWD/Municipal Corporation/other local government authorities are eligible to quote for this tender. The firm must possess valid electrical contractor’s license issued by Energy and Petrochemical Department, Government of Gujarat. Electrical Contractor having similar work experience and have to submit all documents like Registration certificate, License and Insurance policy of the man power engaged by Electrical Contractor for the New LED Street Light Works the streetlight work to the **GIDC** prior to starting the work.
2. The contractor should quote the rate of each items inclusive of all prevailing duties and taxes, i.e. GST, Excise duty, Octroi, Sales Tax / VAT on works contract / works contract tax, service tax, service charges, etc., as applicable and are deemed to be included in the rate of each item. The Contractor should mentioned the present rate of GST, Excise Duty, VAT, Service Tax, Service Charges, etc, considered in the rates quoted by him separately for each item invariably. Any statutory variation in the present prevailing taxes and duties shall be borne by the contractor during the entire contract period including extended period if any.
3. Any item of work, either supply or erection of materials which have not been specifically mentioned in this specification and drawing but are necessary to complete the work for trouble free, efficient operation and guarantee performance of the entire System offered shall be deemed as included within the scope of this specification and shall be provided by the contractor without any extra cost to the owner.
4. The contractor should note that rates of New LED Street Light Works with allied accessories should be quoted considering consumables being used and man power required for Maintenance under Five (05) Years Free comprehensive Guarantee period & Five (05) Years Operation at Chhapara, GIDC Estate, District – Rajkot, Gujarat.
5. Consumables/ Spares like LED Luminaire/Lamp, Lamp holder, Surge Protector, Driver, Wire, Cable, Gland, lugs, LED streetlight fixture, bracket, Foundation Bolt, junction box, Allen Key, Cover, MCB, MCCB, Time Switch and allied accessories etc. required for the replacement during day to day routine preventive maintenance under Five (05) Maintenance under Five (05) Years Free comprehensive Guarantee period & Five (05) Years Operation at Chhapara, GIDC Estate, District – Rajkot, Gujarat shall have to be provided by the Contractor at his cost.
6. **GIDC** shall make the payment of Energy Bill only. The agency has to make the arrangement for collecting the Energy bills from the concerned power supply authority and have to hand over the same to concerned officials of **GIDC** for the timely payment of Energy Bills.

7. Any charges due to late payment of energy bills, Power factor adjustment charges (penalty) due to poor power factor or any other levies imposed by the power supply authority shall be by the contractor and recovered from the performance bond/ S. D. / dues if any of the Contractor.
8. The contractor has to engage the required qualified and experienced duly insured man power for the day to day routine maintenance. The contractor has to make the arrangement for the Complaint Centre with communication facility for registering the day to day complaints/ faults/ non-working of streetlights.
9. The contractor has to maintain the complete history of Complaint Register and has to furnish the Daily/Weekly/Monthly report (Format Attached) to Department to assess the status of performance of streetlights.
10. On completion of Five (05) Years Free comprehensive Guarantee period & Five (05) Years Operation at Chhapara, GIDC Estate, District – Rajkot, Gujarat at the time of handing over, the contractor shall have to hand over all i.e. 100% LED Street Light Works with allied accessories in working conditions to GIDC/ Owner.
11. The contractor has to carry out the numbering to the each streetlight pole (Pole-Road-SP wise) and allied accessories at his cost with good quality of enameled Aluminum/ Silver paint as directed by Engineer In charge/ GIDC Officials.
12. Any damage caused to LED Street Light Works with allied accessories due to accident will be replaced with accessories by the contractor at his cost during the Five (05) Years Free Comprehensive maintenance guarantee period.
13. Insurance against any injury to person/ man power and damage to the property :

The Contractor shall insure against each liability for any loss, damage, death or bodily injury which may occur to any physical property (Mechanical, electrical, automation work) or to any person which may arise out of the Contractor's performance of his obligations under this condition during the contract period.

This insurance shall be for a limit of per occurrence of not less than the amount, with no limit on the number of occurrence, insurance for contractor's personnel The contractor shall effect and maintain insurance against liability for arising from injury, sickness, disease or death of any person employed by the contractor or any other of the Contractor's personnel i.e. " All RISK TYPE POLICY"

The employer shall also be indemnified under the policy of insurance, except that this insurance may exclude losses and claim to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel.

The contractor shall have to take insurance for items of streetlights as well as qualified and experience man power, semi skilled and un-skilled labour compulsory. The same should be taken by the contractor as per labour act laws in force. "ALL RISK POLICY "of man power

employed by the contractor as approved by Engineer in Charge should be taken on Account of **GIDC**.

Contractor shall provide the wheel/vehicle mounted ladder, Crane and necessary equipments at site for day to day routine maintenance of LED Street Light Works with allied accessories during Five (05) Years Free Operation & Maintenance at Chhapara, GIDC Estate, District – Rajkot, Gujarat.

**General:**

The scope of the works covers Design, manufacturing, factory testing, supply, delivery to site, unloading, handling and storage at site, complete installation including cement concrete foundation and supporting steel structure wherever necessary, final checkup, painting, performance testing and commissioning including Five (05) years Comprehensive Maintenance Guarantee Period contract with required manpower and related electrical equipments and other required accessories to be supplied under these specifications. The scopes also include first filling of consumables and satisfactory performance of all equipment provided in the price schedule.

All the equipment and accessories shall be manufactured as per the regulations, relevant updated International & Indian standards and specifications. The equipments / materials shall be selected and procure from the approved vendor only.

The contractor shall have to arrange inspection and testing of the equipment/ materials as per the Indian Standard specifications or equivalent at his cost. During the inspection, the OEM shall have to provide traceable certificates (of authorized bodies) of test and calibration instruments/ equipment's that are used for testing of instruments.

The following Test Certificate/Testing shall be provided.

- Certificate of calibration with its accuracy and uncertainty
- Certificate of standard and classification
- MOC certificate of instruments and its parts.
- Required Certificates (As per Technical Specification)
- Required Type / Routine/ Acceptance/Mock /Site Testing (As per Technical Specification)

The equipment shall be installed as per the instruction of respective manufacturer of equipments and approved by the owner.

The contractor shall have to submit a completion certificate of electrical license holder for installation of electrical equipments for inspection of installation to release power supply connection by concern power supply authority.

On completion of work, the contractor shall have to submit As-built drawing which indicating the complete road wise and phase wise installation of the street Light Works with allied accessories in Soft (Autocad) as well as Hard Copies (5 Sets of A0/A2 Copies) to **GIDC**.

**Documentation Required:**

- 1) Within 30 days after issue of an acceptance letter, the contractor is required to submit bar chart for showing planning and progress of work.
- 2) The design and lighting layout showing lighting poles, section pillar location as per required Lux level shall be submitted by the contractor to Engineer In charge within 30 days of acceptance of tender. All queries / remarks raised by the Engineer In charge with respect to the contractor's design shall be complied by the contractor within 15 days.

**Record Drawing :**

"As-built drawing for the same project shall have to be submitted by the contractor in Five (5) sets with reproducible soft copy on CD to **GIDC** within **One (01) month** after completion of work.

**INSPECTION OF MATERIALS BEFORE DISPATCH AT SITE :**

- No materials shall be dispatched without inspection, accepted and prior approval of the authorized representative of the Department. Inspection charges, to & fro charges, lodging & boarding charges, if any, shall have to borne by the contractor.
- All fabricated, manufactured items, equipments, etc. shall be subjected to inspection and tests as per the relevant standards at the manufacturer's works prior dispatch.
- Bidders shall give notice of two weeks to the Engineer-in-charge who may depute his representatives at his option to witness such tests.
- All inspection call must be placed on manufacturer's letter by authorised signatory (Quality control) duly stamped, clearly indicating qty. offered for inspection and evidence of readiness of materials. Sales / marketing / irrelevant department's letter will not be considered.
- It shall however, be the bidder's responsibility to supply all materials as per specifications, standards mentioned herein and inspection by the clients does not relieve the contractor from his all obligations.
- Bidder has to arrange for air travel ticket (if required), railway ticket, minimum two tier A.C., transportation, lodging and boarding and any other relevant expense for the team of GIDC/TPQA. Bidder has to quote appropriately for the same in price bid on per visit (across India) basis.

- If, first testing, on any ground fails and, retesting is required, in such case, entire expenditure for retesting shall be in bidder's account. a. The Contractor shall provide at all times during the progress of the work and also during the defect liability period proper means of access and required attendants to move and arrange things as directed for the purpose of inspection or assessment of the work by the GIDC or its authorized representative.
- All Works embracing more than one activity shall be subject to examination and approval at each stage and the contractor shall give due notice in writing to the Engineer-in Charge when each stage is ready. In default of such notice, the Engineer-in-Charge shall be entitled to appraise the quality and extent thereof.
- No work shall be put out of view by the Contractor without the approval of the Engineer-in-Charge and the Contractor shall afford full opportunity for the examination and assessment of any work which is so considered. Similarly, no work involving pre- assessment shall be taken up without a specific authorization by the Engineer-in-Charge. The contractor shall give a notice of not less than 2 days but not more than 4 days, in any case, in writing to the Engineer-in-Charge whenever any work or equipment is intended to be covered up in the earth or in walls or otherwise to be placed beyond the reach of assessment so that the work may be inspected and verified by the Engineer-in-Charge or that the correct dimensions may be taken before being so covered up. The Engineer-in-Charge shall, without unreasonable delay, unless he considers it to be unnecessary and advises the Contractor accordingly, attend for the purpose of examining and assessing such work or materials intended to be covered up. In the event of the failure on the part of the contractor to give such notice, such work/equipment shall be uncovered, if required, by the Engineer-in-Charge at the expense and cost of the Contractor.
- The Contractor shall uncover any part of the Works and/or make openings in or through the same as the Engineer-in-Charge may from time to time direct for his verification and shall reinstate and make good such part to the satisfaction of the Engineer-in-Charge. However If any such part has been covered up or put out of the view after being approved by the Engineer-in-Charge and is subsequently found on uncovering, to be executed in accordance with the Contract, the cost and expense of uncovering and/or making openings in or through reinstating, making good the same shall be borne by the GIDC. In any other case all such costs and expenses shall be borne by the Contractor.

**Quality Assurance / Quality Control Program:**

The contractor shall include in his offer the quality assurance program containing the overall quality management and procedure which is required. The contractor shall establish document and maintained an effective quality assurance system.

The owner / consultant or their representative reserve the right to inspect / witness, review any or all stages of work at shop / site as deemed necessary for quality assurance.

**Safety of materials:**

The contractor shall provide proper and adequate storage facilities to protect all the materials and equipments including those issued / out items in contract **GIDC** against damage, theft from any cause what so ever.

**Care of the works:**

From the commencement to virtual completion of the work, the contractor shall take full responsibility for the care for all works including all temporary works and any damages, loss or injury shall happen to the works or to any part thereof to any temporary works from any cause whatsoever, shall at his own cost repair and make good the same, so that at completion of the work shall be in good order and in conformity in every respects with the requirements of the contract and the **Engineer In Charge's** instruction.

**Five (05) Years Free comprehensive Guarantee period & Five (05) Years Operation & Maintenance at Chhapara, GIDC Estate, District – Rajkot, Gujarat for Street Light Works with allied accessories:**

1. The Comprehensive Maintenance of LED Street Light Works with allied accessories shall be carried out by the contractor for Five (05) years with all required spares, consumables, qualified and experienced man power, tools & tackles required to maintain the average 100% working.
2. GIDC shall not provide any material, labour, tools & tackles, ladders during the Five (05) years comprehensive maintenance period.
3. The contractor has to submit the daily, weekly and monthly report for the working of streetlights to GIDC as per Format mentioned in Tender.
4. Payment of monthly energy bill will be paid by GIDC. If the penalty imposed by the DISCOM (Power Supply Company) for YEARLY MINIMUM CHARGES considering 2200 Units per KW due to non- maintained the LED Street Light Works with allied accessories in average working condition the same shall be recovered from the contractor's dues/ bill.

5. The contractor shall have to provide wheel/ vehicle mounted ladder having suitable sliding length, Lifting Arrangement, crane for maintenance of LED Street Light Works with allied accessories.
6. The contractor shall have to cover insurance of engaged man power and all items / equipments installed/ stored against theft, accident, earth quick cyclone any natural calamity, etc. till streetlights are handed over to Owner.
7. Contractor should provide well qualified and experienced man-power for the Maintenance & Repairing of LED Street Light Works with allied accessories.
8. As this is a LED Street Light Works with allied accessories and required to run 100% working efficiency (number basis) through out the month shall be maintained by the agency. The weekly checking will be carried out jointly. At that time, the contractor has to depute his representative. The average working efficiency will be calculated on that basis. If contractor fails to depute his representative for weekly inspection, then the department will carry out the inspection and the performance shall be binding to the contractor. For daily routine maintenance the contractor should arranged required sufficient skilled / technically qualified man power at his cost. The **GIDC** should not pay any extra cost / charge for daily routine maintenance. Any charges levied / imposed (P.F etc) by the power supply authority, the same shall be deducted from the deposit / performance bond of the Contractor.
9. The LED Street Light Poles Works with allied accessories shall be repainted by enameled/Aluminum silver paint at every year or as per the instruction of **Engineer-In-Charge** by the contractor.
10. The contractor has to attend the fault / non-working streetlights within 48 hours. If the contractor is failed to attend the fault / non-working LED Street Light Works with allied accessories the compensation at the rate Rs.100/- per pole shall be recovered by GIDC.
11. In case of any electrical fault in panel during the contract period, if the contractor fails to repair or replace the electrical parts within 6 hours, GIDC shall recover the penalty of **Rs.1000/- per day** till fault is rectified.
12. The contractor, at his own cost during the **Five (05) Years Free comprehensive Guarantee period & Five (05) Years Operation & Maintenance at Chhapara, GIDC Estate, District – Rajkot, Gujarat** will replace any damage cause to the LED Street Light Works and its allied accessories.
13. **Special Note:**
  1. This is a Complete SITC work. If any items / work required be executed, but not mentioning in the scope of work shall be carried out by the agency for which no extra payment shall be made by the GIDC.

2. The material shall be supplied as per the make/brand given in the Annexure, but wherever the make is not mentioned, the material shall be supplied only IS / ISI mark with the prior approval of Concern DEE (M&E)/ XEN (M&E) GIDC,Rajkot.
3. The sample/Data Sheet of each item as per tender specifications shall be got approved from concern DEE (M&E)/ XEN (M&E) GIDC,Rajkot before placing the order by the contractor to the OEM.
4. The whole work is covered under the Five (05) years operation & maintenance and replacement guarantee period. The manpower and tools maintenance required for replacement during the routine maintenance shall be provided by the contractor. The contractor should attend the fault / non-working LED Street Light Works with allied accessories within 48 hours failing which the Corporation shall carry out the rectification work at risk & cost of the contractor. The expenditure so incurred, shall be recovered from the balance/payable amount of contractor or performance bond / security deposit paid by the contractor.
5. The material shall be dispatched only after due inspection carried out by the inspecting authority deputed by DEE (M&E)/ XEN (M&E) GIDC,Rajkot. The contractor has to provide all the facilities for testing, and inspection of the material to the Inspector. The inspection shall be given preferably at the Original manufacturer works.
6. As soon as the material is ready, before dispatched, the contractor has to inform concerned DEE (M&E)/ XEN (M&E) GIDC,Rajkot for the inspection.
7. The contractor has to make arrangement of required three phase power supply either by temporary power supply connection or by providing the DG Set for the purpose of testing and commissioning of streetlights at his cost. All costs for hiring of D.G. Sets, labours, consumables, fuel, loading-unloading charges, etc., for providing temporary power supply arrangement shall have to borne by the Contractor.



## 8. PAYMENT TERMS & CONDITION FOR THE STREET LIGHTING WORK:

Sr. No	Description	% of Full Tender Rates to be released.
<b>PART - A - (Material incl. 5 Years Free Comprehensive Guarantee Period ) –</b>		
1	On Supply of Items at site duly inspected/tested at OEM place & verified by DEE (M&E)/ XEN (M&E) or Engineer-In-Charge of project.	70%
2	After completion of Installation/Erection work in all respect & duly inspected by DEE (M&E)/ XEN (M&E) or Engineer-In-Charge at site.	10%
3	On Testing work completed & duly inspected by DEE (M&E)/ XEN (M&E) or Engineer-In-Charge at site.	10%
4	On Commissioning of entire street lighting system at the satisfaction of DEE (M&E)/ XEN (M&E) or Engineer-In-Charge at site.	10%
<b>PART - B - (Operation &amp; Maintenance of Complete Street Light System for 5 Years) -</b>		
1	After Successfully completion of O & M for 1 <sup>st</sup> Year from the date of completion of SITC Work.	20%
2	After Successfully completion of O & M for 2 <sup>nd</sup> Year from the date of completion of SITC Work.	20%
3	After Successfully completion of O & M for 3 <sup>rd</sup> Year from the date of completion of SITC Work.	20%
4	After Successfully completion of O & M for 4 <sup>th</sup> Year from the date of completion of SITC Work.	20%
5	After Successfully completion of O & M for 5 <sup>th</sup> Year from the date of completion of SITC Work.	20%

# **DETAILED TECHNICAL SPECIFICATION**

## **FOR THE ELECTRICAL AND MECHANICAL PART OF STREET LIGHT WORKS AT G.I.D.C. INDUSTRIAL ESTATE CHHAPARA ESTATE, Dist.- RAJKOT**

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## SCOPE OF WORK

### PART - A - Material incl. 5 Years Free Comprehensive Guarantee

Sr.	Item	Description n(s)	
(1)	Street Light Pole and Bracket	Height	: 7.0 mtr
		Material	: As per BSEN 10025 grade S355 J0.
		Pole Type	: Octagonal with base plate.
		Base plate and J-bolt	: To be got approved prior to supply. Bidder has to confirm at his own prior the orderplacement to manufacturer.
		<b>Bracket fitment</b>	: <b>Brackets to be fixed with bolts</b>
		Testing of pole and bracket	: At Manufacturer's works only.
(2)	LED Luminaires	<b>IES file is mandatory.</b>	: <b>Must be provided for all luminaires within 30 days from the date of work order.</b>
		<b>Rated I/P (max.)</b>	: <b>90 W</b> <b>(Outdoor Streetlight)</b>
		Luminaire Type	: LED, Outdoor application.
		Ingress Protection for entire LED Luminaires	: As per IEC 60529 IP 66
		<b>LED Driver</b>	: ➤ <b>Luminaires' driver shall be <u>appropriately sealed/ potted.</u></b> ➤ <b>Min. life of LED driver must be 50,000 burning hours.</b>
		<b>Luminaire Testing</b>	: <b>REVERSE TESTING AT MANUFACTURER'S WORKS.</b> After placement of order, bidder will supply all luminaires as per tender. From the received lot(s), sample(s) will be collected and send back to the manufacturer's works and testing will be done at manufacturer's works. If, result(s) aren't as per requirements, entire lot may be rejected or penalty will be imposed as mentioned elsewhere in tender or, the action(s) as per the decision of the competent authority.

		BIS approval for LED Luminaire(s)	:	<b>LED luminaires/ family of LED luminaire models must be approved by Bureau of Indian Standard (BIS).</b>
		BIS approval for LED Driver(s)	:	<b>BIS approval is must along with R-number allotted by BIS.</b>
(3)	Cables / Wires	Size	:	[1] 4 X 10/16 mm <sup>2</sup> aluminium conductor XLPE armoured cable for pole to pole & also CCMS to pole. [2] 3 X 1.5 mm <sup>2</sup> unarmoured flexible copper wire / cable for Luminaire supply.
(4)	Terminations	Glands	:	All cable glands shall be single compression made from appropriate steel material suitable for such application(s).
		Lugs	:	Crimping type bimetallic lugs / sockets.
(5)	Junction box for GI Octagonal poles	Integral part of streetlight pole.	:	There shall be provision for fitment of 3 Nos. of Cable Glands, MCB, terminal / connector strip(s) and, earthing wire / strip for luminaire(s). Having <u>Allen key type locking arrangement WITH NON DETACHABLE / REMOVABLE BOLT.</u>
(6)	DWC Pipe	size	:	<b>ID- 50 &amp; 90 mm.</b>
(7)	G.I. Pipe	size	:	<b>N.B.: 40 &amp; 50 mm.</b>
(8)	CCMS	----	:	10 kW (Current carrying capacity of power cabling/ wiring/ switch gear must be 40 A (min.) per phase), 3-Phase, 415 V AC, 50 Hz system.
(9)	Pole Numbering & colour code	As per respective Zone Colour Code System.	:	Good quality Radium Sticker. Number / series will be finalized in consultation of Engineer-in-charge.

**Tenders are invited for the work of Supply, Installation, Testing & Commissioning (S.I.T.C.) of 7Mtr Hot Dip galvanised Octagonal Streetlight Poles with LED Luminaires Outdoor Streetlight fitting, control panel and allied accessories (Considering 25 Mtr. Distance between two poles ) incl. 5 Years Free comprehensive Guarantee period with 5 Years Free Operation & Maintenance for GIDC Chhapara Estate, District-Rajkot**

All the material/equipment must be supplied with manufacturer's test certificates if asked by GIDC.

The material shall be got tested / inspected for all tests at manufacturer's works in presence of corporation's representative before supply, as mentioned elsewhere in tender. The supplier/contractor must make all the arrangement for testing/inspection of equipment at manufacturer's works without any extra cost to the corporation. 15 days clear prior notice should be given for testing/inspection. If at any time after erection/commissioning, corporation desires testing at any government recognized laboratory for any item utilized by contractor, the same shall be arranged by contractor, for which only testing charges shall be paid by corporation, provided that the testing results are found satisfactory.

Technical data sheet of all item(s) to be tested including LED luminaires (along with driver(s), LED chip(s) to be used) should be submitted for approval. Proof must be provided by the manufacturer of luminaires for make of LED chip used in luminaires. For the authenticity of the same, **it must be certified by manufacturer only, duly sealed and signed.**

Quality assurance plan [QAP] for testing at manufacturer's works along with drawing of item(s) to be tested ~~including LED luminaires (with all relevant/ important technical details)~~ should be submitted for approval.

After receiving all aforesaid details / documents, approval will be given for go ahead to manufacture/supply. Supply of material(s) will not be allowed before aforesaid approval(s).

In case of LED luminaires, relevant test certificate(s) including IES LM 79, LED Driver test certificate must be furnished for all models to LED luminaires / lot(s). LM 79 certificate from own NABL approved laboratory will also be acceptable. LM 79 certificate from own or from third party NABL approved laboratory signed by designated signatory along with stamp of manufacturer and, such certificate must be valid at the time of bidding the tender. However, Third Party's NABL certificate of offered model must be provided before placement of work order.

All the installations shall be of high quality, safe, durable, complete and fully operational including all necessary items, spares and accessories whether not specified in details. All the works shall be completed in accordance with the relevant prevailing regulations and Latest International standards and codes to the satisfactions of the owner

Tenderer must make his own arrangement for watch and ward of material supplied till it is commissioned satisfactorily at site and handed over to the corporation. Corporation will not be responsible for theft of materials till it is commissioned satisfactorily and handed over to the

corporation even if part payment is released.

During defect liability period, the tenderer must attend the fault immediately on receipt of intimation in case of breakdown. During defect liability period, No fitting shall remain out of service for more than 48 hours after intimation, otherwise, penalty as below will be charged and recovered from performance guarantee or any other outstanding payment. The period for penalty shall be counted from the very first day of fitting remaining out of service. Further During the defect liability period, the defect/complaint (off light/out of order item/equipment) shall be repaired/rectified maximum within 7 days of intimation to the contractor, failing which the same shall be repaired/rectified through other agency/contractor, at the risk and cost of the contractor.

1).The contractor has to attend the fault / non-working streetlights within 48 hours. If the contractor is failed to attend the fault / non-working LED Street Light Works with allied accessories the compensation at the rate Rs.100/- per pole shall be recovered.

2). In case of any electrical fault in panel during the contract period, if the contractor fails to repair or replace the electrical parts within 6 hours, **GIDC** shall recover the penalty of **Rs.1000/-** day till fault is rectified.

The Contractor shall quote the rate in on line "price schedule" only. No alterations in form of tender and in "price schedule" and no additions in the shape of special stipulation will be permitted. Tender/tenders, which do not fulfil all or any of the above conditions or are incomplete in any respect are liable to be rejected.

The contractor should offer the rates in on line price schedule only. The works of S.I.T.C. of New LED street light works with allied accessories mentioned in tender shall be allocated to lowest tenderer as per capability or as per decision of competent authority of the corporation and the competency (financial & experience) of tenderer. The lowest tender rates shall be considered and fixed as the unit rate, if found reasonable. All contractors should note the same and participate/ offer the self supporting rates accordingly. The Corporation shall execute the work for the individual items as per requirement.

The TENDER GUARANTEE paid against this tender shall be retained till submission of performance guarantee on award of contract. For future works separate TENDER GUARANTEE shall be deposited while giving consent for carrying out the work as per fixed/sanctioned unit rates, which shall be retained till submission of performance guarantee on award of contract. The earnest money deposit will be forfeited in the event, the successful contractor denies to accept the contract and fails to submit the performance guarantee bond to the corporation as stipulated in the tender documents within ten days after receipt of notice of award of contract.

The bidder is required to understand clearly the purpose of these tender, which are as below.

To execute the Job at various site within GIDC Limit.

Consider the rates of all items (Including various items with zero quantity in this price schedule) as UNIT RATE for all similar type of Job/Items required to be executed in future till further revision of rates.

These Unit rate, so fixed does not entitle the bidder/bidders to get future job automatically. The separate procedure (to seek consent from various contractors and award the work to any specific contractor as per decision of competent authority) as per **GIDC** norms shall be followed.

For any Extra item required to be executed and not mentioned in the tender, payment for that item(s) shall be made as per the sanctioned above(+)/below(-) S.O.R. rate for this tender.

Once the unit rates are fixed, for future requirement of various sites of GIDC Relevant class of registration for different works as per the Work Amount shall be considered while allotting the works as per fixed/sanctioned unit rate.

Acceptance of tender will rest with competent authority who does not bind himself to accept the lowest tender and reserves the right to split the work among tenderers, reject any or all tenders and no reasons will be given for acceptance or rejection thereof. The tenders whose tender is accepted will have to enter into a regular contract and abides by all rules and regulations embodied in the tender.

All equipment/material/accessories are to be supplied by contractor and to be erected by contractor. No tools-tackles/ machinery/manpower will be provided by the Corporation. In case the rate in word differs from that in figures, the former will be taken as correct. No change in units shall be allowed.

Entire lighting scheme with installation methodology shall have to be got approved before commencement of actual work on site. Site visit should be done and necessary technical specification/information should be collected before quoting the rates. No dispute at later date shall be entertained.



## **ITEM WISE DETAILED SPECIFICATION FOR STREET LIGHT PART**

### **PART - LED STREET LIGHT WORKS:-**

#### **Supply, Installation, Testing and Commissioning (SITC) of Hot Deep Galvanized (HDG) octagonal pole :-**

##### **Item no. 1 :- Height- 7 Mtr Long 70 mm Top x 135 mm bottom dia, 3 mm Thickness.**

Supplying and erecting approved make Octagonal pole made from HR sheet steel. The pole should be made as per IS. and shall be coated with hot dip galvanizing of **minimum avg. coating thickness of 85 micron** as per IS 2629/2633/4759, suitable suspend local wind speed with integral Junction box consist of terminal plate of min 12mm Hylam sheet, standard profile 35mmX7.5mm Din-Rail for MCB Mounting, stud type terminal and arrangement for cable termination to be erected on suitable foundation as per details given by manufacturer considering site requirement..(E) 7 Mtr. Long 70 mm Top X 135 mm bottom dia, 3 mm thickness with 225mmX225mmX16mm base plate, 4-M20 Bolts and 600mm long J-Bolt EN 8 grade HDG foundation bolts along with template for the above poles with "GIDC" Logo on Name Plate. Approx Pole weight 67 kg. (Make- As per Approved Vendor List as below.)

**Foundation 500 (mm) x 500 (mm) x 1550 mm (Min) or As per the OEM requirement and as per specification.**

- (a) Overall length of Pole : 7.00 Mtr.
- (b) Planting depth. : 0.0 Mtrs.
- (c) Height above ground level : 7.20 Mtr. (min) or as per site requirement  
Length of section -Out side dia & Wall thickness - 3 mm
- (d) For 7 mtr :- Bottom : 135 mm & Top : 70 mm

### **SCOPE:-**

The scope of work broadly covers supply, erection, testing and commissioning of various types of HDG Type Octagonal poles. This specification gives the general requirements. It shall be the responsibility of the contractor to take the joint measurement and obtain GIDC's approval before the placement of orders to the main supplier/manufacturer

This **GIDC** specification specifies the minimum technical requirement for design, engineering, manufacturing, inspection, testing and performance of Octagonal Steel Poles intended to be used for the low voltage type street lighting system of **GIDC**.

### **APPLIABLE CODES AND STANDARDS:-**

The HDG Type Octagonal pole should meet the requirements of the following standards and rules:

- a) Indian Electricity Acts and Rules
- b) IS 226/ IS 2062
- c) BS 5649: part 6 1982

d) IS 2629/IS 2633/IS 4759

Please note that among the various standards mentioned, most appropriate will be applied. All codes and standards mean the latest. Where not specified, the installation shall generally follow the Indian Standard Code of Practice and/or best engineering practices.

**Structural Design :-**

The general design and dimensions shall be as closed as possible to the Drawings attached and certified by a registered Mechanical Professional Engineer;

Poles shall be designed to withstand the maximum wind speed 159 km/hr & Maximum stress at design wind speed shall not exceed 80% of the strength of steel. The detail of top loading i.e. the weight and area of top luminaires should be worked out based on this consideration. Maximum deflection of the pole shall meet the requirement of BS 5649: part 6 1982.

Wind Loads shall be obtained using the design wind pressure as obtained by the following formula as specified in BS EN 40-3-1:-

$$q(z) = \delta \times \beta \times f \times C_e(z) \times q(10)$$

where:

$q(z)$  is the characteristic wind pressure in N/m<sup>2</sup> for any particular height above ground,  $z$  (m)

$q(10)$  is the reference wind pressure

$\delta$  is a factor depending on the column size

$\beta$  is a factor depending on the dynamic behavior of the column

$f$  is a topography factor and

$C_e(z)$  is a factor depending on the terrain of the site and height above ground  $z$ . Under normal site conditions, the terrain category shall be selected as category III and  $C_e(z)$  shall be taken as 1.78.

When a site is located at a very exposed area and subjected to an extremely high wind pressure, the terrain category and the value of  $C_e(z)$  to be adopted shall be agreed with LTA.

$$q(10) = 0.5 \rho \times (C_s)^2 \times V_{ref}^2 \text{ N/m}^2$$

where:

$\rho$  is the air density and shall be taken as 1.25 kg/m<sup>3</sup>

Cs should be taken as  $\sqrt{0.92}$  for a mean return **period of 25 years**

Vref is defined as the 10 minutes mean wind velocity having a mean return period of 25 years and shall be taken as 20.6 m/s.

The structural design of the pole shall be verified by calculation in accordance with BS EN 40-3-1 and BS EN 40-3-3 with partial load factors Class B and maximum deflection Class 2. Particular attention is drawn to the reinforcement of the door opening which is a highly stressed zone. This must be clearly identifiable in the structural calculation.

The detail of top loading i.e. the weight and area of top luminaries are worked out based on this consideration. Maximum deflection of the pole shall meet the requirement of BS 5649: part 6 1982.

The pole shall be made from HR sheet and shall be hot dip galvanized as per IS 2629/IS 2633/IS 4759 and ASTM 123 standards with **minimum coating thickness of 85 micron.**

Poles shall be continuously tapered OCTAGONAL cross section, presenting a good and pleasing appearance and based on proven design conforming to international standards, to give an assured performance, and reliable service.

## **Construction:**

### **Pole shaft:**

The pole shall be hot dip galvanized as per IS 2629/IS 2633/IS 4759 standards with minimum coating thickness 85 microns considering operating conditions of the GIDC Estate Area..

### **Material:-**

- **Octagonal Poles** - As per BSEN 10025 grade S355 J0. Yield strength Min. 355 N/mm<sup>2</sup> or equivalent national/international standard.
  - Foundation Bolts: - EN 8 grade
  - Base Plate: -Steel as per IS 226/ IS 2062
  - Please note that among the various standards mentioned, most appropriate will be applied and will be binding to contractor
- 1) Poles shall be fabricated from special steel plates, 3mm thick, conforming to ASTM A 572 Gr 50 or equivalent BSEN Standard with mechanical properties, cut and folded to form an octagonal section and welded as below:
    - a. Minimum yield strength - 355 N/mm<sup>2</sup>
    - b. Minimum ultimate tensile strength - 490 N/mm<sup>2</sup>
    - c. Max. ultimate tensile strength - 620 N/mm<sup>2</sup>
    - d. **Silicon content of the steel shall be less than 0.06% to assure a better and lasting quality for galvanizing and Certificate for the Zinc used for galvanizing should be submitted along the order.**
  - 2) Pole shall be made in single section.

- 3) The pole shaft shall have octagonal cross section and shall be continuously tapered with single longitudinal welding. There shall not be any circumferential welding. The welding of pole shaft shall be done by Submerged Arc Welding (SAW) process using state of the art process know how.
- 4) All Pole shafts shall be single piece and shall be provided with the rigid flange plate of suitable thickness with provision for fixing four bolts. This base plate made of Mild Steel / Fe 410 conforming to IS 2062 shall be fillet welded to pole shaft at two locations i.e. from inside and outside and supports to be provided.
- 5) The procedural weld geometry and the workmanship shall be exhaustively tested on the completed welds. Welding shall be checked by using ultrasonic testing methods also. Poles shall be provided with vase plate, which shall be free from any lamination or incursion. The welded connection of the base flange shall be fully developed to the strength of the entire section.
- 6) Structural steel for bearing plate and top cap shall comply with the applicable requirements of ASTM A36 or equivalent BSEN Standard with minimum yield strength of 250 N/mm<sup>2</sup>. The top section fits into the bottom section to form the pole..
- 7) Pole shaft, bearing plate and top cap shall be hot-dipped galvanized after fabrication, including all drilling, cutting and welding. The poles shall be hot dip galvanized in single dipping method as per ASTM A 123 AND 153 standards or equivalent BSEN Standards with the minimum average thickness of coating shall be 0.086 mm, equivalent to 610 g/m<sup>2</sup>.
- 8) Weld material shall be compatible with the material of the pole as defined by American Welding Society.
- 9) The welding shall be carried out confirming to approved procedures as per qualified GMAW process approved by duly qualified by third party inspection agency. The welders shall also be qualified for welding the octagonal shafts.
- 10) Poles seam welding shall comply with the latest edition of EN 1011-2 by automatic continuous welding process.
- 11) **Base Plate:** The base plate shall be welded to the bottom of the pole before dipping in the galvanizing bath. The base of the pole shall be complete in all respects with base plate before hot dip galvanizing internally and externally as per ASTM A 123 AND 153 or equivalent BSEN Standard. The adopter base plate if required shall be supplied and installed free of cost. The dimensions like centre to centre distance of bolts and PCD etc. shall be accurately measured (for each pole base plate). It shall be responsibility of contractor to clean foundation bolts and make foundation ready for installation.
- 12) **Nut bolts/fasteners/terminal/J bolts etc: All Nut Bolts/fasteners/ terminals shall be galvanised for anti-corrosive treatment.**
- 13) The Octagonal Poles shall be in single section (upto 12 mtrs). There shall not be any circumferential weld joint. However, the pole with length of 12 mtrs. and above shall be of 2 sections with telescopic fitment with minimum overlap of 1.5 times the diameter.
- 14) Upper and lower sections shall overlap each other by 1.7 ( $\pm 20\%$ ) times the diameter of the immediate lower section and shall be easily assembled on site by using simple tools without welding. The supplier shall provide a mark on the finished pole indicating the overlapped position of 1.75 X diameter.

- 15) No cutting or welding shall be allowed on the pole after hot dip galvanizing.
- 16) The poles shall be suitably designed for ground and flange mounting.
- 17) For flange mounted pole, the concrete foundation shall be exposed 50-100mm above the finishing turf level.
- 18) For flange mounted pole concrete foundation that is abutting the edge of cycling track / footpath, it shall be flushed with the finishing track / path level. The nuts and J-bolts shall be covered / plastered with cement.
- 19) Same stainless steel grade washers or nuts can be placed below the base flange for balancing purposes. The two (2) nuts on top of each J-bolt are meant for tightening and locking purposes.
- 20) To fill up the gaps between the foundation and the base plate of the lamppost, pressurised, flowable high strength non shrink cementitious grout shall be used.
- 21) Mounting details including all data, calculations, imposed loads and forces and dimensional drawings for the foundations required for the poles shall be endorsed by a registered Structural Professional Engineer.
- 22) The soil bearing capacity at the site shall be ascertained so that the foundations can be correctly designed.
- 23) For poles with One / two or more sections, the lower and upper sections shall have a thickness of minimum 3.0mm. The bracket arms shall have a minimum thickness of 2.5mm. The base plate shall have a minimum thickness of 3.0mm.
- 24) Every section of the poles shall be made in such a way that only one (1) sheet of steel plate is used to form an octagonal pole. Welding shall be carried out along one edge of the poles only;
- 25) The Octagonal Poles shall be bolted on a pre-cast foundation with four foundation bolts for greater rigidity.

#### **Design of Pole Door and Locking System:-**

- 26) A door shall be provided with a locking device over the door opening of each pole as shown in the Drawings. The triangular locking device shall be made of stainless steel as specified in the Drawings. The locking device shall be properly assembled. The triangular bolt shall be jammed at one end so that it will not be dislodged when it is fully opened.
- 27) Pole doors shall be flushed with the poles with no gap between pole and door to prevent ingress of water.
- 28) **An adequate door opening (Minimum Size of door is 250 mm X 65 mm ) should be 1500 mm above from the bottom of the Pole at a convenient location. or as per the site requirement and as approved by Engineer in charge.**
- 29) **A hole of 20mm diameter shall be provided at approximately 500mm below the top edge of the top section. This hole shall come with a tight-fit rubber stopper to prevent water from entering the pole.**
- 30) **The opening shall be such that it permits clear access to the inside of the pole. The door opening shall be hinged type complete with a close fitting, vandal resistant and shall be weather/dust proof to ensure safety of inside connections.**
- 31) **The door shall be flush with the exterior surface and shall have suitable screw / allen key type locking arrangement.**

32) The pole door shall be hinged at the top. The hinges shall have minimum opening of the door of 180 degrees. Door opening should be hinged type with necessary special locking bolt. Door should be minimum 500 mm. Suitable plate of min. 3 mm size shall be provided for cable gland support.

33) The pole shall be adequately strengthened at the location of the door to complete for the loss in section.

34) The door opening shall be carefully designed and reinforced welded steel rod, to avoid undue buckling of the cut section under heavy wind conditions

**35) Terminal Box/Plate:**

Integral Junction box consist of terminal plate of min. 12 mm Hylam sheet, standard profile 35 X 7.5 mm DIN-Rail as per EN 50022 for MCB mounting and stud type terminal. If a particular light fitting has to be manually operated the same can be done by MCB provided on terminal plate. Terminal plate shall be suitable for loop-in-loop-out of max. 4 Core x 25 sq mm armoured cable.

The cable shall be terminated at connector in the pole using ISI Marked PVC 1.1 KV grade insulating tape roll with appropriate colour code.

There shall also be welded a clit of size 40 x 40 x 4 mm for the purpose of earthing with necessary 8.0 S.W.G G.I earthing wire. Termination (lugs, gland, and labour) cost should not be considered in the cost of pole.

**Baseboard :-**

36) During installation, a cut-out unit will be installed inside the poles by means of three (3) M12 25mm long screws.

37) A fixing device, which could be a perforated plate made of hot dipped galvanised steel shall be fixed in the pole directly facing the pole door as part of the pole. The cut-out unit shall be mounted directly onto the fixing device. The fixing device shall be able to cater for different types of cut-out units.

38) Alternatively, a baseboard made of hot-dipped galvanised steel shall be provided and mounted in each pole for fixing of cut-out unit.

**Earthing Terminal:-**

39) An earthing terminal in the form of a bolt made of **stainless steel material** shall be provided close to the door opening of each pole and inside the pole. In addition, it shall have substantial contact surface for the attachment of an earthing lead. Two (2) suitably sized washers and two (2) nuts shall be provided for each bolt. Each pole shall provide with four (4) bolts. The bolts, nuts and washers shall be made of stainless steel.

40) There shall also be suitable arrangement or welded a cleat of size 40 x 40 x 4 mm for providing pole earthing with necessary 8.0 S.W.G G.I earthing wire. The item includes 1 No. of 63 Amp backelite sheet 12 mm thick HYLAM make terminal plate and 1 No. of DP 6 -32 Amp MCB with DIN rail (B series) with rupturing capacity  $\geq 10$  KA, per fitting. for the purpose of earthing.

41) The pole shall be adequately strengthened at the location of the door to compensate for the loss in section.

42) Provision shall be given inside this door for fixing the electrical terminals and allied assecoreis and Suitable plate shall be provided for cable gland support.

43) Poles shall be pre-drilled and supplied complete with pole top cap and base plate.

- 44) The maximum design unit stress shall not exceed the minimum yield stress as stated in this specification for the particular application and types of loads, including overload capacity factors.
- 45) Bolts, nuts and locknuts for top cap, bearing plate and earthing nut shall be steel Grade 4.6 and shall comply with the applicable requirements of ASTM A307 and ASTM A 563 or or equivalent BSEN Standard and hot-dipped galvanized in accordance with the requirement of 01-SDMS-01 with minimum average coating thickness of 0.053 mm, equivalent to 381 g/m<sup>2</sup>.

**Protection against Corrosion:-**

Individual sections of the pole, base plate and bracket arm shall be protected against corrosion by hot-dipped galvanisation internally and externally in accordance with the latest edition of BS EN ISO 1461. All welding works shall be done before the galvanisation.

- (a) No zinc flux shall be left inside the pole or bracket arm after galvanisation. The presence of these impurities can pose a problem in the installation of pole internal wiring.
- (b) The treatment prior to galvanisation shall include degreasing, pickling, rinsing and fluxing.

- (c) The minimum avg. zinc coating weight shall be 610 grams per square meter (85 Microns).

**Extra Protection against Corrosion at the Pole Base:-**

- (a) A coat of bitumen shall be applied internally and externally to the base section on top of the galvanised coating by means of dipping. It shall be applied over the length of the planting depth and for a distance of 200mm (and not more than 250mm) above the planting depth. The total length to be applied with the bitumen coating shall be shown in the following table. A circular marking shall be made on the poles during manufacturing to indicate the level of the planting depth.
- (b) The bitumen used shall conform to the latest edition of BS 4147 or ASSHTO M190-70.
- (c) The bitumen shall be heated in a tank to a temperature of approximately 220°C before dipping.
- (d) The dry film thickness of the bitumen coating shall be at least 762µm.
- (e) A layer of lime powder shall be applied to the bituminous coating for easy handling of poles.

**Aesthetic Appearance of the Finished Surface :-**

- (a) The poles and bracket arms shall be of prime finish and good uniformity; i.e. free from injurious defects, such as blister, flux and non-coated spots, white rust, peeling of bituminous paint coating, etc.
- (b) The galvanising and bituminous appearance of poles and brackets supplied shall not be inferior to the sample submitted for evaluation. If in the opinion of LTA that the galvanising and bituminous finish of the poles and brackets is inferior to the sample supplied, LTA shall have the right to reject the inferior poles or the entire lot.

### **Pole internal wiring:-**

An adequate length of XLPE/PVC sheath cable, 3-core, 2.5mm<sup>2</sup> rated at 600 / 1000 Volts, shall be provided for the connection between the fuse cut-out unit and the lantern. The cables shall be properly supported to prevent undue strain on the cable terminations. The cable colour identification shall comply with the latest IEC/IS requirements.

The cables shall be manufactured to the latest edition of IEC 60502-1.

### **Fabrication:-**

- 1) Shearing and cutting shall be performed carefully and all portions of the work shall be finished neatly. Copes and re-entrant cuts shall be filleted before cutting.
- 2) All forming and bending during fabrication shall be done by method that will prevent embrittlement or loss of strength in the material being worked.
- 3) All welding operations shall be done in accordance with the American Welding Society, AWS D1.1.
- 4) Bolt holes as specified in the applicable drawings shall be punched or drilled. Holes may be punched when the material thickness does not exceed the diameter of the hole. Holes of any diameter may be drilled. Holes shall be cylindrical, perpendicular to the pole shaft, free of burrs, and clean cut without torn or ragged edges. The use of burning torch for cutting holes will not be permitted.
- 5) Extra holes for the purpose of lifting or other than those specified in the drawings shall not be permitted.
- 6) All pre-drilled holes shall be provided with durable ultra-violet resistant, plastic plugs.
- 7) Steel pole shall be provided with M12 earthing nut at the location specified in applicable drawing. Hot-dipped galvanized M12 x 30 mm long hexagonal bolt with washer shall be screwed on to the earthing nut.
- 8) Steel poles shall be provided with detachable top cap and base bearing plate. Flat bar with drilled and tapped hole to suit M12 bolt shall be welded to the top and bottom of the pole for attaching the top cap and base bearing plate, respectively. Hot-dipped galvanized M12 x 30 hexagonal bolts and washers shall be provided for attaching the top cap and base plate.
- 9) The following tolerances shall apply:

Width or Diameter - The tolerance on the width or diameter of the section shall be  $\pm 4\%$  (per BS EN 40-2) of the width or diameter or  $\pm 5$  mm for A/F diameter

Thickness - The tolerance on the thickness of the material shall be  $\pm 0.22$ mm of the thickness (per BS EN 10051).

$\pm 0.5$  % for overall length

$\pm 2$  mm for center-to-center distance between holes

$\pm 0.5$  mm for diameter of pre-drilled holes

- 10) Straightness of the pole shaft shall be within 1 mm/m and without any twist. The completed poles shall not deviate from straightness by more than an amount calculated at the rate of 3mm per meter (per BS EN 40-2). This also applies to the complete poles and bracket assembly.



The detail dimensions of pole are follows: -

Pole Dimension	Requirement of GIDC
HEIGHT (Min.)	7 meter
O.D. TOP (Min.)	70 mm
O.D. BOTTOM (Min.)	135 mm
THICKNESS (Min.)	3 mm
BASE PLATE (Min.)	225 x 225 x 16 mm

### **DRAWING APPROVAL**

Product manual & spare parts list along with drawing of Pole & Bracket must be submitted along with offer for each product quoted.

G.A. drawing of pole, Data Sheet and Quality Assurance Plan (For testing by client at manufacturer's works) shall be got approved before starting manufacturing.

The Hot Deep galvanized Top mounting bracket shall be supplied along with the Octagonal Poles for installation of the luminaries

**Pole drawing from manufacturer must be get approved from DEE (M & E)/XEN (M & E)/ Engineer In charge of GIDC..**

The HDG Decorative bracket same as per Pole Manufacturer shall be fabricated having the design to be approved by the DEE (M & E)/XEN (M & E)/ /Engineer-in-charge/ Suitable arrangement shall be provided at the top of the street light pole for fixing of street light fixtures. MS Plate to be welded at the bottom of the pole and the necessary earthing termination bolt and the cable entry for the Luminaries etc shall be provided at proper distance for fixing of junction box.

The installation of pole shall be done as per direction of Engineer-in-charge at distance of approx. 25 mtr between two poles or as per site requirement or as per luminaire design data requirement in ZIG-ZAG / Single or Double Side/ Central Verge pattern.

Special care shall be taken while erection of poles so that these are not strained or damaged during erection and are firmly stayed till the foundation are secured, as per instruction of Engineer-in-charge and as per drawing.

The alignment of all the pole and the height shall be in one line so that from the distance it looks in one line. The material shall not be dispatched without prior inspection by the inspecting authority appointed by the department or E.E.(M & E)/ DEE (M&E).

### **Type Test :-**

All materials shall be type tested in accordance with the latest standards in this specification.

All sample poles and bracket arms shall be submitted to a accredited testing laboratory for the following tests:

(i) Dimensional and Weight Measurements of pole & bracket;

(ii) **Horizontal Deflection Type Test** (per BS EN 40-3-2: 2000): The serviceability & structural test loads for the verification test are the characteristic dead and wind loads specified in clause 3 & 4 of EN 40-3-1 : 2000.

#### **Serviceability requirements:-**

The temporary horizontal deflection of the lantern connection caused during the load test by the incremental load due to the horizontal forces corresponding to the test load shall not exceed the value given in Table 3 of BS EN 40-3-3 class 2 [Max horizontal deflection  $0.06 (h+w)$ ]

$h$  - is the nominal height of the lighting column (in mm) as defined in EN 40-1

$w$  - is the bracket projection (in mm) as defined in EN 40-1.

#### **Structural requirements:-**

For steel lighting columns the residual deflection after removal of the test load shall be no greater than 10% of the deflection caused by the test load.

#### **Application of forces:-**

Horizontal forces shall be applied to act so that the moments caused at the critical sections in the column are at least equal to the moments resulting from the test loads. At all other points the moments shall be not less than 95% of the moments resulting from the test loads.

The horizontal forces shall be applied in stages by means of at least three (3) approximately equal incremental loads up to the test load. At the test load the horizontal deflection of the lantern connection shall be measured and entered in the test report.

After unloading from the horizontal deflection test, the residual linear horizontal deflection shall be measured and recorded.

(iii) The position of the door relative to the direction of the horizontal loading shall be in the most onerous position allowed in design and the position shall be stated. Where a bracket is used the position of the bracket projection relative to the position of the door shall be stated.

(iv) Before carrying out the tests, the lighting column may be loaded once and then unloaded provided that the applied load does not exceed 50% of the test load.

(v) Galvanising Test: The poles and brackets shall be subjected to the galvanising thickness test as laid down in the latest edition of BS EN ISO 1461.

(vi) Bitumen Test: The bitumen coating on the pole base shall be subjected to thickness test as laid down in the latest edition of BS 4147 or ASSHTO M190-70.

(vii) Material Test: Steel material used for the manufacturing of poles and brackets shall be subjected to test for compliance with the latest edition of BS EN 10025 Grade S 275

JR. The test method and the reference standards shall be subjected to the approval of GIDC **Official**.

(viii) Welding Test: All welded portions of the pole and bracket shall be subjected to a relevant welding test. The supplier shall state the reference standard and the strength of the welded joint together with the tender. The reference standard shall be the latest relevant British Standard. The reference standard and the strength of welded joint shall also be subjected to the approval of GIDC **Official**.

(ix) For longitudinal seam weld, the reference standard shall be the latest edition of EN 1011-2; i.e. by transverse tensile test where results shall not be less than 60% of specified minimum value of parent material.

(x) Mechanical Property Test: The accredited testing laboratory for this test shall cut off a small piece of steel plate of adequate size from the base of the sample poles.

(xi) The tensile strength and yield strength of the sheet metal shall be measured. The test results shall comply with the limits specified in the latest edition of BS EN 10025 Grade S 275 JR steel as follows:

Particular	BS EN 10025 Grade S 275 JR
Tensile strength	(t<3) 430 – 580 (3 ≤ t ≤ 100) 410 – 560
Yield strength	Yield strength

(c) Test report for the above shall be submitted by the supplier/manufacturer together with the batch delivered. Otherwise, the batch of delivery will not be acceptable.

#### **Batch Testing:-**

(a) For each batch of delivery, the supplier shall submit samples to the accredited testing laboratory for testing and inspection on the quality of the products. The delivery will not be accepted by GIDC **Official** unless the sample passes the batch tests.

(b) For every batch delivery, the number of sample to be tested shall be in accordance to the latest edition of EN ISO 1461.

Following the completion of all tests, two certified copies of the test reports shall be submitted to GIDC **Official** for review and approval.

#### **Full-scale Loading Test (Vertical Testing)**

When GIDC desires full scale loading tests, it shall be as stated in the Data Schedule. The Supplier shall then include in his proposal, as a separate item, the cost of the tests.

Full scale loading test shall be in accordance with the applicable standards. The Supplier shall submit for approval by GIDC **Official** diagrams showing the proposed scheme for applying and measuring loads and determining deflections of critical points.

#### **Deflections (During Pole Test)**

Pole deflections under load shall be measured and recorded. Deflection readings shall be recorded for the “before-load”, “load-on” and “load-off” conditions as well as at all

intermediate holds during loading. All deflections shall be performed to common base readings, such as the initial positions, taken before any test loads are applied.

A no-load deflection reading shall be taken five minutes after the removal of the maximum test load, the reading shall not exceed the allowable deflection (5% of the exposed length).

The Supplier shall furnish a full and comprehensive report of each pole test and shall include detailed diagrams and tabulation showing values and methods of load application and deflection records of each load test, photographs of test set up and description (with photographs) of all failures, if any.

Include mill test reports of the material used and the results of any tensile tests of specimens cut from any members, which failed during the testing program. Particular emphasis shall be placed on the determination of the mechanical properties of the material.

#### **Acceptance Test:-**

The Supplier, upon receipt of written acceptance from GIDC **Official** for the satisfactory performance of the pole loading tests, may start fabrication of the steel poles.

**Pole manufacturer should have valid full scale type test certificate for octagonal street light pole for any height upto 12mtr issued within last 5 years by reputed testing facility like CPRI, ERDA or NABL Accredited Test Laboratory and if not available than fresh Type test of pole should be carried out in presence of GIDC Officials and Material testing/Inspection charges of shall be borne by the supplier.**

#### **Pole label:-**

- (a) Comes in one-piece for ease of on-site application: White-retro reflective sheeting as the background and roll laminated with red-coloured cast vinyl film on top.
- (b) The Cast-Vinyl Film shall be of Pantone colour code 187c and have a thickness of 0.05mm, with pressure sensitive adhesive designed for permanent graphics.
- (c) The White retro-reflective sheeting shall comply to Type 11 sheeting of ASTM D4956 - 11a or Equivalent BSEN Standard.
- (d) The whole piece of label shall have a minimum warranty of Fifteen (15) years from the sheeting manufacturer. Quality audit must be performed by the sheeting manufacturer to ensure proper fabrication and conformance to specification.
- (e) Each pole label has to be silkscreen printed with the Sheeting Manufacturer's initials as well as the year of manufacture on it. The silkscreen printed initials / year of manufacture should not affect the visibility of the label and therefore should be kept at a size lesser than 3mm x 10mm to be printed at the bottom of the alphabets / numerals.

(f) The overall dimension of the label shall be 60mm x 110mm. The four (4) corners of the label shall be curved. The height of the alphabets / numerals within the label shall be 100mm.

(g) All lighting poles shall be conspicuously numbered using two (2) sets of pole label and a round sticker bearing a black arrow against a yellow background that indicates the direction of the lighting control box. Samples of the number labels shall be submitted to GIDC for approval.

#### **Warning arrow label:-**

(a) The label shall have black arrows with yellow background. The width of the label should be 300mm and go around the entire pole.

(b) The whole piece of label shall have a minimum warranty of Fifteen (15) years from the sheeting manufacturer. Quality audit must be performed by the sheeting manufacturer to ensure proper fabrication and conformance to specification.

(c) Each label has to be silkscreen printed with the Sheeting Manufacturer's initials as well as the year of manufacture on it. The silkscreen printed initials/year of manufacture should not affect the visibility of the label and therefore should be kept at a size lesser than 3mm x 10mm to be printed at the bottom of the label.

#### **Marking :-**

Each pole shall be provided an aluminium name plate of with 80 mm x 80 mm or Suitable nameplate riveted to the shaft at the location specified in applicable drawing. All markings shall be legible and so applied to remain legible under normal handling and installation practices. The rivets used to fix the name plate must be of non-rust type. Nameplate shall include, but not limited to the following information:

- GIDC Monogram
- GIDC – Estate name
- Pole Type
- Height of Pole:
- Pole Ultimate Load
- Pole Dimension (A/F Top/Bottom/Thickness)
- Pole Weight
- GIDC Work Order Number
- Pole Number
- Batch Test Number
- Manufacturer's Name or trademark
- Year of manufacturing
- Place of Manufacturing
- Made in : Painting the number and words for inventory Identification on erected fittings / equipment's or Such accessories as may required with good quality of enamelled paint as directed by engineer in charge(i) up to 20 characters, up to 75 mm height.

#### **PACKING AND SHIPMENT :-**

In addition to the packing and shipping requirements, the following shall be fulfilled:

As bitumen coating shall be applied internally and externally to the base section of the poles, extra care shall be taken during the transportation and storage to prevent the poles from being dirtied by the bitumen coating. The two sections of the pole shall not be stored inside one another. The poles shall be packed for transportation and storage in such a way that the clean galvanised surfaces are not side-by-side, below or above the bitumen coating. Wrapping of the bitumen portion with newspapers is not acceptable, as the removal of the latter will pose a problem. The protection of the bitumen from smearing the non-bitumen part of the poles shall be such that it could be easily removed during erection.

The material used for strapping the poles together during the delivery shall be of non-rust type. This is to prevent rust from appearing at the straps due to weather if stored for a long period.

The poles shall be stacked with spacers and blocks in order to avoid damages of zinc coating during the loading and transportation.

Poles shall be delivered in bundles of 6 poles with the arrangement of 2 layers, with 3 poles per layer, and strapped at four (4) locations of equal distances with the use of steel straps size 31 mm x 0.8 mm (min.) and necessary wood separators, padding or cushion material underneath the steel straps.

Wooden separators shall be provided between the horizontal and vertical layers of poles to avoid scratches and to facilitate slinging.

Bundled poles shall be so arranged such that the earthing hardware are not disturbed during normal handling.

Reasonable care shall be exercised in the handling and shipment of steel poles. Any expense incurred due to the careless handling and shipment of steel poles shall be considered as a legitimate back charge against the Supplier.

#### **GUARANTEE:-**

The vendor shall guarantee the steel pole against all defects arising out of faulty design or workmanship or defective material for a period of Five (05) years from the date of installation. GIDC certificates for date of commissioning shall be accepted.

The manufacturer shall have to give fifteen (15) years warranty of all items against manufacturing defect from the date of Supply.

**The manufacturer shall have to give design life certificate for 25 years for poles.**

If no exceptions to this specification is taken and no list of deviations is submitted, it shall be deemed that, in every respect, steel pole offered shall conform to this Specification. GIDC interpretation of this Specification shall be accepted.

### **SUBMITTALS:-**

In addition to documentations specified as above , the following shall be submitted by the vendor/manufacture:

Design information and drawings to be supplied with the proposals:

- a) Detailed drawings of steel pole showing the complete dimensions identification marks, number and location of pre-drilled bolt holes, details of pole top cap, bearing plate, hole plastic plug, earthing nut and marking plate.
- b) Detailed drawing/procedure for bundling of poles.
- c) Details of anti-corrosion coating

Submittals required following award of contract:

- a. Drawings for final GIDC approval shall be submitted prior to start of manufacturing. Supplier shall furnish all final drawings in original or Mylar tracings as well as on digital format.
- b. Manufacturing schedule, progress report and test schedules.
- c. Test reports including, but not limited to, the following:
  - Certified mill test reports for all material.
  - Certified welding reports.
  - Impact property test reports showing that the materials used in the structures meet the impact properties.
  - Test reports on coating thickness, nuts & bolts and reports on dimensional checks.
  - Report of all structure testing, when required, including photos, diagrams, loading trees, etc.

### **Requirement from Pole Manufacturer:-**

1. The Bidder should purchase pole from original manufacturer or their sole selling agents / authorized distributors / authorized dealer with specific authorization. Authority Letter.
2. Detailed technical literature/catalogue shall be submitted along with the tender.
3. The Pole manufacturer should be in the business of Pole for at least last 3 years. Copies of order to be submitted as a proof for the same.
4. **Valid BIS license from Manufacture give the proof.**
5. Valid type certificate of pole from CPRI/ERDA or NABL Accredited Laboratory.
6. **The manufacturer shall have to give design life certificate for 25 years for poles.**
7. The pole manufacturer having its own manufacturing & galvanizing facility/ unit with required galvanizing bath for single dipping process according to pole height and shall be ISO 9001: 2000, ISO 14001 & 18001 OSHAS certified to ensure consistent quality & environmental protection. ISO Certificate's shall be submitted along with Authorization letter from Bidder.

### **Testing :-**

The manufacturing unit shall have in-house pole testing facility for validation of structural design data. The pole testing facility shall conform to ASTM A239/BS EN 40-3-2-2000 part 3-2.

The manufacturer of poles shall have the following in house facilities:

- (i) Galvanizing of poles shall be done in house.
- (ii) All relevant testing facilities to check the poles.
  - a) Ultrasonic weld Testing.
  - b) Magnetic Particle testing for weld.
  - c) Galva Micron Testing.
  - d) Dimensional Testing of product.
  - e) Weight Measurement equipment.

**Note:**

- 1. All the materials supplied shall have manufacturer's test certificate.
- 2. Bidder shall have to mention the make of the materials to be supplied.
- 3. Technical specifications with manufacturer's literature shall be attached along with technical bid. – Drawing to be given.
- 4. The specifications mentioned above are minimum requirements of the Owner; bidder can quote for higher specification for better performance & life span.
- 5. Material testing/Inspection charges of shall be borne by the supplier/Bidder, if any testing will be asked by the Owner.

**Providing & fixing of 'J' type EN8 grad foundation bolts:-**

S.I.T.C of set of 4 Nos. M 20 x 600 long 'J' type EN 8 grade Hot Dip Galvanized (HDG) foundation bolts same as recommended by OEM/ pole manufacturer along with templates for the above poles and as per specification.( 1 Set. Per Pole)

The poles shall be suitably designed for ground and flange mounting. The J-bolt size shall be of 20 mm diameter and of EN- 8 Grade stainless steel grade SS 316. Each individual J-bolt shall be complete with washers and nuts (the washers and nuts quantity shall be recommended by the pole supplier) and they shall be of the same EN-8 grade as the J-bolt.

The sample shall be got approved before execution.

The material shall not be dispatched without prior inspection by the inspecting authority appointed by the E.E.(M & E) / DEE (M&E) GIDC, Rajkot.

**Make:-** BAJAJ/TRANSRAIL/VALMONT/RR ISPAT/UTKARSH or Eq.

**Mode of Measurement:-** Measurement shall be taken on No. basis.



## **ITEM No. 2: Pole Foundation for 7 Mtr pole :-**

Providing and laying controlled cement concrete M.200 / 1:1.5:3 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Foundations, footings, Base of columns and Mass concrete with 20 to 25 mm stone metal duly plastered with necessary curing for pole muffing by Excavating hard Murrum or Metal road by chiselling for preparing pit for poles or earth plates or for laying pipes & clearing the site by removing debris & making site good, Providing and laying cement concrete M10/1:3:6 (1-Cement : 3- coarse sand : 6- hand broken stone aggregates 40 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth for Foundation PCC Work of 100 mm thickness. Providing formwork of ordinary timber planking so as to give a rough finish including centering shuttering strutting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in. (A) Foundations Footings Bases of Columns etc. and Mass concrete. (Extra for Providing formwork with sheathing steel sheets so as to give a fair finish in (A) Foundations, Footings, Bases of Columns etc. and Mass concrete). Providing TMT bar FE 415 reinforcement for RCC work including bending, binding and placing in position complete upto floor two level. Finishing wall with weather proof exterior emulsion paint on wall surface (two coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials etc. complete.- For 7 mtr Pole Foundation sized :- 500 x 500 x 1550 mm or as per OEM foundation drawing- (1 No. Per St. Lght Pole).

### **General :-**

Reinforced Cement Concrete (RCC) foundation having Grade M20 along with necessary Foundation Bolt, Nuts, Washers with anchor plate and DWC pipe for cable access etc. shall be casted having minimum size as shown in the specifications (table) or recommended by pole manufacturer with necessary plastering and lime wash. **Also, J Bolt and Nut shall be covered with Cement Concrete/Plastering after installation and alignment of pole.**

The item includes excavation, 3" PCC M10, necessary reinforcement recommended by pole manufacturing company, Shuttering and M20 grade CC from M20 grade CC, necessary Foundation Bolt (**J Bolt, It should be manufactured by manufacturer of the poles (to be supplied) only**), Nuts, Washers with anchor plate and DWC pipe for cable access etc. The Contractor should make necessary arrangement for curing required for the works at his own cost.

Bidder must submit Mix design of M20 Concrete from approved lab of GIDC and also take approval of foundation drawing from before carrying of work.

The item includes excavation, necessary reinforcement recommended by Octagonal pole manufacturing co, Shuttering and M20 grade cc from preferably RMC plant.

The Contractor should make necessary arrangement for curing required for the works at his own cost.

The site should be cleaned or excess material should be removed after the work is completed. While making foundation, best civil engineering practice(s) must be exercised. Foundation

should be made in such a way as site requirement. This section should be finished in decorative manner as directed by Engineer-in-charge.

Pole Foundation should be carried out as per standard drawing of pole manufacturer only.

**Concrete Test Cubes for pole foundation:-**

(a) Four (4) test cubes shall be made from the concrete used in each of the preliminary test piles and working pile as directed by GIDC Official. If a concrete footing is cast separately from a preliminary pile or a working pile, a further four (4) cubes shall be made from this concrete.

(b) The test cubes shall be sent to accredited testing laboratory and tested with accordance to the latest edition of BS 1881 & IS 415.

**Make:-** Same as per Pole Manufacturer / OEM Recommendation and approved drawing.

**Mode of Measurement:** Measurements shall be taken on No. basis.

### **ITEM NO.3: CABLE LUGS:-**

Providing & Fixing of Solderless Crimping Type Aluminium Lugs (4 Nos. per termination) conforming to IS suitable for 1 x 4.0 Core x 16/25 Sq. MM PVC Insulated Aluminium Armoured cable evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner. - (4 Nos. Termination Per St. Light Pole & 2 Nos.per MSP)

**Make:-** DOWELL's/ISMILE/3D/JAINSON

**Mode of Measurement:-** Measurements shall be taken on No. basis.

### **ITEM NO.4:- MCB :-**

Providing & erecting 240 V MCB Single pole switch for lighting Load (B Curve) having 10 KA breaking capacity & confirms to IS : 8828/1996 in existing box having following capacity.(A) 0.5 to 2 Amp. Cat.III - (2 No. Per St. Lght Pole for 1No.- Phase & 1No. - Neutral).

#### **Technical Data 2 Pole MCB :-**

Number of poles - 2,

Characteristic - B

Breaking Capacity – 10 kA

Rated voltage - 1 pole 240/415 V - Multiple pole 415 V.

Frequency - 45 to 60 HZ,

Rated Impulse Voltage- 4 kV

Rated Insulation Voltage- 500 V

Minimum Operating Voltage- 24 V AC

Maximum operating voltage - 240 V

Degree of Protection- IP 20

Operating Temperature- - 25° C to + 70° C

Termination Capacity- 2.5 Sq.mm. Cu flexible

Mechanical Life (operating cycles)- >100,000

Electrical Life (operating cycles)- 20,000

Mounting Position- Horizontal/Vertical/Flat

Fixing - Snap fixing on standard DIN rail profile EN 50 023 - 35 x 7.5

**Make:-** ABB/L & T/SIMENSE/HAVELLS/LEGRAND/SCHNEIDER/HAGER/HPL

**Mode of Measurement:-** Measurement shall be taken on No. basis

### **Cable end termination :-**

The item includes supply, erection, testing and commissioning of end termination at the integral junction boxes or wherever required. The items includes supply of nickel-plated single compression cable gland and solder less crimping Aluminium lugs suitable for cable. The gland should be fixed and cable shall be terminated at connector in terminal box or wherever required using ISI Marked PVC 1.1 kV grade insulating tape roll with appropriate colour code.

#### **ITEM NO.5:- Earthing System :-**

Providing and erecting Funnel Pipe type earthing having 150 cms.long and 2.5 cms. dia. galvanised iron pipe with coupling and buch buried in specially prepared earth pit complete with necessary 8 SWG earth wire and required size HOT deep Galvanised iron strip for earthing of Street light pole using proper clamp with using salt and charcoal / coke as required for pipe type earthing. (Earthing at each poles) as per drawing, specification and Instructed by engineer in charge . - (1 Job Per St. Light Pole).

Earthing electrode shall consist of a GI (Class –C), 25mm Dia. and 1.5 meters long GI pipe electrode shall be buried vertically in the ground as far as practicable bellow permanent moisture level with its top not less than 150mm x 300 mm below ground level. The electrode shall be in one piece and no joints shall be allowed in the electrode. Wherever possible earth electrodes shall be located as near water tap, water drain or a down take pipes. Earth electrode shall not be located in proximity to a metal fence. The pipe earth electrode shall be kept vertically and surrounded with 150mm thick layer of charcoal dust and salt mixture up to a height of 1.50 meters x 300 mm from the bottom as per drawing. A funnel over G. I. Pipe (earth electrode) shall be provided as per detailed drawing given in the R&B SOR for the Electrical Dn.

**Make:-** RAPID/ASHLOK/OBO/INDELEC/SULAH SAFE SOLTION

**Mode of Measurement:-** Measurements shall be taken on No. basis.

## **DECORATIVE TYPE HOT DEEP GALVENIZED SINGLE ARM STREETLIGHT BRACKETS:-**

### **ITEM NO.6 :-**

Providing & erecting **Decorative Sword Type Street** Light pole Bracket comprising main B Class MS pipe of 4.2 cms/require outside dia. and shall be coated with hot dip galvanizing as per IS 2629/2633/4759 complete with suitable B Class MS sleeve tubing of approx. 45 cms length and suitable for 76.5 mm /80 mm/ require size of pole top having sufficient fastners for fixing the brackets and having suitable rise as per site condition and having spread of 1.5.mtr. length with 110 deg.with vertical plane & suitable welded stays, reducer and with check nuts complete painted with one coat of Red oxide / PU base primer and two coats of Aluminium / PU paint suitable for side entry fitting brackets, as per site condition and as per drawing / directed by Engineer Incharge. with following nos of arms. (A) Single Arm Bracket 1.5Mtr. – Decorative Sword Type (1 No. Per St. Light Pole)

As per drawing attached (**Make- same as per pole make mentioned in Approved Vendor List as below.**)– **As per drawing attached.**

(A) Single Arm bracket 1.5 Mtr

### **Bracket Arms :-**

The bracket arms shall be heavy duty hot dipped galvanised steel fabricated in accordance with the design Drawings with particular attention to the following areas:

- (i) Smoothness of curvature of bracket arms;
- (ii) Tolerance of curvature - which shall be within  $\pm 2\%$  of the radius of curvature;
- (iii) The angle of tilt at the end of the bracket arm - which shall be within  $\pm$  two (2) degree per BS EN 40-2 of the tilt. The angle of tilt other than 4m / 5m arm shall be five (5) degrees and measured with the bracket arm installed on the poles and measurements made with a calibrated spirit level at any point within 150mm from the end of the bracket arm;
- (iv) The shape of the bracket arm shall be octagonal throughout except the spigot which shall be tubular end as shown in the Drawings.

Brackets should be provided same as per approved pole make .

Work shall be carried out as per the description of the item and as per instruction of engineer incharge.

The sample shall be got approved before execution from engineer in charge.

**Make:-** BAJAJ/TRANSRAIL/VALMONT/RR ISPAT/UTKARSH or Eq.

**Mode of Measurment:-** Measurements shall be taken on No. basis.

## **Outdoor LED Street Light Fitting and allied accessories :-**

Supplying and erecting 90 Watt LED street light fittings with High power White LEDs wattage of 3 Watt and above assembled on single MCPCB with Fixed Programmable microprocessor based Dimmable Driver, efficiency more than 150 lm/w and corrosion free High pressure die cast aluminum housing with smooth finish powder coated and heat sink extruded aluminium with diffuser and Polycarbonate optics/ lenses with company mark/name engraved or embossed 90 to 300 V, Power Factor more than 0.95, THD < 10 %, CCT 4000 K to 5700K, Uniformity ratio > 0.45, Luminaire efficiency > 150 lumens/watt . LED driver efficiency > 85 %. CREE / OSRAM / PHILIPS Lumileds / NICHIA / SEOUL/ LG/BridgeLux (U.S.A.) make LED used for luminaire. ( Fittings required LM-79 & LM-80 certificates)-(A) Street Light (IP-66), Surge Protection -4KV and 10 KV non integral, Light must have 440VAC line supply protection. It should withstand 48 hours for 440VAC line supply.(Cat-III) The fitting should be suitable for side entry having suitable socket bore for clamping complete erected having IP-66 Protection Class.(1 No. St. Light Fitting per Arm x 1 Single Arm = 1 No. LED Fitting). (Make- As per Approved Vendor List as below.)

### **ITEM NO.7 :- 90 W, 11,700 lumens/watt (min.), Coverage Area should be 25 Mtr X upto 10 Mtr carpet of road**

This specification is for technical and general requirements design, development, manufacturing, testing and S.I.T.C. of energy efficient LED luminaire complete with all accessories, LED lamps with suitable current control driver circuit and required optics including mounting arrangement for streetlight going to use at the site.

**Note :** If at any time, corporation express intention to test the LED luminaires or any item mentioned in BOQ / tender at any government recognized laboratory like ERDA / UL / ERTL / third party NABL approved laboratory; the same shall be arranged by the bidder. In such case, testing charges shall be paid by corporation within limit, mentioned as per Memorandum of work to the Contractor, if the testing results are found satisfactory otherwise the same shall be borne by the supplier. Cost towards all arrangement(s) of such testing shall be borne by the contractor including lodging / boarding of the representative appointed by GIDC.

### **CODES & STANDARDS: -**

Following IS & its latest amendments should be followed unless until specified: -

- (1) 16101: 2012 | General Lighting - LEDs and LED modules – Terms and Definitions
- (2) 16102 (Part 1): 2012 | Self- Ballasted LED Lamps for General Lighting Services:  
Part 1 Safety Requirements
- (3) 16102 (Part 2): 2012 | Self-Ballasted LED Lamps for General Lighting Services:  
Part 2 Performance Requirements
- (4) 16103 (Part 1): 2012 | Led Modules for General Lighting: Part 1 Safety Requirements
- (5) 16103 (Part 2): 2012 | Led Modules for General Lighting: Part 2 Performance

## Requirements

- (6) 15885 (Part 2/ Sec 13): 2012 | Safety of Lamp Control Gear: Part 2 Particular Requirements Section 13: DC or AC Supplied Electronic Control gear for Led Modules
- (7) 16104: 2012 | DC or AC Supplied Electronic Control Gear for LED Modules - Performance Requirements
- (8) 16105: 2012 | Method of Measurement of Lumen Maintenance of Solid-State Light (LED) Sources
- (9) 16106: 2012 | Method of Electrical and Photometric Measurements of Solid-State Lighting (LED) Products
- (10) 16107 (Part 1): 2012 | Luminaires Performance: Part 1 General Requirement
- (11) 16107 (Part 2): 2012 | Luminaires Performance: Part 2 Particular Requirements, Section 1 LED Luminaire
- (12) 16108: 2012 | Photo biological Safety of Lamps and Lamp Systems

IEC 60529 Classification of degree of protections provided by enclosures (IP Codes)

All LED luminaires should be manufactured & supplied as per all applicable & relevant standards for various components as well as functioning as specified in the tender documents, purposes intendeds and keeping safer, longer & reliable operation up to 10 years' lifespan.

- (i) Limits and methods of measurement of radio disturbance characteristic of electrical lighting and similar equipment
- (ii) LED modules for general Lighting-Safety requirements,
- (iii) EMC Immunity requirement,
- (iv) Electro Magnetic compatibility (EMC)-Limits for Harmonic current emission (equipment input current  $\leq 16$  A per phase,
- (v) Environmental Testing: Test Z-AD: composite temperature/ humidity cyclic test etc. should be as per relevant international standard/ all applicable Indian standard(s).

Further, LED should be designed, manufactured and supplied as per relevant Indian/ international standards applicable for fixed general-purpose outdoor streetlight luminaries, Lamp control gear: particular requirements for DC or AC supplied electronic control gear for LED modules, DC or AC supplied electronic control gear for LED modules performance requirements and Self-ballasted LED lamps for general lighting services- Performance

requirements.

IS 4905 Method for random sampling shall be applied unless it is specifically specified.

IES LM 79 LED luminaire photometry and electrical parameters measurement as applicable & IES LM 80 for lumen maintenance shall be applicable.

All applicable relevant Indian Standards published till now for LED luminaires.

All LED luminaires offered must be approved by BIS and obviously LED driver must be approved R-Number (Registration no. provided by BIS).

Approved BIS certificate must be operative/ valid at the time of tendering/ during actual supply. Appropriate certificate(s) needs to be furnished with technical-bid & also during the supply of the offered/ luminaires to be installed. .BIS Certificate as per IS 10322 Part 5 /Sec1

#### **ENVIRONMENTAL CONDITIONS: -**

The LED streetlight is to be used at Chhapara, GIDC Estate, District – Rajkot. It is located in part of West Gujarat .

It is well connected with rails & roads, situated on all type roads, Railway and nearby road is NH. The average atmosphere conditions during the year are mentioned below. The equipment shall be designed to work in such environmental conditions:

- Maximum ambient air temperature: 50° C
- Minimum ambient air temperature: 5° C
- Max. Relative humidity: 90% or as per weather condition
- **Average Rainfall: 100 to 120 inches or as per IMD Gujarat Data**
- Atmosphere: Dusty and Heavy smoke at times in certain areas.
- Coastal area: The equipment shall be designed to work in coastal area in humid, salt laden and corrosive atmosphere.

#### **CONSTRUCTIONAL FEATURES:**

##### **General:**

Luminaire shall be made of die cast aluminum / extruded Alunimiam body with powder coated finish having safety.



The casing of the lighting luminaries shall be made of pressure die cast aluminium coated with epoxy polyester powder coat single. The driver unit must be accessible and if need be replaceable easily and with minimum use of tools.

The casing made of non-corrosive aluminium having high conductivity shall have external surface designed in a manner so as to act as an efficient heat sink to extract heat generated at PN-junction of a LED. Efforts shall be made to install the fittings on the required street light pole without compromising on the performance of the LEDs or luminary.

The Fixture manufacturer shall perform solder point temperature ( $T_{sp}$ ) measurement and compute junction temperature ( $T_j$ ). The manufacturer shall show the proof that the junction temperature shall not go beyond the LED manufacturer's maximum junction temperature for long term lumen maintenance (i.e., 70% of the original value of lumen output after 50000 hours of operation).

The lumen output at end of lifetime shall be supplied as well as initial lumen output, with temperature at which the lumens are rated.

Test result shall be provided to indicate adequate thermal performance for the long term operation of the LED's at an operating temperature ( $T_a$ ) of not less than  $35^{\circ}\text{C}$  in accordance to relevant local or international standards. The LED junction temperature shall be maintained at or below manufacturer's recommendation.

The rated LED life L70/B20 shall be more than 50,000 hours at LED operating at ( $T_a$ )  $35^{\circ}\text{C}$ .

The fixture manufacturer shall furnish proof that the LEDs that have been offered and used in the fixture have been tested to IEC 62471 for safety requirements.

Heat sink used should be aluminum extrusion having high conductivity. Heat sink should be integrated within luminaire and efforts shall be made to keep the overall outer dimensions optimum such that it permits sufficient heat dissipation through the body itself so as to prevent abnormal temperature inside the luminaire and consequential damage to cover, gasket material, LEDs, lenses and drivers.

Heat sink must be thermally connected to MCPCB/ LED light source. The LED Module(s), Driver gear, etc. shall be designed in such a way so that temperature of heat sink shall not exceed  $70^{\circ}$ . Any debris build up shall not degrade heat dissipation performance of the luminaries. A lighting luminaire fitted with an assisted cooling system is not acceptable.

LED must be mounted on Metal core PCB with suitable large area surface by means of fins to

dissipate the conduct heat. The fins must be exposed to ambient flowing air.

The assembly and manufacturing process for the LED source assembly in modules/arrays shall be designed to assure all internal components are adequately supported to withstand sudden impacts and mechanical shock and vibration from high winds and other sources.

All luminaries shall be provided with toughened glass of sufficient strength. UV stabilized Poly carbonate material is also acceptable. The luminaire should be provided with individual optical lens/ optical lens plate on the LED chip for achieving desired photometric distribution.

No part shall be constructed of polycarbonate unless it is UV stabilized.

Material used for the lens of LED source shall be of toughened glass, heat resistant and shall not undergo discoloration during lifetime of the LED source. It shall conform to ASTM specifications for the materials. Any discoloration observed in the lens shall be considered a failure under warranty clause.

All luminaries shall be provided with acrylic / polycarbonate / glass diffusers and/or aluminized reflectors and/or lenses to provide proper road lighting distribution.

Toughened and/or tempered glass of sufficient strength may be provided under the LED chamber to protect the LEDs and luminaries.

The LED lens shall be UV stabilized and shall be capable of withstanding ultraviolet (direct sunlight) exposure for a minimum period of 60 months without exhibiting evidence of deterioration.

The finish of the fixture shall be powder coated and of grey colour.

The luminaire shall provide efficient uniform illumination.

The luminaire shall be assembled without any glue so that it is fully recyclable and environmentally friendly. Final assembly of the luminaire shall be done by manufacturer in an ISO14001 certified factory.

The luminaries shall be capable of operating normally in ambient temperatures from -20°C to 50°C maintaining junction temperature below 100°C and heat sink temperature below 60°C, ensuring efficient thermal management of the luminaire.

The manufacturers shall ensure that the fixture is designed in such a manner that it conducts the heat away from the LEDs as efficiently as possible. The design shall ensure that the junction temperature is kept as low as possible during operation. Thermal management shall be in such a

way that Luminary shall have trouble free operations from -20 °C to +50°C. The following tests shall be done to determine efficient thermal Management.

The minimum IK protection of optic cover shall be IK 08. Appropriate test certificate/evidences shall be provided with the technical-bid.

The fixture shall be designed in such a manner that it is easy to handle and install, is not too large and unwieldy, is of robust construction, light weight and conforms to minimum IP66 class of protection for outdoor use. Luminary's manufacturer should submit IP test report from Govt. Accredited Test Lab / R&D Labs.

Suitable number of LED lamps shall be used in the luminaires. The manufacturer shall submit the proof of procurement of LEDs from OEMs at the time of testing. Please clearly note that LED chips used/ to be used in the luminaires must be from manufacturers mentioned in the vendor's list.

Suitable reflector/ lenses may also be provided to increase the illumination uniformity and distribution.

The electrical component of the LED must be suitably encapsulated with proper heat dissipation facility to function in environment conditions mentioned earlier. Further, LED drivers used must be appropriately sealed/ potted. Proper evidence(s) if required should be provided with the technical-bid. However, it is to further clarify that, appropriately sealed as well as potted driver can be used. LED driver must have separate R-number issued by BIS.

The connecting wires used inside the luminaire, shall be low smoke halogen free, fire retardante-beam cable and fuse protection shall be provided in input side.

The material used in the construction of driver printed boards; driver enclosure etc. shall be non-flammable and heat resistant. Also, all the PCBs in the system shall be coated to prevent any corrosion.

Design of the thermal management shall be done in such a way that it shall not affect the properties of the diffuser.

The equipment should be compliant to IEC 60598-1, IEC 62031 and IEC/PAS 62612 depending on the type of luminary.

The LED Module(s), Driver gear, etc. shall be designed in such a way so that temperature of heat sink shall not exceed 70° C.

The driver module on board circuitry shall include voltage surge protection to withstand High-repetition noise transients as stated in Section 2.1.6 of NEMA Standard TS-2/ 1992.

The Entire LED lamps should be driven by minimum 2 or more numbers of the driver circuits or as per OEM Standards. The entire power supply to the LED Lamps should be divided among the drivers, thus each driver controlling a group of LED lamps if required for Higher wattage of LED Fitting.

All the material used in the luminaire shall be halogen free and fire retardant confirming to standard.

The LED fitted lighting fittings shall operate at 50 Hz +/- 5 % Hz AC over a voltage Ranging from 90V to 300V with a avg. power factor > 0.95 in a 3-wire distribution system. The total power consumption in the LED lighting fixture shall not exceed the total guaranteed power consumption including power consumption in the electronic circuit of the driver for that particular application over the entire voltage range given in clause. Driver output DC Voltage shall be more than 65V DC complying to safety extra low voltage compliance.

The infrastructure for Quality Assurance facilities to verify/ test/ prove above specifications must be available at the manufacturing facility of the offered company (ies). Compliance shall be ensured with submission of appropriate evidence(s) with the technical-bid.

All fasteners must be of stainless steel.

Cable gland(s) should be provided for cable entry/ exit. All glands inside/ outside luminaires must have IP 66 protection specifically mentioned for particular capacity of LED luminaires.

Surge Protection: LED drivers should have 4 KV internal surge protection for all LED luminaires. External surge protection (External to LED driver) device must be mounted inside housing of LED luminaires.

#### **Low voltage compliance:-**

The fluctuations in line voltage shall have no visible effect on luminous intensity of the LED luminaries. The operating voltage of the luminaries shall be 230V. All parameters measured at this voltage shall stand valid for the entire operating voltage range of 90- 300V.

Total harmonic distortion (THD) of current and voltage induced into the AC power supply by an LED lighting source shall not exceed 15% for current and 5% for voltage. Harmonic Generation shall be as per EN61000-3-2 and EN61000-3-3 / IEEE 519.

The lighting luminaries shall withstand the following tests.

- a. HV test
- b. IR test of 500V
- c. Product shall cut off its supply when voltage exceeds 300V and regains its normal working at 230vac
- d. Surge Test of 6 KV.

The output circuit shall have short circuit and open circuit protection inbuilt to the driver unit.

The infrastructure for Quality Assurance facilities to verify/ test/ prove above specifications must be available at the manufacturing facility. The compliance shall be indicated clearly in the tender itself.

All fasteners must be of stainless steel and rust free.

All glands inside/ outside luminaire must be metallic

Heat sink must be thermally connected to MCPCB/ LED light source.

**High power and high lumen efficient LEDs suitable for following features shall be used:-**

- a) The working life of the lamp at junction temperature of 85° C (max) at operating current shall be more than 50,000 working hours of accumulative operation as per IES LM 80 with min. lumen maintenance of 70% of rated initial lumen and shall be suitable for continuous operation of 24 hours per day. These features shall be supported with datasheet.
- b) Lumen maintenance report as per LM 80 guidelines shall be produced for the power LEDs used with the technical-bid.
- c) Thermal management shall be in such a way that LED soldering point temperature shall not go beyond 75° C.
- d) The detailed calculation with uniform distribution including the lux distribution curve/ graph/ spatial distribution shall be submitted in support of the dimensions selected and variation thereof. The luminaire shall be so designed that the illumination level shall be evenly distributed and shall be free from glare

The LEDs shall be of reputed make such as CREE / OSRAM / PHILIPS Lumileds / NICHIA / SEOUL/ Bridge Lux (U.S.A.).

The rated LED life L70/B20 shall be more than 50,000 hours at LED operating at (Ta) 35°C.

To enhance the secondary optics of the fixture, suitable Acrylic Optical Lenses shall be used.

The Correlated Color Temperature (CCT) of the LED fixture shall be in the range of  $4000 \pm 300 \text{K } ^\circ\text{K}$ .

The luminaries shall ensure a CRI of above **70**.

The Uniformity Ratio ( $E_{\text{min}} / E_{\text{avg}}$ ) shall be minimum of 40%.

The LED luminaries shall produce constant lux level in the voltage range of 140V to 270V.

Voltage variations/ fluctuations in the specified voltage range shall not impinge upon the lux level it produces.

The life span of the LED source including its Driver shall be minimum or greater than 50000 hours.

**Fixed Programmable microprocessor based Dimmable Driver for LED Street Light specification used for streetlight: -**

- a) Current waveform should meet relevant nation and international standard.
- b) LED Driver shall withstand voltage of 440 V for 1 minute and restore normal working when normal voltage is applied.
- c) The life of the driver should match life of LED luminaire **more than equal to 50,000 Hours**.
- d) Maximum Temperature rise  $\leq 30^\circ \text{C}$  @  $45^\circ \text{C}$  Tamb. With safety margin of  $10^\circ \text{C}$ .
- e) The control gear should be compliant to relevant international standard/ all applicable Indian standard(s) as per the requirements.
- f) The driver of the luminaires should have Short Circuit, Over Voltage, over current, over temperature, Under Voltage, String Open protections, **Surge & line protection devices/ components**.
- g) The driver should comply to CISPR 15 for limits and methods of measurement of Radio Disturbance characteristics
- h) The equipment should comply to IEC 61547 for EMC immunity requirements
- i) The control gear should be compliant to IEC 61347-2-13, IEC 62031 and IEC 62384 as per the requirements.
- j) **Additional MOV protection must be provided for protection of LED driver, LED chips having voltage rating of  $270 \pm 1\%$ . Protection of MOV must cover phase-neutral, neutral-**

earth & phase-earth terminals.

**k) LED drivers used must be appropriately sealed/ potted. Proper evidence(s) if required should be provided with the technical-bid. However, it is to further clarify that, appropriately sealed as well as potted driver can be used. LED driver must have separate R-number issued by BIS.**

l) The LED with Fixed Programmable microprocessor based Dimmable Driver must be confirming to IS 16104: 2012.

**The electronic components used shall be as follows: -**

a) The protective cum adhesive coating used on PCBs should be clear and transparent and should not affect colour code of electronic components or the product code of the company.

b) The construction of PCBs and the assembly for components for PCBs should be as per IS standards.

**c) Specific mentioned of the Indian Standard(s) or international standard(s) does not relieve contractor to design, supply & installation of LED luminaires as designed to give intended performance up to lifespan of 10 years.**

**d) Driver should have built – in 4 KV Surge protection and IC (Integrated circuit) shall be of industrial grade or above.**

e) Metallic film/ Paper/ Polyester Capacitor shall be rated for a sustained operating temperature of 105° C.

f) The resistors shall be preferably made of metal film of adequate rating. The actual rating versus loading shall be by a factor of 3.

g) The junction temperature of the Switching devices such as transistors and MOSFETs etc. shall not exceed 125° C (allowing thermal margin of 25° C).

**LED Light must be constructed to achieve the average illumination of LUX as required by PART 8 : ROAD LIGHTING as per National Lightng Code SP 72 : 2010 with Latest Amendments OR latest edition of CIE 136 (International Commission on Illumination) and all applicable Codes, Regulations, Standards, and relevant Authorities or better without glare at the ground level/ working level for the all the Utility Plants roads with the Uniformity Ratio ( $E_{min} / E_{avg}$ ) of minimum of 40% and tranverse ratio ( $E_{min}/E_{max}$ ) of 0.4 as per relevant to the employers requirement.**

LED must be mounted on heat sinking conductive bars if any with suitable large area surface by

means of fins to dissipate the conducted heat. The fins must be exposed to ambient flowing air.

Heat sink used should be aluminium extrusion / high pressure die cast aluminium having high conductivity. Heat sink should be integrated within luminaire and efforts shall be made to keep the overall outer dimensions optimum such that it permits sufficient heat dissipation through the body itself so as to prevent abnormal temperature inside the luminaire and consequential damage to cover, gasket material, LEDs, lenses and drivers.

The electrical component of the LED and LED driver must be suitably enclosed in hermetically sealed unit.

The luminary should be provided with in-built power unit & electronic driver. The luminary should be so constructed to ensure that the drivers shall be of modular type that can be easily replaceable, if required.

The luminaries shall conform to IEC 60598 or equivalent standard. The driver should comply with IEC 61347-2-13, IEC 61547, CISPR-15; and 61000-3-2. The supplier should submit luminary test report conforming to the specified standards.

Light Distribution shall be of Cut Off/ Semi Cut Off type. xix. Each lighting fixture shall be provided with an earthing terminal suitable for connecting 2.5 sq. mm (1 core of the 3Cx2.5 sq. mm copper-PVC cable to be used) copper stranded conductor.

### **Applicable standards:**

The standards and code of practices referred to below shall be the latest editions including all official amendments and revisions.

General safety requirements: IS 1913 - for luminaries

Luminaries for street lighting: IS 10322 - electric cables

Current waveform for the LED drivers should meet relevant national and international standard. xxii. Electronic components IC (Integrated circuit) shall be of industrial grade or above.

Metallic film/ Paper/ Polyester Capacitor shall be rated for a sustained operating temperature of 105° C.

The construction of PCBs and the assembly for components for PCBs should be as per IS standards.

Adequate heat sink with proper thermal management shall be provided.

Lumen maintenance report as per LM 80 guidelines shall be produced for the power LEDs used.



Thermal management shall be in such a way that LED soldering point temperature shall not go beyond 75° C.

The LED luminaries shall be free of glare.

**POWER (PRICE) LOADING: -**

Power (Price) loading shall be calculated based on followings: -

Rated power input of LED streetlight luminaire shall be guaranteed performance figure.

Luminaries shall be designed according to “Fixed” parameters mentioned elsewhere in the tender to achieve Guaranteed Rated Input Power.

**PENALTY:-**

1. If guaranteed rated power input at fixed parameter is not achieved during the test at site. Corporation shall have (1) the right to accept the luminaires & shall have right to charge penalty for that or (2) also right to reject the luminaires.

2. It should be very clearly noted that performance parameter i.e. guaranteed rated power input must be achieved according to the fixed parameters. No allowance shall be permitted to alter fixed parameters. No relaxation in this regard is permitted.

**Particulars and Details to be submitted by the bidder:**

For proper assessment and due diligence on submissions, the Bidder should provide various information regarding LED chip/ drive/ luminaires as per Annexure- E as mentioned earlier in the technical-bid1

**1. General Description**

Following details of the proposed luminaire shall be submitted as per Annexure: E

**2. Electrical specifications**

Electrical ratings of the proposed luminaire product shall be submitted in Annexure: E.

**3. LED chip and driver information**

LED chip and driver information of the proposed luminaire product shall be submitted in Annexure: E.

**1. Photometric information to be submitted as per Annexure: E.**

**2. Design:-**

Dialux design should be submitted of the product to be Given.

IES Files of the design also to be submitted for the verification.

Latest LM79 report from NABL approved 3<sup>rd</sup> party not more than 2 years old to be submitted.

#### **TESTS & CERTIFICATES:-**

- i. Design Qualification Testing shall be performed by the manufacturer or an independent testing lab hired by the manufacturer on new LED module/ array designs and when a major change has been implemented on an existing design.
- ii. The bidder shall submit manufacturer's test certificates complete with verification of Design Qualification Testing details by an independent testing authority.
- iii. The Luminaire manufacturer must show proof that the LEDs they use have been tested and approved to IESNA's LM80. The manufacturer must be able to provide the test data set to establish the authenticity and genuineness of the LEDs.
- iv. Tests conducted on LED luminaires are classified as:
  - a) Type test,
  - b) Acceptance test,
  - c) Routine test and
  - d) Mock-up test.

#### **Type Test: -**

Type test certificates for both the luminaires shall be provided with the technical-bid.

**These Test** shall be carried out to prove confirmation with the requirements of specification and general quality/ design features of the unit. In case of any change in Bill of Material or design of unit, complete type test shall be repeated. If any sample fails in any of the type tests, fresh samples shall be taken and tested. If any sample again fails in that test, the whole lot shall be rejected. The selected fixtures from the lot shall be type tested from the ERDA/CPRI/UL.

#### **Acceptance Tests: -**

These tests are carried out by an inspecting authority at the supplier's premises on sample taken from a lot for the purpose of acceptance of a lot. Acceptance tests shall not be carried out from particular size from the lot on which type tests have already been conducted. Recommended sampling plan is given below.

**Routine Tests:**

These tests shall be performed by the manufacturer on each complete unit of the same type and the results shall be submitted to the inspecting agency, prior to offering the lot for acceptance test. The firm shall maintain the records with traceability.

**Mock up Test:**

The successful bidder shall provide proposed LED lamp and luminaries on three consecutive poles as demonstration to prove the suitability of the fittings matching with the requirement in regards to lux level, quality of illumination for professional, objective & impartial review jointly by the bidders team along with team of GIDC Engineers. This shall be carried prior to submission of detail design for approval.

**Sample size and criteria for conformity:**

The luminaries shall be selected from the lot at random. In order to ensure randomness of selection, procedures given in IS 4905-1968 (Reaffirmed 2001) may be followed.

All Tests defined for acceptance other than LM 79 and LM 80 is allowed to be carried out at Manufacturer works.

Normally testing of LED luminaires to be supplied/ installed are to be done as mentioned in the table below. The testing methodology mentioned wherein is for normal cases. Competent authority or concern department head of GIDC can waive some or all tests, in special cases or quantity of the LED luminaires are less.

**Method of testing shall be as per relevant standards/ industry practices**

Sr. No.	Description of test	Prototype Test	Type Test	Acceptance Test	Routine Test
1	Visual and Dimensional check	Y	Y	Y	Y
2	Checking of documents of purchase of LED	Y	Y	Y	Y
3	Resistance to humidity	Y	Y	--	--

4	Insulation resistance test	Y	Y	Y	Y
5	HV test	Y	Y	Y	Y
6	Over voltage protection	Y	Y	Y	Y
7	Surge protection	Y	Y	Y	Y
8	Reverse polarity	Y	Y	Y	Y
9	Temperature rise Test	Y	Y	--	--
10	Ra (Colour Rendering Index) measurement test	Y	Y	--	--
11	Lux measurement	Y	Y	Y	Y
12	Fire retardant Test	Y	Y	--	--
13	Test for IP 66 protection	Y	Y	Y	--
14	Environmental tests	Y	--	--	--
15	Reliability Test	Y	--	--	--
16	Life Test	Y	Y	--	--
17	Endurance Test	Y	--	--	--
18	LM-79	Y	Y	Y	Y
19	IK-08	Y	Y	Y	Y
**	<b>Quality Assurance Plan/ Details</b>				
20	Testing at	Approved Govt. Lab	Approved Govt. Lab	Mfr. works	Mfr. works
21	Testing by	---	---	GIDC & TPI	GIDC & TPI
22	Lot size for testing not less than	---	---	50 Nos.	---
23	Test Sample Size	---	---	Min. 10%.	---

24	Documentation to be submitted	Whenever asked	After issuance of work order/intimation	During testing at Mfr. works	During testing at Mfr. works
25	LM 79 and LM 80 test report & result	---	-as above-	---	---
26	Certificate for Impact Resistance Test	---	---	During testing at Mfr. works	

### **Method of Testing: -**

#### **Visual and Dimensional Check:**

The unit shall be checked visually for all dimensions as per approved design and drawing.

General workmanship should be good; all the components properly secured and sharp edges shall be rounded off. Check the marking and quality of the workmanship visually. Check the rating and make of electronic/ electrical items.

#### **Checking of documents of purchase of LED**

Check Document of purchase of LED lamps of approved sources viz. CREE/OSRAM/PHILIPS Lumileds/NICHIA/SEOUL/LG/BRIDGELUX (USA) make LED used for luminaire.

#### **Resistance to humidity test**

This is carried out by suspending the painted panels in corrosion chamber maintained at 100%

RH and temperature cycle of 42 to 48° C for 7 days and examining it for any sign of deterioration and corrosion of metal surface.

#### **Insulation resistance test**

The insulation resistance of the unit between earth and current carrying parts shorted together shall not be less than 2 MΩ when measured with 500 V megger.

#### **HV test**

Immediately after insulation resistance test, an AC voltage of 1.72 KV rms (1500 + 2 x rated voltage) of sine wave form of 50 Hz shall be applied for one minute between the live parts and frame. There shall not be any kind of break down, flashover or tripping of supply.

#### **Over voltage protection**

The LED Driver Shall be cut off once voltage exceeds 300V +/- 10 VAC. It shall be reconnected when supply comes within limit.

### **Surge protection**

It shall withstand a surge of 10 kV at the input terminals for all types.

### **Reverse polarity**

The Luminaire shall withstand polarity reversal. It shall be operated with reverse voltage for 5 minutes at maximum value of voltage range. At the end of this period, the supply shall be made correct polarity and Luminaire shall operate in a normal way.

### **Temperature rise Test:**

Temperature rise Test shall be conducted at 100 V ~ with full load. The temperature rise shall be recorded by temperature detectors mounted at the specified reference points on the body of semiconductors, capacitors and other components as agreed between purchaser and manufacturer. The maximum-recorded temperature under worst conditions shall be corrected to 55° C and compared with maximum permissible temperature (for power devices at junction). Under loading conditions as specified above, the corrected temperature of the power devices shall have a safety margin of minimum 10°C. Temperature at junction shall not exceed 100° C when corrected to 55° C. The Luminaire shall also be subjected for short time rating after continuous loading to ensure the temperature rise is within the permissible limit. The maximum temperature rise of the electronics devices on the PCBs shall be in limit for industrial grade components suitable for 85° C environment. In case of exceeding limit, use of MIL-grade component shall be considered keeping RDSO informed.

### **Ra (Colour Rendering Index) measurement test :**

The lumen is the unit of luminous flux, which is equal to the flux emitted in a solid angle of one steradian by a uniform point source of one candela.

The initial reading of the chromaticity co-ordinates x & y shall be within 5 SDCM (Standards Deviation for Colour matching) from the standardised rated value as per Annex: D of IEC 60081- 1997.

The initial reading of the general colour-rendering index (Ra) shall not be less than the rated value decreased by 3.

The lumen maintenance of the lamp shall not be less than 80% of the initial lumen after 20,000

burning hours and 70% of the initial lumen after 50,000 hours. The initial lumen will be taken after 100 hours aging.

Photometric test shall be conducted as per Annexure: B of IEC 60081-97.

The lumen maintenance test shall be done as per Annexure: C of IEC 60081-97.

**Fire retardant Test:**

Fire Retardant test shall be conducted as per IEC 60332-1 of the wire used in the luminaires.

**Test for IP 66 protection:**

This test shall be conducted as per IEC 60529.

**Environmental tests (Prototype Test) :**

The Luminaire shall meet the following tests as prescribed in IEC-60571.

- (i) Dry heat test.
- (ii) Damp heat test
- (iii) Test in corrosive atmosphere
- (iv) Combined dust, humidity and heat test

**Reliability Test :**

The reliability can only be determined in actual service. However, the following tests shall be carried out on the prototype to simulate as close as possible, the service conditions.

There shall be no failure during this test.

The light unit shall be mounted in an oven maintained at 45° C.

- (ii) The light will be operated at the specified maximum voltage and at 45° C for a period of 100 hours.

**Photometry Test: -**

The test shall be carried out for Total Luminous Flux, Luminous Intensity Distribution, Electrical Power, Luminous Efficacy (calculation), Color Characteristics— Chromaticity, CCT & CRI etc. as per IES LM 79.

**The following tests and measurements shall be conducted to verify the LED photometric data:**

**(a) Isolux Diagram;**

**(b) Coefficient of Utilisation curves;**

**(c) Polar Lighting Distribution Diagrams.**

**Manufacturer shall be having full glass photogonio meter / integrating sphere in their own facility. LM79 should be witnessed by GIDC Engineer.**

### **Life Test**

The lumen maintenance & life test shall be done as per IES LM 80 for LEDs.

### **Endurance Test**

The Luminaire shall be kept “ON” with input voltage of 250 V ~ for 200 hours. After this the Luminaire is subjected to 20,000 cycles of “ON” and “OFF”, each cycle consisting of 3 seconds “ON” and 10 seconds “OFF” period. Luminaire should survive this test. Test is to be continued for 20,000 cycles, followed by performance test.

The luminaire should be tested as per IEC 60598-2-3: 2002 standards and following test reports should be submitted: -

(i) Heat Resistance Test

(ii) Thermal Test

(iii) Ingress Protection Test

(iv) Drop Test

(v) Electrical/ Insulation Resistance Test,

(vi) Endurance Test,

(vii) Humidity Test,

(viii) Electrical and Photometric Measurements Test Report (IES LM 79)

(ix) LED Lumen Maintenance Test Report (IES LM 80)

(x) Vibration test as per ANSI.

**Note :- 100% lot for the given streetlight order will have to manufactured, 2 random samples will be selected by GIDC officials from the whole lot. Testing to be done at ERDA/UL/HYPHYSIS/MSME, If required. If testing fails, whole lot gets rejected.**

**Safety:**



The Luminaire shall comply with the safety requirements as per IEC 61195.

**All Tests defined for acceptance other than LM 79 and LM 80 are allowed to carry out at Manufacturer works.**

**The offered LED streetlight luminaires must have passed IES LM 79, IES LM 80, IP, IK from ERDA/NABL approved laboratory only and attested copies of the test certificates must be attached.**

**IES file of the tested product will be compared with the design submitted after order and both should match.**

**One (1) copy of all test certificates and reports certified by accredited laboratories shall be furnished to GIDC.**

#### **INFRINGEMENT OF PATENT RIGHTS**

GIDC shall not be responsible for infringement of patent rights arising due to similarity in design, manufacturing process, use of the components, used in design, development and manufacturing of these light luminaires and any other factor which may cause such dispute. The responsibility to settle any issue rises with the manufacturer.

#### **MARKING:-**

The following information shall be distinctly and indelibly engraved on the housing:

Client's name – GIDC– **Estate Name**

Year of manufacture, Batch Number, Serial Number

Name of Manufacturer (**Engraving only, stickers not allowed**)

Rated wattage and voltage (input), Supply Voltage, Input frequency, LED Make

**Marking Like CE, BIS**

#### **GUARANTEED TERMS & CONDITIONS:-**

In addition to meeting the performance requirements for the minimum period of 60 months, the manufacturer shall provide a written comprehensive guarantee against defects in materials and workmanship for the modules/ arrays for a period of 60 months after acceptance of the modules/ arrays. Replacement modules shall be provided promptly after receipt of modules that have failed at no cost to the Owner.

The bidder shall stand guarantee for full replacement of the luminary due to any failure in 5

years, from the date of purchase. Failures shall include failure/ deterioration of LEDs in terms of performance like guaranteed luminous efficiency, high junction temperature, and abnormal lamp lumen depreciation, deterioration in LED including its lens, driver unit and quality of light. The vendor shall replace the entire LED module/ array of the defective luminaire with new module /array free of cost immediately.

In the event of single LED source getting defective, the entire array/ module shall be replaced by the bidder by the new fittings.

The bidder shall stand guarantee against lumen depreciation beyond 20%. Vendor shall ensure that LED module/ array shall deliver at least 70% of initial lumens, when installed for a minimum of 50,000 hours, failing which bidder shall carry out necessary rectification free of cost to the entire satisfaction of GIDC.

The bidder shall maintain appropriate level of inventory in India for immediate replacement of a defective/ malfunctioning luminary/ LED module/ array/ driver etc.

#### **GUARANTEE / WARRANTY:-**

Bidder shall have to offer the following minimum Guarantee/ Warranty:

The LED Light Fixture supplier / manufacturer shall provide a warranty against all defective materials and workmanship up to five (05) years after the date of Completion of the Works certified by GIDC.

The Deed of extended warranty shall be submitted upon the acceptance of the LED Light Fixture.

Provide a five (05) years on-site replacement warranty covering warranty covering material fixture finish and workmanship. To include transportation, removal, and installation of new products.

Provide five (05) years replacement warranty for defective or non-starting LED source assemblies and all drivers

Provide a five (05) years warranty for luminaries exhibiting inadequate lumen maintenance at the end of the warranty period in compliance with the following table :

<b>L 70 lifetime claim</b>	<b>Min. Lumen maint @ 5 Year</b>
30,000 Hours	92.50%

50,000 Hours	85.50%
1,00,000 hours	80.00%

A

luminaire dirt depreciation (LDD) factor may be included in the above calculation, such a value be determined by mutual agreement between GIDC and the manufacturer, consistent with local ambient environmental conditions and practice

A luminaries dirt depreciation (LDD) factor may be included in the above calculation, such a value be determined by mutual agreement between GIDC and the manufacturer, consistent with local ambient environmental conditions and practice

A monitoring programme to implement above will be determined by mutual agreement between GIDC and the Bidder. The Costs of the monitoring programme over the three year warranty period will be borne by the bidder, unless agreed otherwise by GIDC and the Bidder.

The warranty shall cover all LED light sources (Packages or modules/arrays) including but not limited to the LED die, enclosure, and phosphor if the expected life of the luminaire system is not maintained net of LDD, the the bidder shall replace the light source(s) and /or luminaries as needed.

### **Photometric information**

The proponent needs to submit the following photometric

1. Photometric modeling results, preferably within a LM79 report, from an independent accredited laboratory showing generic candlepower traces and isofootcandle plots for the proposed luminaries' product.
2. Photometric information data and diagrams that model the luminance flux distribution of the proposed luminaire referencing the site characteristics given in above. The proponent should consider the following during the modeling exercise
3. Such modeling should verify that the products proposed luminaire will meet Indian Roadway lighting standard IS 1944, which specifies average luminance (Eavg) and unifroity (Emin/Eavg) for roads at the above sites.
4. Use industry accepted, standardized software like Dialux for the above modeling while modeling, a maintenance factor of 0.8 should be used
5. Note the proponent needs to submit a soft copy of the IES file of the proposed luminaire along with the bid

### **Lumen maintenance statement**

1. The proponent must submit a lumen maintenance statement that estimates how many operating hours can be expected from the proposed luminaire product until its light output declines to 70% of its initial output (L70) given the specific climatic character, including extremes of temperature and high humidity, associated with the than local condition.
2. The lumen maintenance statement should also clearly explain that how or what method was used to determine the rated life time
3. Describe in details the thermal management how th physical and thermal design of the luminaire will prevent the LED chips from overheating on extremely hot days
4. Other trials of pilot projects submit information and contacts for other relevant trials in which the proponent's proposed luminaire product or similar products sold by the agency have been tested in the field
5. Such information should include LM80 report for the LED chip package employed in the product illuminance measurements, if available, taken over a minimum of two years of operation fromm pilot project the proposed luminaire product, or a similar luminaire product, in the field

### **Luminaire specification – others**

The provide information and certifications

- 1 Requirements, Tests, and Certifications specified in IS 10322
- 2 Specifications such as ISI and BIS
- 3 Specifications IP 66

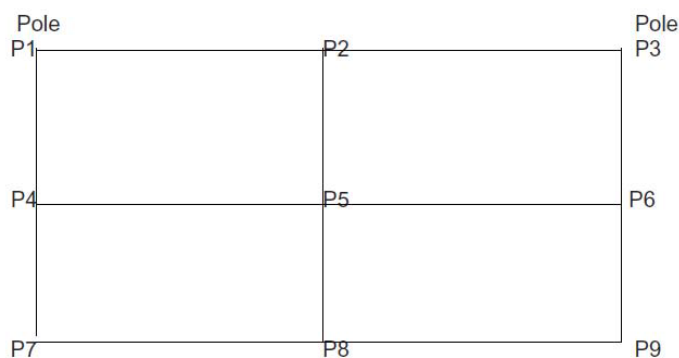
**Note : Tenderer must have to submit following information regarding the LED manufacturer compulsory.**

1. Since how many years the LED manufactures have manufacture same type LED Fixtures ?
2. In last 5 years how many nos. Same type LED Fixture supplied in Govt., Semi Govt. And Corporates by the LED manufactures.
3. Annual turn over of the LED manufactures of the last 5 years with all supporting documents with and without LED Fixtures.

### **MEASURMENT OF WORK :-**

**Testing / Sampling of Lower Promenade Lighting:** The Sampling should be required for Lighting on all the different stretch of the Lower Promenade. The method for sampling should be as per CIE norms - 1976a (Nine point Method) & the taken results should be reported separately & required to be approved by the relative authorities of the client before further execution of the same stretch. The type of lighting fixtures will be finalized based on the same results along with its aesthetical suitability on the roads. No extra cost shall be paid for the process to the bidder; it is the responsibility of Manufacturer to coordinate with all the required concerns & vendors for sampling & takes the approval of the same from the authorities of client & architects.

**9 point method Field Measurements:-**



**Basics :**

- Divides the section between two poles into 4 quadrants of equal size
- Measures the Lux levels at four corners of each quadrant
- Takes the average of each quadrants
- Finds the average of the all the four quadrants

Sr.No	Quadrant	Average of the quadrant
1	Q1	$(P1+P2+P4+P5)/4$
2	Q2	$(P2+P3+P5+P6)/4$
3	Q3	$(P4+P5+P7+P8)/4$
4	Q4	$(P5+P6+P8+P9)/4$
	Average	$(Q1+Q2+Q3+Q4)/4$

Recurrence	Points	Factor
Points taken only once	P1/P3/P7/P9	$(P1+P3+P7+P9)/16$

Points taken twice	P2/P6/P8/P4	2(P2+P6+P8+P4)/16
Points taken four times	P5	4((P5))/16

$$\text{Average Lux levels} = (((P1+P3+P7+P9) + 2(P2+P6+P8+P4) + 4((P5))) / 16) \\ = ((P1+P3+P7+P9)/16 + (P2+P6+P8+P4)/8 + (P5)/4)$$

**Make:-** BAJAJ/PHILLIPS/SCHREDER/LIGMAN/WIPRO/ CROMPTON/ /HAVELLS or Eq

**Mode of measurement:-** Measurement shall be taken No basis

### **SUPPLY, LAYING, TESTING AND COMMISSIONING OF ARMOURED XLPE CABLE AND UMARMOURED PVC CABLE :**

**ITEM NO.8:-** Supplying and erecting Flexible FR PVC insulated multi strand multi core 1.1 kV grade ISI Marked Copper wires of 1.5 Sq. MM., 3 core round PVC sheathed in existing pipe/ in street light pole erected with green colour for earth continuity. - (11 / 9 Mtr. per St. Light Fitting x 1 No. St. Light Fitting = 9/ 7 Mtr Pole.) (As Per Make List)

The item includes supply, laying, testing and commissioning of round 3C x 1.5 mm<sup>2</sup> (as per IS: 694) for LED luminaires flexible unarmoured single PVC insulated copper conductor cable 1.1 kV grade to be laid through the pole from luminaires to junction box by experienced technician without any damage. The cable joint shall not be allowed. Also, Cable should be terminated in MCB and Luminaires using appropriate size copper lugs.

**Make:** FINOLEX/TORRENT/POLYCAB/RAVIN(PRIMECAB)/KEI/RR Cable or Eq

**Mode of Measurement:** Measurements shall be taken on Rmt basis.

**ITEM NO.9.1:-** Providing & erecting of 1 x 4.0 Core x 10 Sq. MM, XLPE (IS: 7098 (i) - 88), ISI Mark, Armoured cable, Multistranded Aluminium Conductor suitable for 1.1 kV grade to be laid on wall with necessary clamps or to be laid 90 Cms underground in existing cable trench/ pipe at road crossing or on floor and making the ground as per original. - For Streetlight between two poles & Service Connections.(Considering 25 Mtr. Distance between two poles and extra cable for loop = 35 Mtr.)

**ITEM NO.9.2:-** Providing & erecting of 1 x 4.0 Core x 16 Sq. MM, XLPE (IS: 7098 (i) - 88), ISI Mark, Armoured cable, Multistranded Aluminium Conductor suitable for 1.1 kV grade to be laid on wall with necessary clamps or to be laid 90 Cms underground in existing cable trench/ pipe at road crossing or on floor and making the ground as per original. - For Streetlight between two poles & Service Connections.(Considering 25 Mtr. Distance between two poles and extra cable for loop = 35 Mtr.)

**Make:** FINOLEX/TORRENT/POLYCAB/RAVIN(PRIMECAB)/KEI/RR Cable or Eq

**Mode of Measurement:** Measurements shall be taken on Rmt basis.

### **General**

The item includes supply, laying, testing and commissioning of round 3 X 1.5 sq. mm for LED luminaries flexible unarmoured single PVC insulated copper conductor cable 1100 V grade to be laid through the pole from luminaries to junction box by experienced technician without any damage. The cable joint shall not be allowed.

### **Scope**

This section shall cover supply, installation, connection, termination, testing and commissioning of low voltage cables. The cables shall be installed either underground or on cable tray, or on cable support, or in purpose made built up trench or any other method as indicated in the relevant drawing & as per instruction of Engineer- In-charge.

The cable laying procedure should be as per IS and National Electrical code of practice. Any damage to other services during excavation, cable laying or refilling work shall be solely on the Contractor's account. The following factors should be considered while laying the cable.

The cable shall be stranded Al. conductor, Cross Linked Polyethylene Insulated PVC sheathed, galvanized strip armour 1100 V grade confirming to relevant I. S. (IS: 7098 Part I ) specification bearing I. S. I. mark. In this work the cable shall be required for providing power connection to the street light pole.

The copper flexible cable shall be provided for connection from the pole box to the luminaries and it shall be of ISI marked only and approved list of make.

### **CODES AND STANDARDS**

The design, manufacture, testing and supply of the brand new cables under this specification shall comply with the latest revisions including amendments of the following following referenced standards/documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

#### **International Electro technical Commission (IEC) Standards:**

IEC:60189-1 & 2 Low frequency cables and wires with PVC insulation and sheath

IEC 60228 : Conductors of insulated cables. Guide to the dimensional limits of circular conductors.

IEC 60287 : Calculation of the continuous current rating of cables (100% load factor)

IEC 60331 : Tests for electric cables under fire conditions

IEC 60332 : Tests on electric and fiber cables under fire conditions.

Part 3-10 : Test for vertical flame spread of vertically mounted bunched wires or cables - Apparatus, Part 3-21 :Test for vertical flame spread of vertically-mounted bunched wires or cables - Apparatus - Category A F/R

IEC 60502 : Power Cables with Extruded Insulation and Their Accessories for rated voltage from 1kV ( $U_m = 1.2\text{kV}$ ) Up to 30kV ( $U_m = 36\text{kV}$ ), Part 1: Cables for rated voltages of 1 kV ( $U_m = 1.2\text{kV}$ ) and 3 kV ( $U_m = 3.6\text{kV}$ )

IEC 60754 : Test on gases evolved during combustion of materials from cables. Part 1: Determination of halogen acid gas content evolved during combustion of polymeric material taken from cables.

IEC 60811 : Common test methods for insulating and sheathing materials of electric cables.

IEC 60885 : Electric test methods for electric cables.

IEC 60304 : Standard colours for insulation for low frequency cables and wires.

IEC 60227 : PVC insulated cables of rated voltages up to and including 450/750 V.

IEC 61034 : Measurement of smoke density of electric cables burning under defined conditions.

IEC 60028 : International Standard of Resistance for Copper

IEC 60949 : Calculation of thermally permissible short circuit currents, taking into account of non-adiabatic heating effects.

### **British Standards(BS) :**

BS:6346 Specification for PVC insulated cable for electricity supply

BS:6746 Specification for PVC insulation and sheath of electric cables

### **Indian Standards (IS) :**

IS:694 PVC insulated cables (for voltage upto 1100 V)

IS 1554 Part 1 :HRPVC &PVC insulated (heavy duty) electric cables for working voltages up to and including 1100V.

IS: 3961-II: Recommended current ratings for cables.

IS 3975 : Mild steel wires, formed wires and tapes for armouring of cables.

IS 5831 : PVC insulation & sheath of electric cables.

IS 6474 : Polyethylene insulation & sheath of electric cables.

IS 7098 Part 1 : Cross linked polyethylene insulated PVC sheathed cables for working voltages up to and including 1100V.

IS 8130 : Conductors for insulated electric cables and flexible cords.

IS 10810 : Methods of test for cables.

IS 10418 : Specification for drums for electric cables

### **ISO Standards:**

ISO 9000 : Quality Management and Quality Assurance Standards

ISO 9001 : Quality Systems – Model for Quality Assurance in Design Development, Production, Installation and Servicing

ISO 9003 : Quality System Model for Quality Assurance in Final Inspection and Test.

## **GENERAL**

### **Features of Construction**



### **a) LT Power Cables**

(i) PVC Insulated Cables: The Cables shall be 1.1 KV Grade, heavy duty, Stranded Aluminium / Copper Conductor, PVC Compound type A insulated, inner sheathed, galvanised steel wire /strip armoured, black PVC compound type ST1 outer sheathed.

(ii) XLPE Insulated Cables: The Cable shall be 1.1 KV Grade , heavy duty, stranded aluminium/ Copper Conductor , XLPE insulated , Extruded inner sheathed, galvanised steel wire / strip armoured ,extruded black PVC Compound type ST2 outer sheathed.

### **b) Control Cables:**

The Cables shall be 1.1 KV grade, heavy duty, stranded copper conductor, PVC Compound type A Insulated, galvanised steel wire/ strip armoured extruded PVC type ST1 outer sheathed.

### **c) Cable Rating:**

The Contractor shall ensure that cable and wires associated with the distribution and control systems, plant wiring and all other installations throughout the Works are adequately rated for their use.

In assessing the rating of any cable or wire, the following factors shall be taken into account Supply voltage and frequency.

- Maximum voltage drop permissible
- Type and magnitude of load
- Fault level and duration related to circuit protection relays and fuses
- Circuit Overcurrent protection
- Route length and disposition of cables
- Ambient temperature
- Method of installation

All power cables shall be sized for continuous current carrying capacity at the ambient temperature of 45 deg C. The design current of any circuit shall exceed the full load current of the supplied device by at least 10%. Power cables shall be sized to limit the maximum voltage drop to no more than 3 %.

Under motor starting conditions the corresponding voltage drop shall not affect the operation of the motor controls or the ability of the motor to start and run effectively and in any event shall not exceed 10%.The Contractor when sizing cables for the remote operation of shunt trip coils shall take due account of the voltage drop caused by the momentary current surge taken at the instant of energisation. HV and LV cables shall be sized for a fault clearance time of 0.5 seconds for the incoming feeders and 0.16 seconds for switchboard feeders controlled by circuit breaker.

### **d) Cable Colours:**

All cable cores shall be colour coded throughout their length and shall be so connected between switchboard, distribution board, plant and accessories, that the correct sequence or phase colours are preserved throughout the system.

The colour coding should be as follows:

3 phase - red, yellow and blue

single phase or dc - red and black

earth- green/yellow

control -blue (dc), red (ac)

**e) Cable Conductors:**

Copper conductors shall be used for cables of sizes upto 4 Sqmm .Aluminium conductors shall be used for cables of size 6 Sqmm and above. Cores of crosssectional area greater than 1.5 mm2 shall be stranded. Lighting final distribution circuits shall be of a minimum cross-section of 1.5 mm2. Power cables shall be of a minimum cross-section of 2.5 mm2 Internal wiring of control panels shall be of a minimum cross-section of 1.0 mm2 flexible and stranded. Control cables shall be of a minimum cross-section 1.5 mm2 for external use and 1.0 mm2 for internal use. For the following two interconnections the cable used shall be of 3Cx2.5sq.mm.

(i) Junction Box on Each street lighting pole to lighting fixture on the pole

**f) Cable Numbering:**

All cables shall be allocated a unique number which shall be fixed to each end of the cable using a corrosion resistant label. Cables of different categories shall be tagged with the following subscripts and three digit numbers.

HV power HV-P\_ \_ \_

LV power P\_ \_ \_

Control C\_ \_ \_

Instrumentation I\_ \_ \_

Protection PR\_ \_ \_

**g) Cable Drums:**

Cables shall be supplied in non-returnable wooden drums. The wood used for construction of the drum shall be properly seasoned and free from defects and wood preservative shall be applied to the entire drum. All ferrous parts shall be treated with a suitable rust preventive coating to avoid rusting during transit or storage. The Bidder shall indicate in the offer, the maximum length for each size of cable, which can be supplied on one drum. The actual length supplied on each drum shall be within tolerance limit of 5% without any tolerance on total ordered quantity of each size of cable. However, before winding the cables on drums. Contractor shall obtain Employer's approval for the drum lengths.

Each drum or coil of cable shall be accompanied by a certificate stating the manufacturer's name, cable size, number of cores, length, result and date of tests as required in the Employer's Requirements. Cables manufactured more than 12 months before delivery will not be accepted. All cables shall be delivered with cable ends effectively sealed by hygroscopic sealing caps.

When a cable is cut from a drum both ends shall be immediately sealed to prevent ingress of moisture. Cables shall not be transported to site in loose coils but a number of short lengths of cable may be transported on the same drum. The Contractor shall be wholly responsible for the purchase and/or hire costs of all cable drums and for the removal of these drums from site after use.

**h) Cable Installation**

i. General Cables shall be installed in such a way that the minimum bending radii are not reduced when installed or during installation. Cables shall not be installed in ambient temperatures below that recommended by the cable manufacturer.

Cables grouped together shall have insulation capable of withstanding the highest voltage present in the group. Cables of different categories shall be installed so as to maintain satisfactory clearances for safety and in order to reduce the possibility of electrical interference. The following Table details the distances in mm that shall be maintained between the different categories of cable.

Table of Separation Distances in mm between different Categories of Cable.

Cable Category	HV Power	LV Power	C&I/Protection
HV Power	N/A	300	500
LV Power	300	N/A	300
C&I/Protection	500	300	N/A

These separations are minimum and special circumstances such as the presence of high current flows, or harmonic content may necessitate larger separation distances. In order to make economic use of the cable support system, cables shall be arranged in groups of 50 mm maximum overall diameter. These groups shall be securely tied to the cable support system at intervals not exceeding 900 mm for horizontal runs and 300 mm intervals on vertical runs. Cables shall be laid in a manner such that any electrical interference between cables shall not have a detrimental effect on the life and operation of Plant. Where practical a separate cable support system shall be provided for power and non-power cables. Where this is not practical a separation of 150 mm shall be maintained between power and non-power cables when run on the same support system. Heavy duty galvanised iron cable tray and ladder racking shall be used for cable support systems. Plastic or GRP cable support systems shall be used in areas used for the storage and handling of chlorine. These systems shall be used to route cables around walls and within cable trenches. Cables shall be securely fixed to the support systems. Bundling of cables shall be permitted where allowance for this practice has been made in sizing the cables.

ii. Cables Laid Direct in Ground

Buried cable up to 650/1 100 V shall have a minimum cover of 500 mm measured to the top of the highest cable. On crossing roadways the cable shall be run through a PVC-U duct of minimum diameter 100 mm with a minimum of 1 000 mm cover and encased on all sides by 150 mm of concrete. Cables of greater than 650/1100 V shall be buried with a minimum cover of 1m. The bottom of the cable trench shall be freed of sharp stones and such like and 75 mm of sieved sand laid below the cable. After cable laying 75 mm of sieved sand shall be laid above the cable.

Interlocking cable protective covers, minimum 1 m long x 300 mm wide, marked 'Danger Electric Cable' in English and the vernacular shall be laid on top of the sieved sand. Covers shall extend the whole length of the cable trench and shall overlap cables by a minimum of 50 mm. Warning tape shall be laid a minimum of 200 mm above the protective covers. Cables are to be installed without tees or through joints unless otherwise approved by the Engineer. Single core cables shall be run in trefoil formation.

iii. Cables Laid in Underground Ducts Underground ducts shall be constructed of impact resistant DWC pipes and laid at a minimum depth of 750 mm, ducts shall be surrounded by at least 75 mm of sieved sand except at road crossings where it shall be 1 m deep and encased on all sides by 150 mm of concrete. The Contractor shall ensure that sufficient drawin points have been provided and that adequate room has been allowed for installation of cables. Drawstrings shall be provided in all ducts to enable additional cables to be installed when required. Where cables pass in or out of any duct entries into the poles or feeder pillars, together with any spare ducts shall be sealed against the ingress of moisture by means of duct stoppers and bituminous compounds or by anyother method approved by the Engineer. The stopper shall have a fire resistance of at least 30 minutes.

#### i) Cable Terminations and Joints

##### i. Multi core or Control Cable Terminations

A sufficient number of terminals shall be provided to terminate all cable cores. For control and auxiliary wiring an additional 20% of this number shall be provided as spares.

Not more than one core of internal or external wiring shall be connected on any one terminal. Where duplication of terminal blocks is necessary, purpose-made solid links shall be incorporated in the design of the terminal blocks. Terminals which remain energised when the main equipment is isolated shall be suitably screened and labelled.

Terminal blocks for different voltages or circuit type shall be segregated into groups and distinctively labelled.

##### ii. Cable Fixings

Ties and strapping shall be suitable for securing cable and cable groups to cable tray or ladder. They shall be resistant to chemical and marine corrosion. Plastic coated metal ties used in order to obtain corrosion resistance shall not be acceptable. Nylon ties shall be resistant to the effects of ultra-violet light and shall be self-extinguishing. Large single cables shall be secured with cable clamps or cable cleats.

##### iii. Cable Identification

At each end of each cable, in a uniform and visible position a label shall be fixed on the cable in accordance with the cable schedule. Labels shall be made of PVC and shall be indelibly marked to the approval of the Engineer. The label shall be retained using proprietary nylon strips passing through two fixing holes at either end of the label. If the cable gland is not normally visible, then the label shall be fixed inside the panel by means of screws.

##### iv. Cable Glands

Glands shall generally be of the mechanical compression hexagon type. Earth continuity of brass glands shall be assured. This may be achieved by the rigid clamping of the armour within the gland and the intimate contact between the threaded components of the gland and the equipment. Each gland shall be installed complete with proprietary earth tag providing a ready means of connecting a flexible strand or strip earth bond to the gland at any position around the gland in relation to the associated apparatus. Adequate earth

continuity shall be assured between the earth tag, the gland and the armour wires of the cable where applicable.

Glands for single core cables shall be constructed from non-magnetic materials. Each gland shall be installed complete with a proprietary non-ferrous lock-nut to secure the gland body to the equipment where the entry hole is plain, i.e. not tapped.

Where holes for cable entries are not provided it shall be the responsibility of the Contractor to mark out and drill such holes. Burrs and swarf shall be removed, care being taken to ensure that swarf and filings, etc do not enter the equipment.

For non-hazardous areas cable glands in situations where moisture may be present shall be double seal weatherproof type, gland shrouds shall be used and entry shall be sealed. For dry indoor situations, standard industrial glands with shrouds are acceptable. For hazardous areas, glands used shall be used with double seal and shroud. Power cable glanding arrangements in hazardous areas shall incorporate an insulated adapter and earth link. This shall provide the facility to disconnect the armouring from the glanded device in order that a true earth loop value may be measured when carrying out tests on the installation.

### **Marking Locations of Underground Cables**

The location of all underground cables shall be engraved on brass or other noncorrodible plates to be fixed to the exterior surface of all walls of buildings 300 mm above ground level and directly above the point where cables pass through the wall.

In addition concrete marker posts shall be installed at intervals of not more than 50 m at all junctions and changes of direction along the cable route. Such marker posts shall be not less than 200 mm high and of substantial construction. A drawing or sample of a typical marker post shall be submitted for the approval of the Engineer.

The markers shall be marked 'electric cable' in English and the vernacular.

LV/MV cables shall be supplied, inspected, laid, tested and commissioned in accordance with drawings, specifications, relevant Indian standards specifications and cable manufacturer's instructions. The cable shall be delivered at site in original Hot Mix plant with manufacturer's name clearly written in the Hot Mix Plant.

The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

### **MATERIAL**

The LV/MV cables shall be XLPE insulated Aluminum / Copper conductor armored cable conforming to IS: (IS: 7098 (i) - 88) laid in trenches, ducts and underground as shown in drawings of SOR of R&B Department, Electrical Dn.

### **TECHNICAL REQUIREMENTS**

- 1.1 Power cables shall be 1100 volts grade, multi core constructed as per IS: (IS: 7098 (i) - 88) as follows.
  - 1.1.1 Stranded aluminum / copper conductor
  - 1.1.2 Extruded XLPE insulation cores laid up
  - 1.1.3 Extruded ST2 PVC inner sheath
  - 1.1.4 Galvanized steel wire armored

### 1.1.5 Extruded ST2 PVC outer sheath

- 1.2 Conductor shall be hard drawn aluminum , electrolytic Grade ,Should carry 61% Conductivity and min 99.6% Purity as per IS specifications /Class2 Flexibility / grade H2 as per IS: 8130
- 1.3 Insulation shall be of XLPE type - A as per IS: 7098-1-88 and its latest version.
- 1.4 The cables shall be suitable for laying in racks, ducts, trenches, conduits and underground-buried installation with uncontrolled back fill and chances of flooding of water.
  - 1.4.1 Cables shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transit operating conditions.
  - 1.4.2 The cable should withstand the system fault current with insulation screen / armor insulated at one end. Bidder shall furnish calculations in support of capability of cables for 3 phase fault. Armor shall be designed to withstand the earth fault currents. The current carrying capacity of armor shall not be less than the earth fault current values of the system.
  - 1.4.3 Progressive automatic in line sequential marking of the length of cables in meters at every one meter shall be provided on the outer sheath of all cables and also the marking of property of GIDC.
  - 1.4.4 Cables shall be supplied in non-returnable wooden Hot Mix Plant as per IS: 10418. Both ends of the cables shall be properly sealed with PVC / rubber caps and Brand Name embossed on it, so as to eliminate ingress of water during transportation, storage and erection.
  - 1.4.5 Following Details of Identification Shall be embossed at intervals of Length of one meter of Cable outer sheath,
    - a) GIDC- Estate Name
    - b) Voltage Grade
    - c) Year of Manufacturing
    - d) Manufacturers Name
    - e) ISI embossing
    - f) Per Meter Marking.

Armouring for the cables shall comprise galvanized steel or hard drawn aluminium, in the form of round wires or strips as indicated in the datasheet. Minimum area of coverage of armouring shall be 90%. The gap between any two armour strip/wire shall not be more than width of strip/diameter of armour. Type, dimension, resistance of armour shall be according to applicable standards mentioned herein. For multi-core cables, the armoring shall be by galvanized steel strips / roundwire as per IS 1554 (part-1) for PVC insulated cables and IS 7098 (part-1) for XLPE insulated cables. If armoring is specified for single core cables in the data sheet, the same shall be of non-magnetic material

**Refer General Technical Parameters as follows:-**

<b>1 Dimensional Details</b>		Unit		
1.1	Number of Cores		4	4
1.2	Conductor Cross-Sectional Area	mm <sup>2</sup>	10	16
1.3	Type of Cable		A2XFY	A2XFY
1.4	Approximate Overall Diameter	mm	As per IS	As per IS
1.5	Approximate Cable Weight	kg/km	As per IS	As per IS
2	<b>Conductor :</b>			
2.1	Conductor Flexibility class		Class - 2	Class – 2
	Material		Stranded AL	Stranded AL
2.2	Number & Wire Diameter (For Guidance)	No/mm	As per IS	As per IS
2.3	Shape		Sector	Circular
3	<b>Insulation :</b>			
	Material		Cross Linked Polyethylene	Cross Linked Polyethylene
3.1	Average Thickness (Min.)	mm	As per IS	As per IS
3.2	Minimum Thickness	mm	As per IS	As per IS
3.3	Core Identification (As per Cl. No. 10.1 of IS:7098 (part-1))		R,Y,Blue& Black	R,Y,Blue& Black
4	<b>Extruded ST2 PVC Inner Sheath :</b>			
	Material		(As per Cl. No. 10.1 of IS:7098 (part-1))	(As per Cl. No. 10.1 of IS:7098 (part-1))
4.1	Minimum Thickness	mm	As per IS	As per IS
5	<b>Armour :</b>			
	Material		Galvanized steel round/strip as per IS	Galvanized steel round/strip as per IS
5.1	Size of Armour	mm	As per IS standard	As per IS standard
6	<b>Outer Sheath :</b>			
	Material		Polyvinyl Chloride ST2 Compound	Polyvinyl Chloride ST2 Compound
6.1	Minimum Thickness	mm	As per IS	As per IS
6.2	Colour		Yellow	Yellow
	Embossing / Identification on Outer sheath		“GIDC- Estate Name” Marking & Manufacturer's Name, Trade mark, Voltage grade and words Electric cable and	“GIDC- Estate Name” Marking & Manufacturer's Name, Trade mark, Voltage grade and words Electric cable and

			meter mark showing measurement of cable & shall embossed/ printed/ indicated at each 1 meter throughout the length of cable	meter mark showing measurement of cable & shall embossed/ printed/ indicated at each 1 meter throughout the length of cable
<b>7 Electrical Parameters</b>				
7.1	Rated Voltage U <sub>0</sub> /U	kV	0.65/1.1	0.65/1.1
7.2	Maximum Conductor DC Resistance at 20°C	Ω/km	As per IS	As per IS
7.3	Permissible Cont. Current Rating in condition laid direct Air at 40°C	A	As per IS	As per IS
7.4	Permissible Cont. Current Rating in condition laid direct Underground at 40°C	A	As per IS	As per IS
7.5	Maximum Continuous Operating Temperature	°C	As per IS	As per IS
7.6	Maximum Conductor temperature during short circuit	°C	As per IS	As per IS
7.7	Short Circuit Current Rating of Conductor for 1sec.	kA	As per IS	As per IS
<b>8 Packaging</b>				
8.1	Standard Delivery Length	M	500/1000/1500	500/1000/1500
8.2	Tolerance	%	± 5	± 5
<b>9 Applicable Standards</b>				
9.1	Cable		IS 7098-1	IS 7098-1
9.2	Conductor		IS 8130	IS 8130
9.3	Insulation		IS 7098-1	IS 7098-1
9.4	Sheath Material		IS 5831	IS 5831
9.5	Test		IS : 7098 Part I (All acceptance Tests)	IS : 7098 Part I (All acceptance Tests)
<b>10 Installation Guidelines</b>				
10.1	Minimum Bending Radius	mm	As per IS	As per IS
10.2	Safe Pulling Force	N/mm <sup>2</sup>	As per IS	As per IS

The following information may be stenciled on the drum with either water proof ink or oil paint:

- Reference of IS / IEC standard.
- Manufacturer's name or trademark.
- Type of cable and voltage grade.
- No. of cores.



- e. Nominal cross-sectional area of conductor.
- f. Cable code.
- g. Length of cable on the drum
- i. Direction of rotation of drum (by means of an arrow)
- j. Position of outer end of cable
- k. Gross weight
- l. Country of manufacture
- m. Year of manufacture
- o. Property of “GIDC Estate Name ”

The drum may also be marked with ISI Certification Mark.

## **INSPECTION AND TESTING:**

All cables shall be inspected upon receipt at site and checked for any damage during transit.

While selecting cable routes, corrosive soils, ground surroundings sewage effluent etc. shall be avoided, where this is not feasible, special precautions as decided by the Engineer In charge particularly for HV cable installations, shall be taken. Street lighting and service line to each pole should have separate route.

Cables shall be subjected to routine and acceptance tests in accordance with standards specified. Test methods shall conform to IS 10810 (Methods of Test for Cables).

Cables offered shall be of type tested quality. Type tests shall be performed in accordance with latest relevant standard in recognized national / international laboratory. Manufacturer shall ensure use of calibrated test equipment having valid calibration test certificates from standard laboratory traceable to National /International Standards.

### **Routine Tests**

**Routine tests shall comprise of the tests listed below as a minimum.**

- Insulation Resistance Test
- Conductor Resistance Test
- High Voltage Power frequency withstand Test at room temperature
- Dimensional Check

### **Acceptance tests**

**Acceptance tests shall comprise of the tests listed below as a minimum.**

- Annealing test for copper
- Tensile test for Aluminium
- Wrapping test for Aluminium
- Conductor resistance
- Test for thickness of insulation and sheath
- Hot set test for insulation
- Tensile strength and elongation at break of insulation and sheath
- High voltage test

- Insulation resistance (volume resistivity)

## **Type Tests**

Type tests shall comprise of the tests listed below as a minimum.

- Tests on conductor
- Annealing test for copper
- Tensile test for Aluminium
- Wrapping test for Aluminium
- Conductor resistance
- Test for armouring wires / stripes
- Test for thickness of insulation and sheath
- Physical tests for insulation
- Tensile strength & elongation at break
- Ageing in air oven
- Hot set test
- Shrinkage test
- Water absorption (Gravimetric)
- Physical tests for outer sheath
- Tensile strength & elongation at break
- Ageing in air oven
- Loss of mass in air oven o Hot deformation
- Shrinkage test
- Heat shock test
- Thermal stability test
- High Voltage Test
- Insulation Resistance (Volume resistivity test)
- Oxygen Index
- The critical oxygen index value shall be minimum 29 when tested at  $27 \pm 2^\circ\text{C}$  as per ASTM-D-2863.
- Flammability (wherever applicable)
- Cables shall pass test under fire conditions as per IS-10810- Part-53.
- Cables shall also pass tests as per IS-10810 Part- 61 & Part-62 (CAT-AF).
- Test for Smoke Generation (where applicable)
- The maximum smoke density rating shall not be more than 60% when tested as per ASTM-D-2843.

- Tests for Acid Gas Generation
- The hydrochloric acid generation when tested as per IEC 60754-1 shall be less than 20% by weight.
- Tests for Resistance to Ultra Violet Radiation
- This test shall be carried out as per DIN 53387. The retention values of tensile strength and ultimate elongation after the tests shall be minimum 60% of tensile strength and ultimate elongation before test.
- Temperature Index as per ASTM-D-2863.
- The temperature index value shall be minimum 250°C at oxygen index of 21 when tested as per ASTM-D-2843.
- Swedish Chimney test as per SS 424-1475
- Anti-rodent & Termite repulsion test
- Tests for Water Absorption check (Gravimetric)

### **Optional Tests**

- Optional tests shall comprise of the tests listed below as a minimum.
- Cold bend test for outer sheath
- Cold impact test for outer sheath

### **LAYING METHODS**

The cable laying procedure should be as per IS and National Electrical code of practice. Any damage to other services during excavation, cable laying or refilling work shall be solely on the Contractor's account. The following factors should be considered while laying the cable.

I. Before laying, the insulation of the cable should be checked with megger in presence of representative of corporation as a preliminary check against any probable damage.

II. Manufacturer's test certificate must be furnished for cable of concerned work. If the quantity of cable is more/equal than standard packing drum, the cable must be got tested at manufacturer's works for all routine tests as well as acceptance tests in presence of GIDC's representatives before supply. The contractor must make all the arrangement for testing at manufacturer's works without any extra cost to the corporation. 15 days clear prior notice should be given for testing. If the quantity of cable required in particular work is less than standard packing drum length contractor is permitted to use the cable from tested cable drum only. However tenderer shall use the loose cable from standard packing drum for more than one work.

III. If Corporation desires the cable testing at ERDA/any other government recognised laboratory the same shall be arranged by the contractor. Testing charges shall be paid by corporation if the testing results are found satisfactory, otherwise necessary expenses towards testing of cable will be borne by contractor.

IV. Cable length marking at interval of one meter length shall also be embossed/ printed/ indicated in figures.

Cables shall be laid direct in Doubled walled corrugated pipes.

Joint in the cable throughout its length of lying shall be avoided as far as possible and if unavoidable, prior approval of site Engineer shall be taken. If allowed, proper straight through epoxy joint shall be made without any additional cost. A loop of one Mtr. Of each length of cable shall be left near each street light pole. Also a loop of one meter shall be provided on both end of the cable. This additional length shall be used for fresh termination in future. Cable for this loop shall be paid for supply and laying. During the preliminary stages of laying cables, consideration should be given to proper location of the joint position so that when the cables are actually laid, the joints are made in the most suitable places. As far as possible, water logged locations, carriage ways, pavements, proximity to telephone cables, gas or water mains, inaccessible places, ducts, pipes, racks etc., shall be avoided for joint position.

### **LAYING DIRECT IN GROUND**

#### **General**

This method shall be adopted where the cable route is through open boundary, along roads lanes etc., and where no frequent excavations are encountered and where re excavation is easy possible without affecting other services.

#### **TRENCHING:**

##### **Width of trench:**

The width of trench shall first determine on the following basis.

The minimum width of trench for laying single cable shall be 35 Cms.

Where more than one cable is to be laid in the same trench, in horizontal formation, the width of trench shall be increased such that the inter-axial spacing between the cables, except where otherwise specified shall be at least 20 Cms.

There shall be a clearance of at least 15 Cms between axis of the end cables and the sides of the trench.

##### **Depth of Trench:**

The depth of trench shall be determined on the following basis.

Where cables are laid in single tier formation, the total depth of trench shall not be less than 90 Cms. for cables up to 1.1 KV and 120 Cms. for cables above 1.1 KV

When more than one tier of cables is unavoidable and vertical formation of laying is adopted, depth of trench in above shall be increased by 30 Cms for each additional tier to be formed.

##### **Excavation of trenches:**

The trenches shall be excavated in reasonably straight lines. Wherever there is a change in direction, suitable curvature shall be provided complying with the requirements of the manufacturer.

Adequate precautions should be taken not to damage any existing cable(s), pipes or other such installation in the proposed route during excavation. Wherever bricks, tiles or protective covers or bare cables are encountered, further excavation shall not be carried out without the approval of the Engineer In charge.

If there is any danger of a trench collapsing or endangering adjacent structures, the sides should be well shored up with timbering and / or sheeting as the excavation proceeds. Where necessary, these may even be left in places when back filling the trench

Excavation through lawns shall be done in consultation with the staff of the department

The bottom of the trench shall be a leveled and free from stone, brickbat etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 8 Cms in depth

### **BACK FILLING:**

The trenches shall be then back filled with excavated earth free from stones or other sharp edged debris and shall be rammed and watered, if necessary, in successive layers not exceeding 30 Cms. Unless otherwise specified, a crown of earth not less than 50 mm in the center and tapering towards the sides of the trench shall be left to allow for subsidence. The crown of earth however should not exceed 10 Cms. so as not to be a hazard to vehicular traffic. The temporary re-installment of roadways should be inspected at regular intervals, particularly during the wet weather, and any settlement should be made good by further filling as may be required. After the subsidence has ceased, trenches cut through roadways or other paved areas shall be restored to the same density and material as the surrounding area and repaved to the satisfaction of the Engineer In charge.

Where road turns or lawns have been cut or kerbed stones displaced, the same shall be repaired and made good except surfacing. Asphaltting to the satisfaction of the Engineer and all surplus earth or rock removed to places as specified.

### **LAYING IN PIPES / CLOSED DUCTS :**

In locations such as road crossing, entry to pump house on poles, in paved areas etc. cables shall be laid in pipes or closed ducts.

Stoneware pipes, G.I., C.I. or spun reinforced concrete pipes shall be used for such purposes. In the case of new construction, pipes as required, shall be laid along with the civil works and jointed as per the instructions of the Engineer In charge. The size of the pipe shall be as per schedule B for more than one cable. These pipes shall be laid directly in ground without any special bed except for SW pipe which shall be laid over 10 cm thick cement concrete 1:5:10(1 cement: 5 coarse sand: 10 graded stone aggregate of 40 mm nominal size) bed. No sand cushioning or tiles need be used in such situations. Unless otherwise specified, the top surface of pipes shall be at a minimum depth of 1.0 m from the ground level when laid under roads, pavements etc. Where steel pipes are employed for protection of single core cables feeding AC load, the pipe should be large enough

to contain both cables in case of single-phase system and all cables in the case of poly phase system.

Pipes for cable entries shall slope downwards and suitably sealed to prevent entry of water. Further, the mouth of the pipes at the road-crossing end shall be suitably sealed to avoid entry of water.

All chases and passage necessary for the laying of service cable connections to street poles shall be cut as required, and made good to the original finish and to the satisfaction of the Engineer In charge.

Cable grips / draw wires and winches etc. may be employed for drawing cables through pipes & loose ducts etc.

### TESTING:

Prior to laying cables and prior to energizing the cables, following tests shall be carried out Insulation resistance test between phases, phase to neutral and phase to earth.

Continuity test of all the phases, neutral and earth continuity conductor.

Sheathing continuity test.

Earth resistance test of all the phases and neutral.

All cables before laying shall be tested with a 500 volts megger for 1.1 KV grade or with a 2,500 / 5,000 volts megger for cables of higher voltages.

All cables shall be subjected to above-mentioned tests during laying, before covering the cables by protective covers and back filling and also before the jointing operations.

All tests shall be carried out in accordance with relevant Indian standard code of practice and Indian Electricity Rules. The Contractor shall provide necessary instruments, equipment, and labour for conducting the above test and shall bear all expenses in connection with such tests. All tests shall be carried out in the

presence of the representative of the Corporation and results shall be recorded in prescribed forms.

**Mode of Measurement:** Measurements shall be taken on Rmt basis.

Sr No.	Description	Unit	Technical Particulars
<u>1</u>	<u>1100 V Grade</u> <u>XLPE Insulated</u> <u>multistrand</u> <u>Aluminum</u> <u>Conductor</u> <u>armored cable</u>  <u>Power Cables - 1 x</u> <u>4.0 Core x 10.0/16.0</u> <u>Sq. MM</u>		
1.1	Make		As per Preferred

			Makes/Manufacturers
1.2	Applicable Standards		
1.3	Continuous current rating with cable laid in air under specified ambient temperature	A	As per requirement
1.4	Overall diameter of the cable	mm	As per requirement
1.5	Recommended minimum bending radius	mm	To be furnished by the bidder
1.6	Safe pulling force when pulled by using pulling eye	N/m2	As per requirement
1.7	Standard length of cable on each drum	mtrs	As per requirement
<b><u>2</u></b>	<b><u>1100 V Grade FR PVC Insulated Stranded Copper cable having 3 Wire 1.5 Sq. mm</u></b>  <b><u>Power Cables</u></b>		
2.1	Make		As per Preferred Makes/Manufacturers
2.2	Applicable Standards		
2.3	Continuous current rating with cable laid in air under specified ambient temperature	A	As per requirement
2.4	Overall diameter of the cable	mm	To be furnished by the bidder
2.5	Recommended minimum bending radius	mm	To be furnished by the bidder
2.6	Standard length of cable on each drum	mtrs	As per requirement

#### **Double Walled Corrugated (DWC) pipes :-**

**ITEM NO.10.1:-** Providing & laying of approved make 50 MM outer dia Doubled Walled Corrugated Pipes (DWC) of polyethylene (conforming to IS 14930 - II) with necessary connecting accessories like coupler, Tee, L - Bow, etc. of same material at required depth (90 cms) for laying of cable below ground/ road surface for enclosing cable and back filling the

same to make ground as per original & as per instruction of Engineer Incharge - for Streelight Cable of 1 x 4 core x 16 Sq. MM. (30 Mtr Per Between two Pole)

**Make:-** DURALINE / JAIN Irrigation/GEMINI/VARAHI/REX or Eq

**Mode of Measurment:-** Measurements shall be taken on Rmt. basis.

**ITEM NO.10.2:-** Providing & laying of approved make 90 MM outer dia Doubled Walled Corrugated Pipes (DWC) of polyethylene (conforming to IS 14930 - II) with necessary connecting accessories like coupler, Tee, L - Bow, etc. of same material at required depth (90 cms) including excavation for laying of cable below ground/ road surface for enclosing cable and back filling the same to make ground as per original & as per instruction of Engineer Incharge - for Streelight Cable of 1 x 4 core x 16 Sq. MM and Service cable of 1 x 4 core x 16 Sq. MM. (Make- As per Approved Vendor List as below.)

**Make:-** DURALINE / JAIN Irrigation/GEMINI/VARAHI/REX or Eq

**Mode of Measurment:-** Measurements shall be taken on Rmt. basis.

**General :**

Double wall corrugated (DWC) pipes should be made of High Density Polyethylene ( HDPE) Raw material. The DWC HDPE pipes should be suitable for the LT cable installation works and should be in as per IS-14930 & BSEN 50086 standards the standards The outer wall should be of corrugated type for the maximum load bearing strength and the inner wall must be smooth for easy installation of cables without any friction. The DWC Pipes should be as per IS14930 & BSEN 50086 standards. The pipes must be very good Resistance to Corrosion, chemically inert & environmentally safe, good impact strength , Light in weight and easy to handle and transport. The life of the pipe should be atleast 50 years. Different colors of DWC pipes can be used for cable identification.

**JOINTING INSTRUCTIONS FOR THE DOUBLE WALL CORRUGATED (DWC) PIPES ( With Push Fit Couplers ) :**

1. The jointing of DWC pipes is by using a push fit coupler.
2. Make sure that both ends of the pipe are cut square and finished in valley.
3. place a rubber ring onto the pipe, in the second valley from the end.
4. Hold the pipe firmly and force or push fit the coupler onto the rubber ring, over the pipe with hands, till the pipe end touches the central rib of the coupler.If required, strike the coupler gently with a wooden mallet. Do not strike hard on the coupler to avoid damage to it.
5. Mark a distance on the end of the another pipe, equal to the coupler depth from one side up to the central rib.
6. Insert this pipe with rubber ring into the other end of the coupler, by gripping the pipe with hands as close to the coupler as possible. Repeat the procedure point No.4 till the marked line reaches the coupler end.
7. A Lubricating power available with tyre dealers or tyre repair shops, may be used. Apply this powder over rubber rings in small quantity to bring about ease in push fitting the coupler. However, using too much of powder may lead to a joint with lower pulling strength.



8. The normal push fitting of couplers gives satisfactory and the desired pulling strength. If for any reason, every high pulling strength is essential, this can be achieved by applying a foot wear or leather adhesive over rubber rings just before push fitting. This creates an almost permanent joint ruling out chances of dismantling.
9. Silt tight and water tight joints mean that what's inside the pipe stays inside the pipe, and what's outside stays outside.

Dimensions required for the DWC HDPE pipes are as follows:

Sr. No.	Outer diameter (mm)	Inner Diameter (mm)	Suggested - Average/ Minimum Weight ( Grams / per mtr )
1	50	As Per Standard	As Per Standard
2	90	As Per Standard	As Per Standard

DWC pipe must be laid first. Cable drawing work must be carried out after completion of backfilling.

Any damage to any of the services during excavation & refilling shall be to the contractor's account. The work shall be carried out to the satisfaction of Engineer- in-charge. Refilling work of the trench should be carried out after final supervision of the representative of the corporation. After completion of DWC pipe laying, trench should be refilled and ground should be levelled including watering etc. The site should be cleaned of excess material/debris after the work is completed, without any extra cost.

## LAYING METHODS

Pipes shall be laid direct in ground / closed ducts, in open ducts or on surface depending on environmental conditions.

## TRENCHING:

### Width of trench:

The width of trench shall first determine on the following basis.

The minimum width of trench for laying single cable shall be 35 Cms.

Where more than one cable is to be laid in the same trench, in horizontal formation, the width of trench shall be increased such that the inter-axial spacing between the cables, except where otherwise specified shall be at least 20 Cms.

There shall be a clearance of at least 15 Cms between axis of the end cables and the sides of the trench.

### Depth of Trench:

The depth of trench shall be determined on the following basis.

Where cables are laid in single tier formation, the total depth of trench shall not be less than 90 Cms. for cables up to 1.1 KV and 120 Cms. for cables above 1.1 KV

When more than one tier of cables is unavoidable and vertical formation of laying is adopted, depth of trench in above shall be increased by 30 Cms for each additional tier to be formed.

### **Excavation of trenches:**

The trenches shall be excavated in reasonably straight lines. Wherever there is a change in direction, suitable curvature shall be provided complying with the requirements of the manufacturer.

Adequate precautions should be taken not to damage any existing cable(s), pipes or other such installation in the proposed route during excavation. Wherever bricks, tiles or protective covers or bare cables are encountered, further excavation shall not be carried out without the approval of the Engineer In charge.

If there is any danger of a trench collapsing or endangering adjacent structures, the sides should be well shored up with timbering and / or sheeting as the excavation proceeds. Where necessary, these may even be left in places when back filling the trench

Excavation through lawns shall be done in consultation with the staff of the department

The bottom of the trench shall be a leveled and free from stone, brickbat etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 8 Cms in depth

**Laying of pipe in trench as directed by engineer in charge.**

### **BACK FILLING**

The trenches shall be then back filled with excavated earth free from stones or other sharp edged debris and shall be rammed and watered, if necessary, in successive layers not exceeding 30 Cms. Unless otherwise specified, a crown of earth not less than 50 mm in the center and tapering towards the sides of the trench shall be left to allow for subsidence. The crown of earth however should not exceed 10 Cms. so as not to be a hazard to vehicular traffic. The temporary re-installment of roadways should be inspected at regular intervals, particularly during the wet weather, and any settlement should be made good by further filling as may be required. After the subsidence has ceased, trenches cut through roadways or other paved areas shall be restored to the same density and material as the surrounding area and repaved to the satisfaction of the Engineer In charge.

Where road turns or lawns have been cut or kerbed stones displaced, the same shall be repaired and made good except surfacing. Asphaltting to the satisfaction of the Engineer and all surplus earth or rock removed to places as specified.

Pipes for cable entries shall slope downwards and suitably sealed to prevent entry of water. Further, the mouth of the pipes at the road-crossing end shall be suitably sealed to avoid entry of water.

All chases and passage necessary for the laying of service cable connections to street poles shall be cut as required, and made good to the original finish and to the satisfaction of the Engineer In charge.

Cable grips / draw wires and winches etc. may be employed for drawing cables through pipes or loose ducts etc.

### **Marking:**

Following Details of Identification Shall be embossed at intervals of Length of one meter of DWC outer sheath.

**GIDC Estate Name**

Year of Manufacturing

Manufacturers Name

ISI embossing

Meter Marking

Both ends of the cables shall be properly sealed with PVC / rubber caps with proper embossing of Manufacturers seal so as to eliminate ingress of water during transportation, storage and erection.

#### **ITEM NO.11.1 :-**

##### **SUPPLY, ERECTION, TESTING AND COMMISSIONING OF STREET LIGHT Central Control & Monitoring System (CCMS) Panel:**

Smart 4G Timer, Supply of IoT based 4G Smart Streetlight Control & Monitoring System having a Smart Panel comprising of 3 Phase IoT Streetlight Smart 4G Timer with 16x2 LCD to display RSSI, relay status, RTC time & diagnostics., Controller works on 3-phase & also on any available 1-Phase., Controller with 8-hour battery backup during external power failure. External power failure alert immediately to cloud., 110-630 V AC @ 50-60 Hz – 3 phase operating range., Standby power consumption <3W., Smart 4G Timer with RS232 port for DLMS Energy meter., Smart 4G Timer must be compatible with any make / brand of DLMS (RS232) Energy Meter., DI: 4 Nos. (3 Contactor / Latch detection, 1 for Door Sensor.), DO: 3 Relays for Independent control each phase (R, Y, B) with 1 extra spare relay., Smart 4G Timer with dual SIM functionality for connectivity backup., 4G M2M SIM 3-Year communication included., Local configuration via WiFi / BLE for maintenance or during force majeure., GPS chip inbuilt of Smart 4G Timer for auto location tracking & astronomic schedule location., 50 programmable schedules., Astronomic scheduling with monthly offsets., Smart 4G Timer has inbuilt timer stores schedules locally & also stores schedule execution logs locally, syncs to cloud whenever connected to cloud., Auto-scheduler overrides manual operations., Monitoring & alerts for MCB trips., Over/under voltage, current, overload, power factor & short circuit protections with alerts via Dashboard, App, SMS, WhatsApp & Email., Contactor / Latch chattering protection & alerts., Smart 4G Timer with neutral failure protection and alert., BUILT-IN Watchdog for anti-jamming., Smart 4G Timer must send Regular "heartbeat" on software for CCMS status., Accelerometer for tamper & panel movement detection & alerts., Smart 4G Timer must be tested from an NABL Lab for Surge Test @ 6 KV (IEC 61000-4-5), ESD Test @ 4 KV (IEC 61000-4-2), EFT @ 2 KV (IEC 61000-4-4), Conducted Emission @ 150 KHz-30 MHz (CISPR11), Damp Heat Test (40 Deg C @ 95% RH) 2 cycles of 12+12 hours (IS: 9000 (Part 5/Sec.2):1981 latest) with all test passing criteria as "Temporary degradation or loss of function or performance which is self-recoverable", FOTA functionality required for upgrades., Smart 4G Timer sends & stores online/offline data of controller & load for lamp burn hours analysis., It stores & syncs connectivity logs for configuration of network connections & analytics., PANEL & SWITCHGEAR, The panel includes a Class 1 DLMS energy meter NABL approved with 1-2 months of stored data of daily, hourly, monthly, load survey, instantaneous,

events, tamper data & with power events stored in meter memory for audit purpose., Must monitor V, I, KWH, KVA, PF, KVAH, etc., Panel made with 2 mm CRCA sheet with ground mountable stand complete with gland plate, waterproof glands, earthing bolt., IP55, weatherproof panel with RAL7035 powder-coated., Smart 4G Timer must be fitted on removable terminal sockets for easy maintenance., Switchgear includes 3 Nos. 3 pole Contactor / Latch having minimum 50 A Load carrying capacity per phase, all other switchgear & wires: 40 A load carrying capacity., 1 Nos. 4P MCB 10 kA for Incomer & 6 Nos. 1P MCBs 10 kA for Outgoing., Phase-Wise Bypass MCBs required., 4P RCCB 100 mA., door sensor. Also, provide lock & key facility., Panel mount outdoor antenna for GSM, GPS., Canopy design for draining down water., CCMS SMART SOFTWARE, OAuth 2.0 APIs for sending data to Government clouds/software, etc., CCMS Web dashboard with secure password & OTP login., Hosted on trusted cloud, data security, antivirus & attack protection., HTTPS., AES256-bit encryption., Vulnerability Assessment and Penetration Testing (VAPT) certificate for CCMS Software., Streetlight management software for load status, live analytics & reports., Energy meter data tables (kW, kWh, PF, I, V, etc.) available., Utility monthly bill reconciliation & Class 1 accuracy reports for billing, energy monitoring & auditing for streetlight load., Fault detection., Light fault 99% analysis on dashboard using energy monitoring., WhatsApp integration., Hierarchy-wise reporting & alerts., GIS mapping of live connected streetlight control panels, poles & streetlights., MQTT protocol., Smartphone app with local configuration & navigation., Monitoring & reporting of lighting parameters., Facility for media attachments for site photos/videos/work permits/checklists, etc. per Feeder Panel for remote verification., Asset management module for streetlight infrastructure data., Complaint/service task management with history & escalation must be available., Android & iOS App for dashboard analytics, graphs, energy data, alerts., 5 Years CCMS Web Software & Cloud Server Hosting subscription included., Customizable, user-friendly dashboard.,  
(Make- As per Approved Vendor List as below.)

**Note :- PLEASE CLEARLY NOTE THAT ENTIRE CCMS MUST BE DESIGNED & MANUFACTURED BY THE SAME MANUFACTURER OTHERWISE SUCH CCMS WILL NOT BE ACCEPTED.**

**General: -**

GIDC has already installed CCMS units in GIDC area for street light network. Here the CCMS Unit means the outdoor unit to be installed on the site which will have ability to communicate with Centralized Control.

Bidder should supply, install, test, commissioning of lighting controls (Centralized Control & Monitoring System– CCMS) for LED streetlights.

GIDC has already executed CCMS system and all CCMSs can be monitored & controlled at central control room. The newly installed CCMSs must be duly integrated with existing system so that similar functions can be performed from the room. For technical specification & features, please refer below.

## **General Features: -**

### **Controller and Metering unit: -**

- Schedule the timing of lights (pre-programmed based on astronomical clock or on field or through central control)
- ON / OFF Switch (on field or centrally)
- CCMS System for Capture the energy usage and other parameters at pre-determined interval and store data for 30 days till it is transfer to server.
- Ability to connect with a communication device
- Ability to download data in field
- System protection against surges
- Ability to upgrade firmware on field using a communication device

### **Outer Body Enclosure: -**

1. The outer body of the inner enclosure shall be G.I. wire mesh with appropriate height stand & support angle. This stand shall be appropriately covered such that incoming & out going cable are protected & aesthetically good looking.
2. Prefer minimum dimension of angle & strips are as under.
  - MS Angle Size 35 x 5 mm, Door Angle Size 30 x 3 mm, Supporting Strip 25 x 5 mm,
  - Supporting Strip 65 x 5 mm, Box Size, and Stand Size.
3. Bidder is required to furnish enclosure in two separate compartment, where bottom part consist of CCMS unit & upper part shall consist of Incoming switchgear (supply mains) which may include RCCB, MCB, TPN switch ETC. of appropriate rating. Further, this upper section shall be separate such that energy meter of supply company is totally isolated from remaining parts. Appropriate separate door for Energy meter section (Supply Company) to be provided.
4. The dimension of the panel shall be decided during detailed engineering after order & requirement of supplied company must be coordinated & considered before finishing this structure & section of panel.
5. The arrangement of door shell as below:
  - (a) Bottom legs of the panel of shall be of appropriate height. Skirting of 2 mm thick G.I. Sheet on complete periphery fitted through screw like arrangement, however, not open able easily.
  - (b) CCMS unit Component as mentioned above should have appropriate hinged single door arrangement required for maintenance purpose with appropriate locking arrangement.
  - (c) Upper section belongs to supply company must have open able door (Double/Single).

### **Inner CCMS Enclosure:-**

- **Enclosure should be made of fire-retardant FRS/ SMC material and with impact resistance of IK 10 & IP 65 preferably.**
- Dimensions of the enclosure box should be such as there should be adequate space to access components of the box for R & M purpose. The vendor must

also ensure at least 20% space is left in the box for future up-gradation/ devices to be added.

- The enclosure box must have a standard lock which cannot be opened by all kinds of commonly available tools.
- GIDC shall be providing the design and size/specification of sticker including the logo after the award of work. For placement of sticker, an area of 9" x 7" should be available on the front of the box.
- Wiring inside the enclosure box should be done neatly with proper use connectors & numbering with use of Ferrule PVC Tube. The enclosure should have theft control mechanism and generate alerts when opened.

#### **Communication Module: -**

- Ability to communicate securely with via cellular networks (GSM / GPRS) and/ or RF networks
- Communication technology between CCMS unit and central server should be 2G/3G/4G hardware device which should be capable to run 2G/3G/4G OR upgraded available grade as per availability in the site.
- Two-way communicator
- Ability to send data regarding energy usage, ON/OFF status etc. from controller
- Ability to give commands from a central level for switching ON/OFF scheduling etc.
- Ability to remotely upgrade the CCMS device firmware from central server

#### **Software (At Control Room): -**

- A web-based/ mobile based software package with a detailed information dashboard. At present GIDC has pre-installed web based information dash board, therefore bidder is required to integrate the system with existing one.
- Ability to show the status of each controller on the dashboard.
- Ability to schedule and switch ON/OFF controllers remotely through the dashboard
- Reports in form of matrix as well as graphical representation
- Ability to provide overload indication.
- Ability to provide software up gradation for 10 year and communication charge for one year should be included.
- Server uptime should be minimum 95 % with disaster backup and sufficient storage capacity and processing power to ensure stable operation of CCMS throughout the contract period. Maintenance of the server and software is the responsibility of the vendor

#### **Specifications: -**

Single phase (240 Volt P-N, Whole Current, Class 1.0) or a three phase system (Wires 3 \* 240 Volts P-N, Whole Current, Class 1.0) electronic controller and energy controller compiled as per IS: 13779 & CBIP-88 with add on MCB.

Rating of the CCMS units for (including rating of safety equipment's - MCB, Relay, etc.) (As mentioned in BOQ).

Controller should also be compatible for remote communication using GPRS/GSM modem for operations like controller data downloading, & relay ON-OFF for maintenance purpose. Controller should records events like supply ON-OFF and relay ON-OFF for analysis etc.

The controller should be type tested in a NABL certified Lab The controller should be interfaced with a communication module which would wirelessly transmit data recorded to a dedicated server or on cloud-based architecture. The communication module also relays commands to schedule and control the cluster of street lights.

### **Street Light Controller: -**

#### **Rated Electrical Parameter**

1. Connection type System for Single Phase/Three Phase Switching points
2. Voltage 240 volts P-N (+20% to -40% Vref) on each phase
3. Current 05 - 63 A for each phase (Withstands 120% I<sub>max</sub>), Starting current- 0.2% I<sub>b</sub>
4. Frequency 50 Hz  $\pm$  5% (47.5 to 52.5) Hz
5. Power Factor Zero (lag)- Unity-Zero (Lead)
6. Accuracy 1.0 (Energy Meter)
7. Withstand Voltage 440 V up-to 5 minutes between Phase – Phase

#### **Functional Specifications**

##### **Input / Output**

1. **Data** the CCMS unit should be able to capture (record) and provide following parameters at variable time-intervals
  - Cumulative Active Energy
  - Average Power Factor
  - Power on hours
  - Monthly Load on/off
  - Controller should have the provision to store last 30 days data at half-hour interval. All these data are accessible for reading, recording by downloading through HHT (Hand Held Unit) through optical port or USB/Bluetooth given on controller front or from website/ web application. For HHT, a Smartphone-based solution for collecting/ accessing data is also acceptable.
2. **RTC**  
the controller should have a built-in calendar & clock, having an accuracy of  $\pm$  1 minute per year or better, however meter may confirm to accuracy as per IS 13779. A separate internal Lithium battery back-up should be provided for continuous operation of controller RTC for at least two years under controller un-powered conditions.

### **3. Tamperers**

Following tamperers are logged with occurrence and restoration in FIFO manner:

Low Load  
Over load  
Under voltage  
Over voltage

### **4. Astronomical Calendar for switching operation**

Based on latitude and longitude of the installation place controller itself decides switch on –off timings.

### **5. Maintenance Mode of switching**

In case of emergency it should be manually ON/OFF and in case of maintenance it can be ON/OFF from Website after login.

### **6. Switch on –off operation events**

- Switching events with the following reasons will be logged:
- 4 Timed operation- As per astronomical calendar
- 5 Unscheduled operation – In maintenance mode
- 6 Event based like on over current, overload switching

### **7. Power on-off events**

Last 20 power on-off events with power off duration will be logged.

### **8. Separate Energy Consumption registration for unscheduled switch on period**

Last 20 events of maintenance mode with snap of energy register and date/time is logged in meter. In BCS, with these events, duration of these events and energy consumption during that period is also shown.

### **9. Switching on Overload/ over current**

Controller will continue monitor over current & overload condition against the threshold defined in controller and if condition persist for predefined time period (default 5 minutes) then disconnection of switch will be occurred. However, if required this feature should be bypassed.

### **10. LED Flashing Indication LED is provided on controller front.**

### **11. Communication**

Controller stored data can be downloaded through its optical port or USB using HHT (Hand held Unit) or directly by Laptop using Base computer software or can be downloaded from website.

Controller should be able to interface with the communication module through a serial port

### **12. Surge Protection**

Standard CAT B 6000 V protection (IEC 61000-4-5) 13.

### **13. Programmable Scheduling**

The schedule for light operations can be programmed on field or during installation overriding the astronomical-clock.

### **14. Operating temperature 0° C to 70° C**

### **15. Storage temperature -20° C to 80° C**

### **17. Humidity 95% non-condensing**

### **Constructional specifications**

1 Controller sealing as per IS 13779 and CEA Metering Regulation 2006

2 Guarantee 1 year



3 Insulation Withstand an insulation test of 4 KV and impulse test at 6 KV  
4 Resistance of heat and fire the terminals block and Controller cases have safety against the spread of fire. They will not be ignited by thermal overload of live parts in contact with them as per the relevant IS 13779.

**Contactor:** Contactor confirming to relevant IEC/IS Standard

**Polycarbonate Box – Enclosure:** Enclosure should be made of fire-retardant FRS/ SMC material and with impact resistance of IK10.

- Dimensions of the enclosure box should be such as there should be adequate space to access components of the box for R&M purpose. The vendor must also ensure at least 20% space is left in the box for future up-gradation/devices to be added.
- The enclosure box must have a standard lock which cannot be opened by commonly available tools
- GIDC shall be providing the design and size/specification of sticker including the logo after the award of work. For placement of sticker, an area of 9"X7" should be available on the front of the box.
- Wiring inside the enclosure box should be done neatly with proper use connectors & numbering with use of Ferrule PVC Tube.
- The enclosure should have theft control mechanism and generate alerts when opened or if the unit experiences motion of any kind beyond a configured threshold
- Providing and making cable end termination using Bakelite sheet with heavy duty stud type connector and solder less crimping lugs for feeder pillar, if applicable.

### **MCB**

Should conform to IEC 62053/ 62054, IS/IEC 60898 and IEC 60947-2.

Breaking capacity of 10 kA throughout the range

MCB along with design for protection & auto-recovery/ self-healing is accepted.

### **Controller (Communication Module)/Feature Details**

- |                                    |   |
|------------------------------------|---|
| 1. Power Supply:                   | 240 V AC                                      |
| 2. Mobile / Communication Network: | GSM/ GPRS: Quad band<br>850/900/1800/1900 MHz |
| 3. Communication Method:           | TCP – IP/http via GPRS / 3G and/<br>or RF SMS |
| 4. SIM Card:                       | Machine to Machine (M to M) SIM<br>Card only  |
| 5. Status of SIM:                  | Based on LED on the module                    |

### **Features:**

- Remote ON/ OFF in case bad weather, maintenance or emergency
- Remote RTC Synchronization of Street Light Controller
- Communication should be encrypted by 128-bit encryption or adequate security protocol should be incorporated.

- Alert message in pre-defined abnormal system conditions through SMS (5 numbers) and mobile/web-based application through GSM/GPRS/RF for:
  - Phase-wise currents on crossing threshold values\*
  - Phase-wise voltages on crossing threshold values\*
  - MCB trips
  - Theft alerts
  - Group failure of lights
  - No output supply

**Web based software provided by the bidder must be compatible with existing system.**

Following are the key feature of our GIDC Centre CCMS Monitoring Software:

- The Main page of software shows real-time information about the cumulative load, number of faulty lights, total number of lights on/off (uptime %), number of approx. faulty lights, number of faulty switching points.
- A separate tab in the software to show the list of CCMS units installed in the project area along with the meter parameters being showcased against each CCMS Unit.
- Alert in case of fault – describing the fault.
- A separate tab in the software to show the switch point summary which showcases the meter parameters, active alerts, link to the map page, etc.
- A separate tab in the software for - monitoring & controlling, Alerts, Maps, Configuration page, Reports – uptime, history, energy savings, power failure, operational hour.
- It should be able to display the power failure details of a particular switching point.
- It should register all fault conditions like excess voltage/ current drawn, no-power supply, etc. through the instantaneous alert messages sent by the CCMS unit.
- It can generate MIS reports in Matrix as well as in Graphical format based on Power supply status, Energy Consumption, Over/ Under Voltage/ Load, System parameter/ controllers i.e. Voltage, Current, Power factor, Cumulative KWH/ KVAH for individual switching points.
- Different user authorization levels should be settable and the central server should be capable of handling high traffic.
- GIS Mapping should be done covering all switching points and the details of each switch point shall be viewable in the web application software through a Google-map interface or web based digital map.
- All the CCMS units should be remotely configured from the Central Control Unit:
  - Setting new ON/OFF timings
  - Setting the RTC time of Automation unit
  - Knowing the current status of any particular switching point.
  - Reset the unit.

- The minimum interval for the update of data should be 30 minutes but in case of any event it should send immediately.
- Auto synchronization of controller with server timing to be further synchronized with standard GPS/Network clock timing.
- Further, system can indicate various faults as below: -
  - Failure of lights (by association to a drop-in power consumption against a set benchmark)
  - Status of the incoming supply (power failure)
  - High /low voltage
  - Overload on the phases
- Ability to remotely upgrade the CCMS device firmware from central server.

### **Bill of Quantity:**

Any other item/ material/ equipment/ system as may be required to be supplied for completing the work and successful commissioning under this contract in all respects in accordance with the provisions of the contract and/or to ensure the safety of installation during and after execution should be carried out by successful vendor at 'No extra to GIDC'.

Following is list of materials (but not limited to) to be included in the streetlight controller for configuration - 1. Bidder shall use required material per unit to ensure the entire specifications as given in the tender document are met.

- (1) IP 65 or better enclosure box with min. IK-10 impact resistance
- (2) Class 1.0 accuracy Energy Meter with IS-13779
- (3) Controller Module (GSM/GPRS Module, Microcontroller and Power Supply)
- (4) Contactor
- (5) Door Tamper Switch
- (6) MCB (for Bypass facility): 1 Pole, 6 to 32 A (Per each phase)
- (7) MCB (out going from CCMS): 1 Pole, 6 to 32 A (Per each phase)
- (8) Neutral Link: 1 No. of 32 A with copper connector strip of 25 x 3 mm size
- (9) Copper wiring should be used for connections with 6 mm<sup>2</sup> size wires.
- (10) RCCB (out going from Energy meter): 2 Pole, 32 A and 4 pole ,32 A
- (11) Outer Body MOC must G.I. mesh body.

1. Warranty of the product will be min. 5 year from the date of commissioning.
2. The feature proposed for CCMS is indicative. However, bidders are free to offer their lighting control technology which should encompass all key features as above. But, the same time, software must have open source code, compatible with all relevant software(s) are in use by GIDC. It means control, supervision; data acquisition must be possible with the software to be provided.
3. Offered brand has a dedicated telephone number/ Toll Free Number to lodge a complaint by PROJECT AREA Officials/ Public in respect of system problems.

4. For comprehensive on-site Warranty and Maintenance for 1 year: Successful bidder shall ensure 97% service level through CCMS Unit at any point of time during the contract period of 1 year. In case of failure of CCMS Unit which is brought to the notice of successful bidder (by mail, letter etc.). The same has to be replaced within 48 hours of intimation. If vendor fails to correct the fault within 48 hours, the penalty starts with first penalty being levied on completion of 72 hours from logging of complaint. Penalty rate @ Rs. 100 per day per light connected to the CCMS unit shall be imposed and the amount shall be deducted from the vendor payment.
5. Ceiling limit of 10% on penalty shall be set, over and above the LD Limit of 10%. GIDC is at Liberty to carry out Third Party Inspection at any time during the contract period.

**BYPASS FACILITY: -**

In case of mal-functioning or non-functioning of the CCMS, streetlight operation can be done manually without any additional installation a 2 Poles MCB having 32 A capacity will be provided. The MCB should be connected with outgoing wires from energy meter and outgoing MCB of CCMS.

**Detailed Specifications of Various Components are as under:**

**Detailed specifications for MCB/ RCCB:**

Characteristic - B

Breaking Capacity – as per relevant IS/ International Standard

Rated voltage - 240/ 415 V (as applicable)

Frequency - 45 to 60 Hz, Rated operating voltage – 240 V

Fixing - Snap fixing on standard DIN rail profile EN 50 023 - 35 x 7.5

**Detailed specifications for RCCB: -**

Earth Leakage Circuit Breaker confirming to IS- 12640/ 1988 & BS 4293/ 1983 with latest amendment(s) having sensitivity 100 mA and breaking capacity of 16 kA and suitable for 1 Ø & 3 Ø, 4 pole having characteristic of quick acting & tripping with all advance feature with suitable enclosure box/ mounting rail.

**Note :- Since the technology is updating every day and hence, the intention behind the installation of CCMS unit as mentioned in paragraph(s) under "General" section is important and if any deviation in offered CCMS unit is there it should be brought in notice and these deviations can be accepted if they are fulfilling the intentions of the installation of CCMS Unit for streetlight application.**

**Installation: -**

The CCMS unit shall be installed on suitable fabricated stand made from GI. Reinforced Cement Concrete (RCC) foundation having Grade M20 along with necessary Foundation Bolt, Nuts, Washers with anchor plate and DWC pipe for cable access etc. shall be casted having required size as proposed by manufacturer of CCMS unit with necessary plastering. Foundation should be made in such a way as site requirement. This section should be finished in decorative manner as directed by Engineer-in-charge. The item includes excavation, necessary reinforcement recommended by manufacturing co,

Shuttering and M20 grade CC from preferably RMC plant or mixture of 1:1.5:3 M20 grade CC. The Contractor should make necessary arrangement for curing required for the works at his own cost. The site should be cleaned or excess material should be removed after the work is completed. While making foundation, best civil engineering practice(s) must be exercised. Bidder must take approval of foundation drawing before carrying out the work.

Work shall be carried out as per the description of the item and as per instruction of engineer incharge. The sample shall be got approved before execution.

**Make:** MOTWANE/KAKATIYA ENERGY SOLUTION/MEMIGHTY /PYROTECH or Eq.

**Mode of Measurement:** Measurement shall be taken on No. basis

**ITEM NO.11.2:-**"Supplying & erecting in earthpit of minimum bore dia. 150mm size approved make Earthing Electrode consisting Pipe-in-Pipe Technology as per IS 3043-1987 made of corrosion free hot dipped G.I.Pipes having Outer pipe dia of 50 mm having 80-200 Micron galvanising, Inner pipe dia of 25 mm having 200-250 Micron galvanising, connection terminal dia of 12 mm with constant ohmic value surrounded by highly conductive compound with high charge dissipation suitable for following type of applications with chamber and heavy duty cover.(approved make OEM has to submit test certificate including value of earth resistance of installation.) & having back filling compound of (B) Inner Chemical (CCM Compound) - Resistivity :- 0.2 Ohm/meter testing as per IEC 62561-2017 , Voltage Drop :- < 1 volt at no load & dry form , Sulphur content :- <2% .(C) Back filling compound :- Earthing compound should be capable to retain moisture for long time. Necessary test report must be submitted.(C) For Electrical Installation covering Transformer Neutrals, Lightning arrester Earthing, A.C.Plant & Sensitive Computer System (like Automation, SCADA) i.e. independent Earthing located in other than normal soil i.e. Soft Rock, Marshy Soil etc..-Length of Pipe : 3 Mtrs. -Back filling Compound :2 nos Bags of 25 Kg.- (1 Job per Distribution Box)". (Make- As per Approved Vendor List as below.)

**General:**

All the non-current carrying metal parts of the electrical installation and mechanical equipments shall be earthed properly. The metal conductor, trenching cables armor and sheath; electrical panels boards; lighting fixtures; and connected by means of specified earthing system. An earth continuity conductor shall be installed with all the feeders and circuits and shall be connected from the earth bar of the panel boards; earth pin of the socket outlets and to any metallic wall plates used.

♦ **Scope of work :**

The scope of work shall be cover supply; laying; Earthing GI installation; connecting; testing and commissioning of:

1. Earthing station.
2. Earthing G.I./Aluminum/copper strips from earthing station to equipotential bar / Section pillar.
3. Earthing G.I./Aluminum/copper strips from earthing station to equipotential bar to lay feeder / Section pillar.

4. Bonding of Non- current carrying part and metallic parts of the electrical installation.
5. Earthing station to be provided shall comprise of earth Electrode of copper plate in earth pits, earth bus/grid of GI flats 25 mm x 6 mm and bare GI wires as earth continuity conductor.

#### ◆ **CODE AND STANDARDS.**

The entire earth system shall conform to the following standards and rules as applicable.

1. IS 3043 – 1966 Code of practice for earthing.
2. Indian Electricity Act 1990.
3. Indian Electricity Rules 1956.

All codes and standards mean the latest. Where not specified otherwise the installation shall generally follow the Indian Standard Codes of practice in absence of Indian standard.

#### ◆ **GENERAL REQUIREMENT :**

1. GI flat 25 mm x 6 mm strips of specified size shall directly earth Neutral of the Transformer / section pillar.
2. Enclosures and frame work of all current carrying equipment and accessories, structural steel/ columns shall be adequately earthed to a single earthing system, unless separate earthing systems are specifically stipulated. All electrical equipment shall be earthed at two distinct points.

#### ◆ **EARTH ELECTRODES IN EARTH PITS.**

Plate Electrodes of copper shall be 600 X 600 X 3.15mm thick.

#### ◆ **EARTH BUS AND EARTH CONTINUITY CONDUCTOR.**

1. Earth bus is a copper strip or flat of specified size interconnecting all earth electrodes.
2. Switchers and power Distribution Boards shall be earthed by a copper flat strip.
3. Panels fused DBs shall be earthed by a continuity conductor, as specified. Minimum size of continuity conductor shall be 6 SWG bare soft drawn.
4. Road Lighting poles shall be earthed with GI stranded wire conductor while for lighting and power wiring bare copper conductor shall be provided unless otherwise specified to use insulated conductor.

#### ◆ **RESISTANCE TO EARTH:**

The resistance to each earthing system shall not exceed 1.0 ohm to 3.0 ohm.

#### ◆ **Earthing Station :**

##### 1. **Plate Electrode Earthing:**

Earthing electrode shall consist of copper plate not less than 600 X 600 X 3.15 mm thick, as called for in the drawings. The plate electrode shall be buried as far as practicable below permanent moisture level but in any case not less than 2.5 Mts. Below ground level. Wherever possible earth electrode shall be located as near the water tap, water drain or a down take pipe as possible, Earth Electrodes shall not be kept clear of

the factory foundations and in no case shall it be nearer than 2 meters from the outdoor face of the wall. The earth plate shall be set vertically and surrounded with 150mm thick layer of charcoal dust and salt mixture 25mm GI pipe shall run from the main earth conductors shall be connected to the electrode just below the funnel, with proper terminal lugs and checks nuts of copper/brass for copper plate. The funnel over the GI pipe and earth connections houses in a masonry chamber, approximately 350-mm length X 300 mm wide and 300mm deep. The masonry chamber shall be provided with a cast Iron hinged cover resting over a Cast Iron frame embedded in masonry.

♦ **INSTALLATION AND CONNECTION :**

1. The plate/ pipe electrode as far as practicable shall be buried below permanent moisture level but in no case not less than 2.5 M below finished ground level.
2. The plate /pipe electrode shall be kept clear of the building foundation and in no case; it shall be nearer by less than 2 M from outer face of the finished ground level. The plate electrode shall be installed vertically and shall be surrounded with 150 mm. thick layers of Char- coal dust and Salt mixture. 25 mm. Dia. of G.I. pipes for watering shall run from top edge of the plate / pipe Electrode to the mid level of block masonry chamber.
3. Top of the pipe shall be provided with G.I. funnel and screen for watering the earth / ground through the pipe
4. The funnel with screen over the G.I. pipe for watering to the earth shall be housed in a block masonry chamber as shown in the drawing.
5. The masonry chamber shall be provided with a cast Iron hinged cover resting over the Cast Iron frame which shall be embedded in the block masonry.
6. Construction of the earthing station shall in general be as shown in the drawing and shall conform to the requirement on earth electrodes mentioned in the latest edition of India Standard IS 3043, Code of practice for Earthing Installation.
7. The earth conductors (Strips / Wires – copper / Hot dip G.I.) inside the building shall properly be clamped /supported on the wall with Galvanized Iron clamps and Mild Steel Zinc plated screws / bolts. The conductors outside the building shall be laid at least 600 mm. below the finished ground level.
8. The earth conductors shall either terminate on earthing socket provided on the equipment shall be fastened to the foundation bolt and/ or on frames of the equipment. The earthing connection to equipment body shall be done after removing paint and other oily substances from the body and then properly be finished.
9. Over lapping of earth conductors during straight through joints, where required, shall be of minimum 75mm long.
10. The earth conductors shall be in one length between the earthing grid and the equipment to be earthed.

♦ **EARTH LEADS AND CONNECTIONS.**

Earth lead shall be bare copper or galvanized steel 25mm x 6 mm sizes shown on drawings. At road crossing necessary Hume pipes shall be laid. Earth lead run on surface

of wall or ceiling shall be fixed on saddles so that strip is at least 8 mm away from the wall surface.

The complete earthing system shall be mechanically and electrically bonded to provide an independent return path to the earth source.

◆ **EQUIPMENT EARTHING.**

All apparatus and equipment transmitting or utilizing power shall be earthed in the following manner. Copper / G. I. earth strips / wires shall be used unless other wise indicated in the schedule B.

◆ **POWER TRANSMISSION APARTUS.**

1. Metallic conduit shall not be accepted as an earth continuity conductor A separate insulated/ bare earth continuity conductor of size 50 % minimum & maximum shall be provided.

Copper Aluminum G.I.

Minimum (Sq.mm.)	2.5	4.0	6
Maximum	65	100	200

2. The earth continuity conductor to the drawn inside the conduit shall be insulated.
3. Non metallic conduit shall have an insulated earth continuity conductor of the same size as for metallic conduit. All metal junction and switch boxes shall have an inside earth stud to which the earth conductor shall be distinctly colored (Green or Green / Yellow) for easy identification.
4. Armored cable shall be earthed by two distinct earth connections to the armoring at both the ends and the size of connection being as for the metallic conduit.
5. In the case of unarmored cable, an earth continuity conductor shall either be run outside along with the cable or shall from a separate insulated core of the cable.
6. Three phase power panel and distribution boards shall have two distinct earth connections of the size correlated to the incoming cable size. In case of single phase DB's a single earth connection is adequate.

◆ **UTILIZING EQUIPMENT :**

1. All street light poles shall have an earth stud and be connected to the cable armoring using 6.5 sq.mm. Copper or equivalent unless shown otherwise. For street lighting poles planted in ground, 2.4 M long 6 SWG bare GI wire shall be coiled and buried with every fourth pole in addition to connection to cable armoring.

2. An equipment-earthing grid shall be established as shown in the drawing. All earth connections to all panels, DB's and equipment shall be connected to the nearest point of the earthing grid.

◆ **TEST :**

1. The entire earthing installation shall be tested per requirements of Indian Standard specification IS: 3043,
2. The following earth resistance values shall be measured with an approved earth magger and recorded.

Each earthing station



Earth continuity conductors.

3. Earth conductor resistance for each earthed equipment shall be measured which shall not exceed 1 to 3 Ohm in each case.
4. Measurements of earth resistance shall be carried out before earth connections are made between the earth and the object to be earthed.
5. All tests shall be carried out in presence of the Engineer In charge /Electrical Inspector – if required.

◆ **MODE OF MEASUREMENT:**

1. Provision of earthing station complete with excavation, electrode, and watering pipe. Soil, treatment, masonry chamber with cast iron cover etc. shall be treated on unit of measurement
  2. The following items of work shall be measured and paid per unit length covering the cost of the earth wires/strips clamps. Labor etc.
    - a. Main equipment earthing grid and connection to the earthing stations
    - b. Connection to the weight board, power panels, DB etc
- ◆ The cost of earthing the following items shall become part of the cost of the item itself and no separate payment for earthing shall be made.
1. Isolating switches and section pillar shall form part of amounting frame, switch starter etc.
  2. Light fittings form part of installation of the light fitting.
  3. Conduit wiring, cabling shall form part of the wiring of cabling.
  4. Street lighting shall form part of the street light poles.

**Note :- Earthing Drawing is attached herewith for reference; however, final decision of engineer in charge must be binding to the contractor regarding construction of earthing**

**Make-** RAPID/ASHLOK/OBO/INDELEC/SULAH SAFE SOLTION or Eq.

**Mode of Measurement,-** Measurement shall be taken on No. basis

**ITEM NO.12:-** Painting the number and words for inventory Identification on erected fittings / equipment's or Such accessories as may required with good quality of enamelled paint as directed by engineer in charge (i) up to 20 characters, up to 50 mm height.(The height of numbering is 2,000 mm from base plate.)In case of poles used in central verge, pole number should be painted on both sides so that it can be visible on the either side. (The height of numbering is 1,500 mm from base plate.)

**Make-** As approved by Engineer In-charge.

**Mode of Measutement:-** Measurement shall be taken on No. basis

**MISCELLANEOUS WORKS:- TRENCH /DRILLING WORK:-**

**ITEM NO.13:-**

Drilling the road without breaking the road surface (Asphalt) for laying of cable for feeding power supply by making up to 150mm dia.size of holes at both ends complete as per specification and Instructed by engineer in charge .

**Make-** As approved by Engineer In-charge.

**Mode of Measurement:-** Measurements shall be taken on No. basis.

**ITEM NO.14:-**

Making trench in hard murrum/ tar road of suitable width of 90 cms or required depth for laying any size of cable or locating the fault all over the run and back filling the same and making the surface as normal ground.(B) If additional machinery like hammer driller or JCB use [Add]. (As Instructed by engineer in charge.).

**Make-** As approved by Engineer In-charge.

**Mode of Measurement:-** Measurements shall be taken on Rmt basis

**PART - B - (Power Supply Connection Charges, Operation & Maintenance Charges of Complete Street Light System for 5 Years)**

**ITEM NO.15:-**Annual Maintenance charge: Agency has to carry out Maintenance of the streetlight network after 1st year of completion of the project which is included in Defect Liability Period, in such a way that through all year, streetlight network will run with 100% efficiency. Agency has to carry out Maintenance with Manpower, Material, Tools & Tackles. No extra payment will be provided to agency.

**Make-** As approved by Engineer In-charge.

**Mode of Measurement:-** Measurements shall be taken on Per Year basis

**ITEM NO.16:-**Annual Operation charge: Agency has to carry out Operation of the streetlight network after completion of the project which is included in in such a way that through all year, streetlight network will run with 95% efficiency. Agency has to carry out operation with Manpower, Material, Tools & Tackles. No extra payment will be provided to agency (Unskilled Labour 1 No. & Skilled Labour 1 No.).

Comprehensive Operation, Maintenance & repairing of street light at Chhapara, GIDC Estate, District – Rajkot, Gujarat for all and all risk comprehensive.

The Work required to carry out by deploying qualified & experience manpower of Electrician, Helpers & labours as per the site requirement.

The Agency has to keep vehicle/wheel-mounted ladder for the maintenance work.

The work is inclusive of all required material for maintenance with Labour charges for Operation, Maintenance & repairs of street Lights fittings with minimum working of 95 % Functioning day to day during the whole year by switching On-OFF the street light at various control points at given period as per the instruction of Engineer- in- Charge & repairing the street light in the Estate which are not working by replacing the required spares which goes out of order & shall not be repairable.

The work also includes taking of Insurance of all staff engaged for the work & including all licenses like RPFC etc. The job also includes liaison with **DISCOM/PGVCL** Officials at the time of any fault occurred to restore the power at the earliest.

The scope also includes submitting daily reports to the Engineer-In-Charge for the working of the street light, work carried out during the day etc.

The scraps of used unserviceable materials are required to be deposited in store in presence of Engineer-In-charge day to day.

If the Agency failed to achieve 95% efficiency, the penalty shall be imposed as mentioned in detailed specifications & it shall be deducted from the monthly Bill of the agency.

Entire work shall have to carry out as per detailed Specifications & as directed by the Engineer-in-Charge etc.

All record & registers shall be maintained and to be signed by the authorized person or the agency.

Operation Maintenance & repairing shall be carried out by the agency for which all the tools required for the job shall be arranged by the agency.

**Mode of Measurement:-** Measurements shall be taken on Per Year basis.

**ITEM NO.17:-**Service Connection Charges includes Charges for obtaining N.O.C from Electrical Inspector / Statutory authority for Power / Ele. Installation on behalf of client and shall be paid on submission of original receipt to Client. Charges shall include preparing required attested documents & drawing for obtaining NOC on behalf of client.-10 KW , 3-Phase

**Mode of Measurement:-** Measurements shall be taken on Job basis.

**DEFINITION:** The definitions of terms in the IEC wiring rules shall apply.

**SUPPLY PRESSURE AND FREQUENCY:**

The supply will be three phases, 50 cycles/ second AC, 4 wire system, 415 V between phase and 230/ 240 V between phase and neutral and apparatus required shall be suitable for this supply.

**GENERAL TEST FOR INSTALLATION:** The installation with fittings complete shall satisfactorily pass the following tests, before the current is switched on: -

"All the lamps and appliance having been connected to the conductors and all switches and fuses be ON. A pressure not less than twice the working pressure (subject to a limit of 500 volts) shall be applied and the insulation resistance of the whole or any part of the installation to earth must not be less in MΩ than 25 divided by the number of points, subject to Min. of 1.5 MΩ."

**SUPERVISION: -** The whole of the work shall be carried out to the satisfaction of the Engineer in charge and under the constant supervision of the contractor's competent qualified and experienced supervisor/ engineer. The contractor shall if required by the department, furnish the full details of the supervisor's/ engineer's qualification. Only permit holder persons should be allowed to work at the site

## **Annexure –A**

### **Daily Maintenance Report for Street Lights Works**

**Name of Work:-**

**Name of Estate:-**

**Name of Agency:-**

**Report Date:-**

Sr No.	Date & Time	Name/ No of Section Pillar	Types of Street lights and Wattage	Name of Road and Pole No. (From & To)	Total Streetlight Poles. (Nos./DP)	Streetlight Poles Non-working (Nos.)	% Of WorkingStreet lights	Reason for Non-working	Action taken
1									
2									
3									

**Signature of Contractor**

**Signature of GIDC Official**

**Name of Contractor**

**DY. EXECUTIVE ENGINEER (M & E)  
GIDC, Rajkot**

## **Annexure –B**

### **Weekly Maintenance Report for Street Lights Works**

**Name of Work:-**

**Name of Estate:-**

**Name of Agency:-**

**Report Date:-**

Sr No.	Week & Time	Name/ No of Section Pillar	LED Light			Any other Light which are installed		
			Total Qty (Nos.)	Non-Working (Nos.)	% of Working	Total Qty (Nos.)	Non-Working (Nos.)	% of Working
1								
2								
3								

**Calculation:-**

**Street light Efficiency** =  $\frac{\text{Total No of Light} - \text{Out off order light}}{\text{Total No of Light}} \times 100$

**Note** : No of complain not attended within 48 Hrs. incl. street light off due to power problem will also be consider as out-off order light.

**Signature of Contractor**

**Signature of GIDC Official**

**Name of Contractor**

**DY. EXECUTIVE ENGINEER (M & E)  
GIDC, Rajkot**

**Annexure -C**  
**Monthly Maintenance Report for Street Lights Works**

**Name Of work:**

**Calculation for the Efficiency for Month of Billing :**

$$\text{Street light Efficiency} = \frac{\text{Total No of Light} - \text{Out off order light}}{\text{Total No of Light}} \times 100$$

**Note :** No of complain not attended within one day incl. street light off due to power problem more then one day will also be consider as out off order light.

**Efficiency Report**

Sr. No.		Date	LED Light
1	Efficiency as per inspection on dated :		
2	Efficiency as per inspection on dated :		
3	Efficiency as per inspection on dated :		
4	Efficiency as per inspection on dated :		
		<b>Total :</b>	

**Average Efficiency = Total Efficiency / 4**

Say :

Mode of Payment	
Efficiency	Payment
Average Efficiency 95%	100%
Average Efficiency 80%	80 %
Average Efficiency 70 %	70%
Average Efficiency Below 70 %	50%
Average Efficiency Below 50 %	25%
Average Efficiency Below 25 %	Nil

**Signature of Contractor**

**Signature of GIDC Official**

**Name of Contractor**

**DY. EXECUTIVE ENGINEER (M & E)**  
**GIDC, Rajkot**

### **Check List for Routine Maintenance of Street Light Works:-**

<u><b>Sr No.</b></u>	<u><b>Measured Parameters</b></u>	<u><b>Assessment Time</b></u>	<u><b>Trouble Causes</b></u>	<u><b>Action Taken</b></u>	<u><b>Remedial Measures</b></u>
1	To Maintain Energy Meter Reading Manually (i.e. - V/A/kVA/kW/ kVAr /PF/ kWh).	Daily	Meter Faulty	Inform to Concern DISCOM	Daily Check-up. (Annexure-A)
2	To Maintain Routine Check list / Complaint Register	Daily	<u><b>Possible Major Faults:</b></u> 1).Cable Fault 2).Termination Issue. 3).Voltage fluctuation Issue. 4).Luminaire Problem. 5).Streetlight Pole related Issue.	Inform to Concern DISCOM.  Repair /Replace or Maintain the same immediately.	Daily Check-up and make History sheet for each type of problem and take suitable remedial measures. (Annexure-A)
3	Inspection of Glands at each Feeder Pillars, Junction Boxes and Transformers.	Weekly	Loose Connection, Check-nuts.	Proper Tightened the loose connection, Check-nuts.	Weekly Check – up. (Annexure-B)
4	Measurement of Electrical parameters at each Feeder Pillars, Junction Boxes and Transformers Manually/ Power analyser.. (i.e.V/A/kVA/k W/kVAr/PF/kW H)	Weekly	<u><b>Possible Major Faults:</b></u> 1).Cable deterioration.  2).Loose Termination Issue.  3).High/Low Voltage Issue.	Repair /Replace or Maintain the same immediately. Proper Tightened the loose connection, Check-nuts. Inform to Concern DISCOM.	Weekly Check-up and make History sheet for each type of problem and take suitable remedial measures. (Annexure-B)
5	Measurement of Earth resistance at each Feeder Pillars, Junction Boxes and Transformers	Monthly	<u><b>Possible Major Faults:</b></u> 1). High/Low Earth Resistance.	Proper poring of Water /denominate/ch arcoal or inform to concern DISCOM.	Monthly Check-up and make History sheet for each type of problem and take suitable remedial measures. (Annexure-C)



			2). Earth Continuity Issue.	Repair /Replace or Maintain the same immediately	
6	Cleaning and maintenance of all Street Light Luminaries, Junction Boxes and Feeder Pillars shall be carried out	3 Monthly	<b>Possible Major Faults:</b> 1).Faulty and Luminaries. 2).Faulty Chock/Driver. 3).Faulty/ Damage Luminaries/Junction Box/Street Light Poles. 4). Dust on Reflectors/ Luminaries/Junction Box/Feeder Pillars. 5). Faulty Feeder Pillars / Transformers	Proper Action required to be taken as recommended in O & M manual.  Inform to Concern DISCOM.	Maintain detail in Register.
7	Painting of all Street Light Poles, Junction Boxes and Feeder Pillars. (Excluding Earthling Terminals)	Yearly (Immediate after the monsoon in Month of November .	<b>Poor Workmanship:</b> 1). Improper Painting.	Proper Action required to be taken as recommended in O & M manual.	Maintain detail in Register.

**LIST OF APPROVED VENDOR OF ITEMS / EQUIPMENTS FOR STREETLIGHT**

<b>SR. NO.</b>	<b>LIST OF ITEMS</b>	<b>APPROVED MAKES</b>
<b>1</b>	HOT-DIP GALVANIZED OCTAGONAL POLE Incl. J-TYPE BOLT and TEMPLET.	BAJAJ/TRANSRAIL/VALMONT/RR ISPAT/UTKARSH or Eq.
<b>2</b>	1.1 KV ELECTRICAL INSULATED PAINT	AKZONOBLE /HEMPLE/STANVEC/ASIAN PAINT or Eq.
<b>3</b>	DECORATIVE STREET LIGHT BRACKET (SWORD TYPE)	BAJAJ/TRANSRAIL/VALMONT/RR ISPAT/UTKARSH or Eq (As per Drawing attached Separately )
<b>4</b>	LED OUTDOOR STREET LIGHT/ INDOOR LIGHT	BAJAJ/PHILLIPS/SCHREDER/LIGMAN/WIPRO/ CROMPTON/ /HAVELLS or Eq
<b>5</b>	FR PVC INSULATED WIRE	FINOLEX/TORRENT/POLYCAB/RAVIN(PRIMECAB)/KE I/RR Cable or Eq
<b>6</b>	XLPE ARMOURED CABLE	FINOLEX/TORRENT/POLYCAB/RAVIN(PRIMECAB)/KE I/RR Cable or Eq
<b>7</b>	LUG	DOWELL's/ISMILE/3D/JAINSON or Eq
<b>8</b>	GLAND	COMET/HMI/SIEMENSE or Eq
<b>9</b>	MCCB/MCB/ELCB/MCCB/ CONTACTOR	ABB/L&T/SIMENSE/HAVELLS/LEGRAND/SCHNEIDER/ HAGER or Eq
<b>10</b>	DIGITAL TIME SWITCH & CONTACTOR	ABB/L&T/SIMENSE/HAVELLS/LEGRAND/SCHNEIDER/ HAGER or Eq
<b>11</b>	DOUBLE WALL CORRUGATED (DWC) POLYTHINE PIPE	DURALINE / JAIN Irrigation/GEMINI/VARAHIREX or Eq
<b>12</b>	CCMS PANEL	MOTWANE/KAKATIYA ENERGY SOLUTION/INSU/HPL /PYROTECH or Eq.
<b>13</b>	EARTHING	RAPID/ASHLOK/OBO/INDELEC/SULAH SAFE SOLTION or Eq
<b>14</b>	LED INDICATION LAMP	SIEMENS /SCHNEIDER /L&T /BINAY /ABB /MG /KAPPA /TECHNIC /GE /VAISHNO

**Note :- For percentage/unit rate works, makes other than above which are approved time to time by R&B/ GWSSB/CPWD department and mentioned prevailing (Current) Govt. SOR can be considered /used with prior approval of the competent authority / E.E (M&E) GIDC, Rajkot**

## CODE OF PRACTICE

### GENERAL

- The method of execution of the items shall conform to the relevant specifications as per the latest version of the Indian Standard unless specified otherwise and as far as applicable.
- Wherever a reference to ANY Indian Standard appears in the specification, it shall be taken to mean as a reference to the latest version of the standard.
- The following specifications, standards, and codes are made as a part of this specification.
- **Indian Standards** : specification for building materials, specification for equipment, method of test, method of measurement of building works ,code of practice for construction , safety code for demolition of building, safety code for scaffolds etc. published by the Bureau of Indian Standards
- The contractor shall invariably carry out Materials & work Tests as specified in the **Schedule “D”** attached with tender documents and IS code. However, if the additional tests are required as per the opinion of the Engineer-in-charge, the same shall also have to be carried out. All such tests shall be got carried out in Government or as approved laboratories and cost thereof shall be entirely borne by the contractor. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
- All moulds, equipments etc. required of preparing specimens for the test shall be kept in sufficient numbers and in good state, as directed by the Engineer-in-charge on the site of work.
- Specimen for tests shall sent to the laboratory along with representative of GIDC in time and the results thereof shall be promptly obtained and reported to the Engineer-in-charge.
- Satisfactory test results shall not observed the contractor from dismantling and re-doing any work revealed to the defective at a later date. The contractor shall have no claim for any payment or compensation whatsoever on account of replacement of such defective work. Contractor shall take all precautions and care during dismantling and re-doing the work to ensure that any other work so far executed does not get damage or affected.

- The work shall be carried out in true line and level and in conformity with the detailed drawing and specified patterns.
- All the work shall be carried out in a workmanship like manner and as per the best techniques for the particular item.
- All tools, tempts equipments etc. for correct execution of the work as well as for checking lines, levels, alignments of the works, during execution shall be kept in sufficient numbers on the side of work.
- All installations pertaining to water supply and its fixtures as well as drainage lines and sanitary fitting shall be deemed to be completed only after giving satisfactory tests by the contractor.
- Scaffolding being provided by the contractor at his own cost for such of the items for the execution of which it is essential.

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