REQUEST FOR PROPOSAL FOR

IMPLEMENTATION OF

"SMART STREET LIGHTING"

For Spine Roads in Guwahati

On

Design, Build, Operate & Maintain Basis

GUWAHATI SMART CITY LIMITED

Guwahati Smart City Limited,

Guwahati, Assam

Tender Notice No. SPV/GSCL/DEV/63/2017/Pt-II/49
Dated: 09/08/2021

Volume II: Technical Specifications & Drawings

TABLE OF CONTENTS

1.0 SCOPE OF WORKS

1.1 The scope of works is as defined in the Vol I of the RFP Instruction to the BIDDERs.

1.2 Refer Drawing no. TCE.10477A-EL-4027-GA-40020 for the road route considered for this project.

2.0 GENERAL INSTRUCTION TO CONTRACTORS

2.1 This specification is the minimum requirement and should be read in conjunction with relevant latest specifications, requirements, rules and regulations of the Local Authority. Any additional requirements as per Local Authority or latest Standards shall be offered by CONTRACTOR. The same shall be indicated in the Technical Proposal.

2.2 All SAFETY considerations in design and manufacturing for safe operation & maintenance and safe practices during installation at site shall be in the scope of the CONTRACTOR. Cost towards accomplishing the same shall be included in the BID price and no extra claim shall be entertained later.

2.3 Equipment furnished/ supplied under this scope of works shall be complete in every respect with all mountings, fittings, fixtures, and standard accessories normally provided with such equipment and / or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the Technical Specification unless included in the list of exclusions. Materials and component not specifically stated in the specification but which are necessary for commissioning and satisfactory operation unless specifically excluded shall be deemed to be included in the scope of specification and shall be supplied without any extra cost. All similar standard components/ parts of similar standard equipment provided shall be inter-changeable with one another.

2.4 The CONTRACTOR shall be responsible for the selection and design of appropriate equipment to provide the best co-ordinated performance of the entire system. The design of various components, sub-assemblies and assemblies shall be so done that it facilitates easy field assembly and maintenance.

2.5 The CONTRACTOR shall be responsible for preparation of calculation and drawings like lighting, cabling, earthing and obtaining the approval from GSCL/Consultant.

2.6 CONTRACTOR shall plan and carry out all supply, installation, testing and commissioning of the lighting system conforming to the approved drawing, technical specification and good engineering practices.

2.7 The material supplied by the CONTRACTOR shall be subject to approval of the designated Authorities of GSCL. Samples of the Supply material under the scope of works shall be inspected by GSCL or their representatives either at site or at Manufacturer's works and approve them for supply and execution. Notwithstanding any approval/ instruction given otherwise, if the GSCL, during random check up, finds any non conformance with the quality of material supplied by the CONTRACTOR with

respect to the technical specifications, GSCL shall have the Authority to reject the entire lot/ batch of that particular material and ask to replace without any cost impact to GSCL.

2.8 For all excavation works the CONTRACTOR shall restore the area/ road, as the case may be, after completing the installation work to its original condition. Taking away any excess material/debris and dumping at a place as per instructions of GSCL/GMC is included in scope.

2.9 During the construction at site, it shall be the CONTRACTOR's responsibility to take care of the safety and security of its person and material at site. The CONTRACTOR shall be self reliant with all the requirements including tools and tackles for digging, filling, erecting, lifting, etc. Electricity and water required for construction shall be arranged by Contractor at his own cost.

2.10 The CONTRACTOR shall make provision for adequate no. of Ladder mounted vehicles self sufficient with all the required tools and instruments, duly calibrated, for installation and maintenance to meet the deadlines and benchmarks specified.

2.11 The CONTRACTOR shall carryout the installations in a safe and responsible manner without any inconvenience or danger to public.

2.12 The CONTRACTOR shall take care not to damage any public/ private property by mistake or by intention during work with its actions and shall be well insured to compensate the owner in case any such incidence happens.

2.13 The CONTRACTOR shall also liaison with DISCOM and other Govt. Bodies like PWD, CEIG, water board etc. for obtaining valid permission to work.

2.14 All the cost towards liaison with statutory Bodies for seeking all necessary statutory approvals and other activities involving Govt. Agencies viz., drawing approval, testing and commissioning etc, shall be borne by the CONTRACTOR.

2.15 All the statutory fees for the above approvals shall be borne by GSCL. Such payments shall be reimbursed to the CONTRACTOR upon submission of stamped receipts to the GSCL. All the responsibilities related to installation, testing, commissioning and O & M of smart street lighting system in the identified Spine roads shall be borne by CONTRACTOR in respect of cost, managing the technical problems and other related aspect.

2.16 The GSCL shall not be responsible for untoward incidence, if occurred due to faulty design and poor installations. The CONTRACTOR would be responsible for any civil/criminal proceedings arising out of such incidence and for damage caused to life and property thereof.

2.17 The CONTRACTOR shall design the distribution of luminaires in such a way that the railway crossings for cable laying are avoided. If at any point crossing is required then the cost of Way leave charges to the Railway Department for seeking necessary approvals shall be borne by CONTRACTOR. Obtaining permissions from Railway authorities, carrying out the work as per the requirements of Railway authorities and obtaining approval of the same from the authority shall be in the scope of the

CONTRACTOR.

2.18 NIL.

2.19 Upon completion of street lighting work on the Spine Roads, fifteen (15)-days testing period will start to check the adequacy of the installed LED street lighting system. The issue of completion certificate to the CONTRACTOR is subject to successful testing and approval of GSCL.

2.20 GSCL is free to draw samples (not more than 0.5% per lot) after the start of supplies from the supplied quantity and subject the same to test in a NABL Accredited Lab. CONTRACTOR shall bear the cost of testing of such samples. The decision of GSCL on the same shall be binding on the CONTRACTOR. Failure of the sample will invite strict penalty and disqualification of the CONTRACTOR from future tenders also.

2.21 The clearance for carrying out dismantling works of existing Street Light Fittings shall be given only after successful completion of trial testing period of 15 days and performance approval from GMC. The testing parameters shall be defined along with GMC during execution.

2.22 The CONTRACTOR shall follow all Safety practices as per prevalent statute and practices for execution of work. All Personal Protective Equipments shall be provided for the Workmen/Staff in the Field while working. Failure to abide by the safety rules shall make the CONTRACTOR Liable for penalty/ Termination of contract (Under repeated incidences).

2.23 The CONTRACTOR shall be fully responsible for any damage and or for loss of life of his own employee or any outsider due to any accident, fire, hazards occurred during the work or after completion of work.

3.0 APPLICABLE CODES AND STANDARDS

3.1 All the equipment and systems shall conform to the latest applicable National and International standards; and latest Rules and Regulation of the Local Authorities. The codes and standards mentioned in this specification shall be latest as on the day of execution of the works unless otherwise specified. The revisions in the relevant codes and standards if any after the date of award of contract shall be informed by the Contractor to the Consultant/ Owner within 30 days of the issue of such revision of the codes/ standards. Consultant/ Owner may approve use of the earlier code/ standard if the revisions do not materially affect the statutory requirements of the project or does not impact safety practices. Any cost impact arising out of such revisions shall be mutually agreed. Nothing in this specification shall be construed to relieve the CONTRACTOR of this responsibility

4.0 DESIGN CRITERIA

4.1 Street Lighting System

4.1.1 The list of identified Spine roads is provided in the Annexure 5. There are no definite RoW sections for any of the road in Guwahati. The roads vary in width along its entire length.

4.1.2 Maximum RoW width is being provided in the Annexure 5. The width of RoW to be considered for the design shall be inclusive of the **Shoulder & Drain Width on either side and Carriage Way**. The pole shall be mounted on the outer edge of the shoulder towards the drain to avoid any obstruction of traffic/ expansion in near future.

4.1.3 The roads can be summarized into different ROWs. The Average Lux level, Uniformity and Threshold requirements of each ROW are indicated in the table below;

TABLE 1 - ROWS FOR SPINE ROADS

ROW No.	Road Width* (m)	Drain Width (m)	Road Length (km)	Design Parameters for Road (CW + SH)				Design Parameters for Drain (Pedestrian Movement)	
				Average Lux Level	Uniformity	Threshold Increment TI (%)	UL (Min)	Average Lux Level	Uniformity
1	5 to 6	1.5	22.82	15	0.4	10	0.7	4	0.3
2	7 to 22	2	113.08	20	0.4	10	0.7	4	0.3
	Total		**135.9**						

**Road widths are including Carriage way and Shoulders.*

**CW- Carriageway, SH- Shoulder*

4.1.4 The CONTRACTOR shall design the system for each road keeping the following in view:

(a) The level and type of lighting adopted for a street shall be based on its traffic importance, both vehicular and pedestrian. However, the system of lighting to be provided should take into account all the relevant factors, such as the presence of factories, market, or places of public resort, the character of the street like trees, landscape etc.

(b) Public lighting should permit users of the road at night to move about with the greatest possible safety and comfort so that the traffic capacity of the road at night is as much equal to that planned for the daytime as possible.

(c) The driver should be able to see distinctly without the use of dipped or driving headlights and locate with certainty and in time all significant details notably the alignment of the road (its direction and its surrounds)

(d) The glare due to luminaries should be controlled at a value which keeps the visual discomfort to which the driver is subjected below an acceptable level as per the latest standard.

(e) The pedestrian should be able to see distinctly the edges of the footways, vehicles and obstacles; dark patches should not occur.

(f) The above aim shall be achieved with due respect to the aesthetic appearance of the lighted road within acceptable limits of cost of installation and maintenance.

4.1.5 All the required Design Factors shall be considered as per the latest version of IS 1944 and National Lighting Code 2010.

4.1.6 The Average Lux levels achieved on roads shall not be less than the actual design requirements even after 30% Lumen Degradation.

4.1.7 Maintenance factor shall **not** be considered **less than 0.8** for the lighting calculation.

4.1.8 Lighting design shall be performed using latest version of DiaLux Software (Version 4.12 or higher)/ Original Equipment Manufacturer (OEM) validated software. The Validation Report validated from Accredited Authority and IES files shall be submitted along with the BID.

4.1.9 Maximum power output of each Feeder Pillar for calculating the incoming cable size shall be considered not less than **10 kVA**. The voltage drop at the terminals of the farthest pole shall not exceed more than **3%** from the Feeder Pillar. Cumulative voltage drop from HT to the farthest Point for one feeder Pillar group shall not exceed **5%**.

4.1.10 The following criteria shall be followed for designing the CCMS system for the Identified roads;

(a) Only Group ON-OFF shall be provided for the roads having lights below or equal to 75W.

(b) Group ON-OFF Plus Dimming shall be provided for the roads having Light fittings rated above 75W and all Light fittings on roads having Carriage Way + Shoulder Width equal to or more than 11m and Road No. 36, 36A, 110, 4A, 1, 1A, 5, 24A, 40B, 14AA for Spine roads.

(c) Dimming shall be possible from min 25% to 100% of the rated output.

(d) Dimmable driver shall be considered only for Luminaires which are rated above 75W and all Light fittings on roads having Carriage Way + Shoulder Width equal to or more than 11m and Road No. 36, 36A, 110, 4A, 1, 1A, 5, 24A, 40B, 14AA for Spine roads.

(e) Only Step-less Dimming shall be provided for the Luminaires where applicable. Incase Step less dimming is not possible then multistep dimming can be considered to get a smooth transition of light. Min 5 steps are acceptable. The dimming steps shall be programmable remotely as per site requirement at various point of time.

4.1.11 **The RFP requirement is Group control**. However, in case **BIDDER wishes to achieve Group control with Individual Controller then that is BIDDER's decision**. Individual controller can be accomplished with either NEMA socket or inbuilt controller. However, the thermal stability of the Luminaire shall be ensured when provided with inbuilt controller.

4.2 **CABLE SIZING:**

4.2.1 The CONTRACTOR shall ensure that cable associated with the power distribution systems in all the installations throughout the Works are adequately rated for their use.

4.2.2 The following main aspects shall also be considered while deciding the final size of the cables-

(a) Supply voltage and frequency

(b) All cables shall be selected to carry the corresponding full load current under site conditions.

(c) Route length and disposition of cables

(d) Maximum allowable temperature rise under normal full load condition based on the material of cable insulation (XLPE/ PVC).

(e) Maximum short circuit current duration (fault clearing time) and final temperature of cable during short circuit current flowing through the cable.

4.2.3 For Cables emerging from MCB outgoing of the feeder pillar, fault clearing time shall be considered as 0.01 second

4.2.4 Appropriate de-rating factors as per cable manufacturer's catalogue as enlisted below shall be considered for sizing the cable:

(a) Ambient Air Temperature (minimum 45 degree C).

(b) Ambient ground temperature (minimum 35 degree C to be considered)

(c) Laid in Air / ducts/ directly in ground etc.

(d) Depth of cable burial (minimum 750 mm for LT). Cables laid under the carriage way under any condition shall not be laid less than 1000mm from the FRL/ FGL as the case may be.

(e) Thermal Resistivity of Soil (minimum 150 degree C Cm/ W to be considered)

(f) No. of cables in a group-touching each other or separated by a distance

(g) No. of cable trays in tier if laid in trays in trench or rack

(h) Any other de-ration factors as applicable & as per Manufacturer's catalog.

4.2.5 The number of light fixture controlled by a single feeder pillar outgoing circuit shall be limited based on the voltage drop at the farthest pole. The cumulative voltage drop at the END point of the CIRCUIT shall not exceed beyond 5%.

4.2.6 The LV power cables shall be 1.1 kV grade, multi-stranded Copper/ Al conductor, XLPE insulated, colour coded, inner and outer extruded PVC sheathed, ST2, galvanized steel round wire/ flat strip armoured cables.

4.2.7 Cables up to & including 4.0 sq.mm shall be Cu multi-stranded conductor with galvanized steel round wire armoured & balance cables shall be Al multi-stranded conductor with galvanized steel round wire/ flat strip armoured.

4.2.8 Control cables shall be Cu multi-stranded conductor with galvanized steel round wire/ flat strip armoured. For multi core cables above 7 cores, minimum two spare cores shall be considered.

4.3 EARTHING SYSTEM

4.3.1 The safety earthing and lightning protection system shall be based on the latest version of the following codes and standard including all amendments.

TABLE 2: STANDARD AND GUIDELINES FOR EARTHING PROTECTION

a)	IS 3043- 2018,	Code of practice for Safety Earthing
b)	CEA Regulations 2010	Measures related to safety & electric supply.
c)	CPWD Specifications - 2013	General Specifications for Electrical Works Part I – Internal

4.3.2 Size of Earthing Conductors

The earthing conductor sizes shall be calculated as per IS: 3043. Following factors will be considered for sizing the earthing conductor.

TABLE 3: PARAMETERS FOR SIZING OF EARTH CONDUCTOR

a)	Design Ambient Temperature	45°C
b)	Allowable temperature rise	500°C
c)	For steel welded joints Fault clearing time	1 second

d)	Overall earthing resistance	Less than 1 Ohms

4.3.3 GI Pipe electrodes shall be provided for Feeder Pillars-2 Nos. each, 1 No. for every consecutive 5 light poles and other systems as per the provisions of latest version of IS 3043 or better. Electrode shall be connected to the feeder pillar by two runs of GI strip of min size 25X6 mm. For street light poles, 8SWG wire shall be used for earthing laid in DWC pipe along with lighting cable.

4.3.4 Requirements for APDCL Two Pole structure and transmission line shall be as per APDCL/ CEIG guidelines for which work will be carried out by APDCL.

4.4 CIVIL DESIGN

4.4.1 All the civil foundation design shall be suitable for the Seismic requirement of Guwahati as per latest IS as the city of Guwahati falls in the Seismic Zone-V.

4.4.2 The design shall also consider the maximum wind speed of min 180 kmph as per IS 875, 1987 (Reaffirmed in 2013).

4.4.3 Grade of concrete to be used shall be M20 (1:1.5:3) and grade of reinforcement steel shall be Fe 500.

4.4.4 40NB Flexible DWC Pipe of 1m length shall be embedded to draw the cable through the foundation.

4.4.5 Minimum requirement for Civil Foundations for Lighting poles upto a **height of 6m** are as follows:

(a) Depth of the foundation should be 1100 mm minimum.

(b) Plan dimensions of footing should be 900mm x 900mm having depth D=200 mm Minimum.

(c) Reinforcement in foundation in both directions -

(d) Bottom reinforcement -T 10 @ 150 mm c/c.

(e) Top Reinforcement to be as per IS 456, 2000 (Reaffirmed in 2016)

(f) Four anchor bolts of 16mm Dia and 500 mm total length are required.

(g) Grade of concrete to be used shall be M20 (1:1.5:3) and grade of reinforcement steel shall be Fe 500.

(h) Concrete pedestal -

(i) Size -300 mm x 300 mm

(ii) Main vertical reinforcement shall be 4 nos. bars of 12mm dia bars

(iii) Shear reinforcement (stirrups) shall be 8 mm dia bars at 200 mm c/c.

(iv) This foundation design of pole will be applicable for all types of soils i.e. soft soil, medium soil and hard soil.

4.4.6 Minimum requirement for Civil Foundations for Lighting poles up to a **height of 10m** are as follows:

(a) Depth of the foundation should be 1600 mm minimum.

(b) Plan dimensions of footing should be 1200mm x 1200mm having depth D=300 mm Minimum.

(c) Reinforcement in foundation in both directions -

(d) Bottom reinforcement -T 10 @ 150 mm c/c.

(e) Top Reinforcement to be as per IS 456, 2000 (Reaffirmed in 2016)

(f) Four anchor bolts of 16mm Dia and 500 mm total length are required.

(g) Grade of concrete to be used shall be M20 (1:1.5:3) and grade of reinforcement steel shall be Fe 500.

(h) Concrete pedestal -

(i) Size -350 mm x 350 mm

(ii) Main vertical reinforcement in shall be 8 nos. bars of 12mm dia bars

(iii) Shear reinforcement (stirrups) shall be 8 mm dia bars at 200 mm c/c.

(iv) This foundation design of pole will be applicable for all types of soils i.e. soft soil, medium soil and hard soil.

4.4.7 The above design requirements are minimum requirement. Bidder may offer better design based on site conditions subject to approval from GSCL.

5.0 DETAILED FIELD SURVEY

5.1 CONTRACTOR shall carry out a Detailed Survey of the identified Spine Roads to gather following information to design the proposed system:

(a) Road width at different stretches of a particular road; - including shoulder width and carriage way details

(b) Road Length of particular roads;

(c) List out the requirements of particular roads for satisfactory illumination and control;

(d) Prospective location for mounting the Switching Point Feeder pillars as per the offered technology; its access to the power from nearest APDCL source.

(e) Identify the location for mounting the lighting poles,

(f) Bottlenecks and hindrances if any and offered solution for the same

(g) Nearest supply point for the feeder pillar, HT/LT

(h) Location for mounting the two pole structures and transmission line poles

(i) Cable corridor and under laying other utilities

5.1.1 Design the new lighting system based on the above inputs in latest validated version of Dialux software.

5.1.2 A Detailed Report shall be submitted by CONTRACTOR incorporating the survey findings and Offered Solutions including design calculations and BOQ for the Luminaires and infrastructural components.

5.1.3 The Report shall indicate the Guaranteed total energy consumption by the system proposed for each road per month.

5.1.4 Road wise drawings for GA layout with Sections for various stretches of the road shall be enclosed showing the location of poles and feeder pillar with HT/LT supply arrangement and any other accessories required. All the space allocations shall be clearly identified after due verification with the authorities.

5.1.5 The Report shall also include the following:

(a) Situation analysis for the surveyed roads and findings

(b) Proposed solution

(c) Design Report for each road

(d) Summary of all the roads including road width with carriage way/ footpath/ drains; proposed wattage; height of poles; distance between the poles; calculated lux level, uniformity etc.

(e) Detail description of CCMS system with proposed communication technology, data sheets, architecture, server details, software applications, features offered, communication technology, list of alerts and alarms, list of parameters offered for monitoring and control, system efficiency, bandwidth requirement

(f) Data sheets of proposed Luminaire, Poles, Feeder Pillar, controller, battery, communication module, server etc.

(g) Details of Helpdesk set up and Complaint Management System

(h) O&M SOP

(i) Resource deployment

(j) Micro Project schedule on weekly basis

(k) Milestones for completion of implementation of lighting system in terms of road length (km)

5.1.6 Apart from the above, in case CONTRACTOR detects any other point of concern during the survey the same shall be indicated in detail in the report.

6.0 TECHNICAL SPECIFICATIONS OF OCTAGONAL POLE

6.1 The Product should be designed for the specific climatic and environmental conditions of the region to ensure full durability and safety throughout its designed life.

6.2 All the Octagonal Poles shall be designed to withstand the maximum wind speed of 180 kmph as per IS 875. The top loading i.e. area and the weight of fixtures are to be considered to calculate maximum deflection of the pole and the same shall meet the requirement of BS EN 40-3-3:2013.

6.3 The pole shall also be designed to withstand the Earthquake as per the provisions of the relevant BIS/other standards related to the urban location in the State of Assam.

6.4 The pole shaft shall have octagonal cross section and shall be continuously tapered with single longitudinal welding. There shall not be any circumferential welding of the pole shaft. The welding of the pole shaft shall be done by Submerged Welding process.

6.5 All octagonal pole shafts shall be provided with the rigid flange plate of suitable thickness with provision for fixing minimum 4 foundation bolts. The base plate shall be fillet welded to the pole shaft at two locations i.e. from inside and outside. The welding shall be done as per standard approved process.

6.6 The materials of the pole are as follows:

(a) Pole - Conforming to grade S355J0,

(b) Base Plate: - Fe 410 Conforming to IS 226/ IS 2062,

(c) Foundation Bolts: - 6.8 Gr. as per IS 1367,

(d) Pole Sections: - The Octagonal Poles shall be in single piece with single longitudinal welding joint,

(e) Galvanization: - The poles shall be hot dip galvanized as per IS 2629 / IS 2633 / IS 4759 and BSEN ISO 1461 standards with average coating thickness of 65 micron. The galvanizing shall be done in single dipping. The zinc Ingot raw material shall be 99.99% pure and procured from reliable sources with Quality Test Certificates.

6.7 The pole manufacturing & galvanizing unit shall be ISO 9001: 2000 & ISO 14001 certified to ensure consistent quality & environmental protection.

6.8 The poles shall have integrated Junction box with openable door of adequate size (Not less than 500mm length) at the elevation of 750 mm from the base plate. The door shall be hinged type with mechanical interlock, dust proof, weather proof and vandal resistant and shall ensure safety of inside connections and components. The door shall be flush with the exterior surface and shall have suitable locking arrangement. The pole shall be adequately strengthened at the location of the door to compensate for the loss in section.

6.9 The door of the Junction Box shall permit clear access to the components inside viz., termination strips, connectors, MCBs, cables etc. There shall also be suitable arrangement for the purpose of earthing.

6.10 Electrical connections - Four way connectors shall be provided along with Slide lock suitable for connecting 1.1 kV grade, 4 core X16 sqmm Al cable. It shall also house 1 no. 6 amps DP MCB,2.5 sqmm connectors for looping with 2.5 Sqmm Copper wires for connecting to the luminaries through 0.75kV grade, 3 core X 2.5 mm² PVC insulated copper conductor flexible un-armoured Cable from the terminal block to the fixture within the pole. All the cables laid through the pipe shall be without any joint.

6.11 Two nos. Earth Boss shall be provided at the bottom of the pole or on base plate (diagonally opposite) suitable for connecting 25X6 mm GI/ CU earth strip earthing of the poles. Similar Earth Boss suitable for connecting 4 sqmm copper wire shall be provided on the control plate inside the Junction Box for earthing of the electrical components.

6.12 Two nos. 50 mm DWC HDPE sleeves of suitable length shall be provided through the foundation up to foundation top.

6.13 Earthing of each pole shall be carried out with one earth electrode for a set of 5 poles. The earth electrode shall be GI pipe electrode as recommended in the latest version of IS 3043. The earth electrode shall be connected with 8SWG wire laid in DWC pipe along with lighting cable to the two distinct earth boss on the pole.

6.14 Aesthetic appearance - All the grooves and carvings of the pole unit shall be free from any kind of distortion for a pleasing aesthetic appearance.

6.15 Top Mountings -The galvanized decorative mounting bracket as selected by the GSCL shall be supplied along with the Poles for Installation of the luminaries.

6.16 The Poles shall be bolted on a pre-cast foundation with a set of foundation bolts for greater rigidity.

6.17 The CONTRACTOR shall carry out all the relevant tests and inspection in the presence of the GSCL or Third Party Agency, as may be selected by the GSCL, before the dispatch of the poles at no extra cost to the GSCL.

6.18 The CONTRACTOR shall inform the GSCL at least FIFTEEN (15) days in advance, about the manufacturing program so that arrangement can be made for inspection. GSCL reserves the right to waive the inspection at any stage.

6.19 All the material/equipment/accessories shall be supplied with manufacturer's test certificates.

6.20 CONTRACTOR shall submit the Proposed Product Catalogue, Detail Data sheet, spare parts list and drawing of Pole & Bracket along with the BID for each product quoted.

6.21 CONTRACTOR shall arrange for all the tools and equipment's including spares.

6.22 M20 concrete foundations shall be provided for all the poles. Approx. dimension of the foundation for evaluation purpose is 600X600X1700 mm. However, CONTRACTORs shall design as per the stability requirement and Soil bearing Capacity of each location. The Poles shall be bolted on a pre-cast foundation with minimum four foundation bolts for greater rigidity.

6.23 Galvanized Poles Dimensions – These are the minimum dimensions (Annexure-3). CONTRACTOR may offer as per their design for a particular Height.

7.0 TECHNICAL SPECIFICATIONS OF LED LUMINAIRE

7.1 Applicable Standards

All applicable standards shall be as per Annexure 4.

7.2 Environmental Conditions

The average atmospheric condition during the year is mentioned below. The equipment shall be designed to work in such environmental conditions:

(a) Maximum ambient air temperature: 45° C

(b) Minimum ambient air temperature: 5° C

(c) Max. Relative humidity: 90%

(d) Atmosphere: Dusty and Humid

(e) Rainfall data:1600 mm

(f) The equipment shall be suitable to sustain and work in the humid and dusty atmosphere of Guwahati.

7.3 Luminaire Description

7.3.1 The Luminaires shall work on single phase three wire system (phase, neutral & earth).

7.3.2 The luminaire light output (lumen) shall be constant and shall be able to withstand allowable supply source voltage variations/ fluctuations, spikes and harmonics.

7.3.3 The Luminaries shall have a sturdy and corrosion resistant high pressure Die cast Aluminium alloy housing with weatherproof gasket for lamp, with separate Driver compartment and control gear accessories. The housing shall be Epoxy coated, without

any cracks or thorough holes, made in a single piece of die-cast LM6 Aluminium alloy. The luminaries shall be totally enclosed, dust tight and water proof.

7.3.4 It should be easily replaceable in the field condition.

7.3.5 Heat sink used should be Aluminium extrusion having high conductivity. The dimensions of luminaries shall be optimum and adequate to permit sufficient heat dissipation, through the body itself, so as to prevent abnormal temperature rise inside the lantern and consequential damage to the cover and gasket materials, LEDs, lenses and electronic drivers. Heat sink must be thermally connected to MCPCB/ LED light source.

7.3.6 The Luminaries Housing shall be suitable for termination of 3C X 2.5 sqmm copper conductor PVC insulated flexible Cable with Double Compression Weather proof Cable Glands if required.

7.3.7 The optical system shall consist of Poly Carbonate lenses on individual high power LEDs designed & tested to achieve typical street lighting distribution from the LED Luminaire. These lenses provided for individual LEDs are to be fixed on lens plate in order to have consistent light distribution from luminaries. Luminaries should conform to the Photometric Distribution / requirements of Cut-Off / Semi Cut – off light distribution and optics as classified in IS 1944 and NLC 2010.

7.3.8 Suitable number of LEDs shall be used in the luminaries. The manufacturer shall submit the proof of procurement of LEDs from OEMs at the time of testing along with the test reports.

7.3.9 The Luminaries shall be provided with distortion free, clear, high tensile, heat resistant, toughened glass of minimum 0.8mm thickness or UV resistant polycarbonate cover with required degree of protection. It is preferred that BIDDER offer Cover with Integrated individual lenses for LEDs fixed to housing providing required degree of protection. All hardware shall be corrosion free/ stainless Steel.

7.3.10 An extruded silicon loop gasket shall be provided in the lantern body to ensure a weather proof seal between the cover and the metal housing to exclude the entry of dust, water, insects, etc. Luminaries should conform to degree of protection of IP 66 or above. Felt gasket will not be accepted.

7.3.11 Luminaire shall be enclosed in an **aesthetically designed** housing with corrosion resistant polyester powder Coating after phosphor-chromate treatment.

7.3.12 All Luminaires shall conform to RoHS/UL/CE/ERTL/ERDI and BIS requirements and Certifications as appropriate. **All the test reports from Third Party NABL accredited laboratory shall be submitted along with the technical proposal/ Bid. Drivers used in the luminaires should be having individual BIS CRS number. BIS certificate shall be submitted along with the BID in the compliance.**

7.3.13 Name of the GSCL, Year of Manufacture, Batch No., Serial Number or Identification No. Luminaries Manufacturer's Name / Logo, Wattage and Frequency should be embossed on the housing.

7.3.14 LED luminaries, should conform to the various National / International standards for safety & performance. Manufacturer should provide test reports as per LM 79 & LM80. The test reports shall be certified from UL/ILAC/NABL accredited Third Party Laboratory (TPL) shall be submitted along with the technical proposal/ Bid for LED as well as Luminaires.- all test **reports not older than Three (3) years.**

7.3.15 Luminaries should conform to the National / International standards for Safety & Performance and test certificates as per relevant standards shall be provided by the manufacturer. In case of luminaries are imported, the CONTRACTOR shall conform to test parameters as per UL or equivalent standards. However, Luminaire should be registered under BIS CRS for IS 10322 part 5 Sec 3 which covers all safety and protection criteria since it has been made compulsory by BIS. BIDDER shall submit the BIS registration number of Luminaires including the Driver or both if separately registered proposed for the project in the technical Proposal and not only one of the two.

7.3.16 The electrical component of the LED and LED driver must be suitably enclosed in separate sealed unit to function in environment conditions mentioned above.

7.3.17 All the connecting wires inside the Luminaries shall be Low Smoke Halogen Free, fire retardant cable or as per IS 10322 part 5 Sec 3 whichever is stringent.

7.3.18 Adequate protection against Overloading, Short Circuit, Over Voltage, Over temperature, Under Voltage, String Open, Surge Protection shall be provided within the Luminaries. Drivers shall have inbuilt protection system to operate safely, automatically isolate during abnormal conditions & restart as soon as the system normalizes. Third party Test certificates from NABL accredited Lab shall be submitted along with the BID for all the above. Drivers shall be capable of withstanding the voltage stress of 440V. Test certificates shall be submitted to justify the same.

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

7.3.20 All the material used in the luminaries shall not contain any toxic material/ metal like mercury; shall be halogen free and fire retardant conforming to relevant standards.

7.3.21 The Manufacturer shall have NABL accredited testing facilities to carry out all the relevant test and shall be offered for inspection to the GSCL for verification of the required parameters and tests. CONTRACTOR shall confirm the same in the BID.

7.3.22 The control gear shall comply with the provisions of IEC 61347-2-13:2014, IEC 62031:2018 and IEC 62384:2006 as appropriate or equivalent BIS standards IS 15885 Part-2 Section 13. BIS certificate shall be submitted along with the BID in the compliance.

7.3.23 The switching surges are expected in the power supply system. Appropriate surge protection shall be provided by the CONTRACTOR for all the Luminaires offered. Such protections can either be provided centrally at the Feeder Pillar or at each individual luminaire level or a combination of both, as may be decided by the CONTRACTOR. No claim for failure of Luminaires, on account of surges will be considered.

7.3.24 Additionally, as per ANSI C 136.2-2014/ UL-1449, External Surge protection device (SPD) with Thermal Protection (TMOVs) of minimum 10 kV/ 10 kA to be separately installed with each fixture while an additional surge arrestor of 20kV/10kA shall be installed inside Feeder Pillar / field panel. The same shall be certified from independent lab and follow IEC 62305:2010 & IEC 61643-11-2011.No claim for failure of Luminaires, on account of voltage surges other than Lightning surges, will be considered.

7.3.25 In case of voltage surges due to lightning, it is expected that lights, in the affected circuit, will fail in a group and not in an isolated manner. Hence, any such failure of lights in a group on account of Lightning surges, may be reported to the GSCL, along with circumstantial evidence preferably within 48 hours of such occurrence. The responsibility for submission of supporting documentation rests with the CONTRACTOR.

7.3.26 The Luminaires shall be suitable for operation within the input supply voltage range specified. The driver of the light should be able to sense and cut-off power to the light in case of phase-to-phase/ 440 V fault. No claim in this regard shall be considered.

7.3.27 The lighting fixtures offered shall comply with the data sheet attached in Annexure 1.

7.3.28 The driver/ control gear offered shall comply with the data sheet attached in Annexure 2.

7.3.29 **The complete luminaire assembly including all the components shall have a warranty period of 5 years.**

7.3.30 Protection against any type of mischief / pilferage should be ensured.

7.4 **Testing Of Luminaire**

7.4.1 The Routine test on each of the offered Luminaries shall be carried out by the CONTRACTOR before dispatch. Following tests shall be carried out as Routine tests by the CONTRACTOR for the offered Luminaries;

(a) Visual and Dimensional check

(b) Checking of documents of purchase of LED

(c) Insulation resistance test

(d) HV test

(e) Reverse polarity

7.4.2 The Acceptance test shall be carried out by GSCL or GSCL's Representative on a sample of the lot offered for Acceptance. The Lot shall be different from the lot from which the Type test samples have been drawn. The cost of the testing shall be borne by the CONTRACTOR. Following tests shall be carried out as Acceptance tests by the CONTRACTOR for the offered Luminaries;

(a) Visual and Dimensional check

(b) Checking of documents of purchase of LED

(c) Insulation resistance test

(d) HV test

(e) Over voltage protection

(f) Surge protection

(g) Reverse polarity

(h) Test for IP 66 protection

7.4.3 Following Type tests reports shall be provided by the CONTRACTOR for the offered Luminaries from Third Party NABL Accredited Laboratory along with the BID;

(a) IES-LM-79 Reports from Third Party NABL Accredited Laboratory

(b) IES-LM-80 Report for LED Chip along with Datasheet

(c) BIS/CRS Registration Certificate for IS 10322 (Part 5 Sec 3)

(d) Resistance to humidity, Dust and Moisture

(e) Insulation resistance test/ electrical strength

(f) HV test

(g) Over voltage protection

(h) Surge protection

(i) Reverse polarity

(j) Temperature rise Test

(k) Colour Rendering Index measurement test

(l) Heat resistant test

(m) Fire retardant Test (Including Wiring)

(n) Test for IP 66 protection

(o) Test report confirming to Impact resistance

(p) Endurance Test

(q) Life Test

(r) Photometric Measurements Test Report (IES LM 79)

(s) LED Lumen Maintenance Test Report (IES LM 80) (As provided by LED manufacturer)

(t) Vibration test as per ANSI

(u) Drop Test

8.0 TECHNICAL SPECIFICATION OF STREETLIGHT FEEDER PILLAR- SWITCHING POINT

8.1 All Feeder Pillars (FP) shall be Outdoor type, Wall/ Column/ Steel Support mounting, Weatherproof, double door, single front, non-compartmentalized enclosure with locking facilities.

8.2 The OFP (Outdoor Feeder Pillar) shall be made of either Galvanised sheet steel enclosure or Powder coated with minimum seven tank process (certification confirming the same shall be submitted) CRCA panel enclosure. All the feeder pillars shall be Outdoor type with permanent rain canopy and shall be dust, damp and vermin proof. All feeder pillars shall conform impact resistance of IK10 and shall be minimum IP55 certified. Third Party Type test report for Impact and Ingress protection shall be provided in the Technical Proposal.

8.3 The GI feeder Pillar shall be fabricated from 3 mm CRCA sheet and shall be Hot Dipped Galvanized as per relevant latest standards after entire fabrication. The enclosure shall be powder coated with Epoxy paint as per desired colour of GSCL. The gland plate shall be 3mm thick.

8.4 The fabricated enclosure shall not have any welds or bolt heads apparent from outside. All fabrication work like cutting, drilling, punching, shearing & welding etc. related to the enclosure shall be complete before proceeding to 7 tank process. The fabricated body shall be thoroughly cleaned and treated by chemical agents as required to produce a smooth surface free of scales, grease and rust.

8.5 Sheet metal components shall be pre-treated using the seven-tank phosphating process consisting of de-greasing, acid pickling, de-rusting, phosphating and passivation including repeated rinsing in between each process. On completion of passivation of the components they shall be preheated and then epoxy powder coated with selected shade for exterior as well as interior and Glossy White shade for the gland plates (Inside the panel) and component mounting plate.

8.6 All interiors and exteriors of the enclosure shall be finished and painted to prevent rusting and corrosion. The paint should be carefully selected to withstand tropical heat, rain and environmental effects. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling. Thickness of all painting shall be average 80 microns DFT. The final colour of Feeder pillar shall be as per GSCL requirements.

8.7 The gasket shall be of neoprene rubber suitable to withstand all weathers for long tenure of service. All hardware shall be made of non-corrosive material either HD

Galvanized or stainless steel. Door shall be with concealed type hinges & captive screws.

8.8 Both the doors shall have an Inspection/ View Window for monitoring the energy meter reading without opening the door. The window on the external door shall be provided with a metal flip cover with small canopy which can be moved up and down for viewing the meter.

8.9 Both the doors shall have panel type lock with keys in duplicate as per the requirements of the GSCL.

8.10 All the feeder pillars shall be of uniform height and shall be mounted with the bottom of the panel at minimum 800mm above the Finished Ground or Floor level as the case may be.

8.11 A danger notice board written in English, Hindi and Assamese shall be made of 2mm thick GI plate and shall be provided on the front door of the feeder pillar.

8.12 CONTRACTOR shall provide minimum 10 mm thick MS fabricated Cage covering entire feeder pillar with 7 lever locking arrangement.

8.13 The details of max load in KW, Rating of Incomer, no of phase, voltage, frequency, controller no., Meter No., road name, Pillar no. name of the agency and year of erection shall be labelled using radium sticker/radium paint.

8.14 The feeder pillar shall consist of Incoming Four Pole (FP) RCBO or MCB with ELCB, 3 Phase Digital Energy Meter, FP Contactor for each outgoing circuit, Astronomical Timer, Outgoing FP MCB apart from all the smart control components like Gateway controller, Power Supply Unit for the Gateway unit, Battery for Back up etc. It shall also consist of FP Isolator for isolating the smart lighting control equipment without discontinuing supply to the light pole during the outage of the smart control system.

8.15 The feeder pillar shall have cable entry at the bottom suitable for terminating double compression glands for 2 Runs of 3.5 C x 50sqmm Aluminium conductor, XLPE insulated armoured cable at the incoming terminal and minimum 4 Runs of 4 core 16 sqmm Aluminium conductor, XLPE insulated armoured cable at the outgoing terminal.

8.16 All MCBs/ RCBOs/RCCBs shall be comply with the relevant IS and IEC standards. It shall be current limiting type and shall provide a cut off in, < 10 ms for prospective currents during faults. It shall be provided with fixed thermal overload, short circuit and earth fault release as appropriate. The breaking capacity of the MCB shall be 10kA for 1 sec.

8.17 The Outgoing and Incoming breakers shall be discriminated based on Current.

8.18 The other power and control components as per requirement are listed below;

(a) The minimum rating of the incomer shall be minimum 32A, RCBO, 100mA sensitivity, Current limiting type, Characteristic Curve C, Breaking capacity 10 kA for 1 sec.

(b) All the contactors shall have high rupturing capacity rated for 3 phase, 440 V, 50 Hz, Four Pole, AC 1 duty.

(c) Astronomical timer having Single channel and capable of Auto resetting when power resumes, provision of manual over ride, switching ON / OFF the circuit as per the Sunset and Sunrise timings along the year.

(d) Min 25X3 mm insulated tinned Copper bus bar with SMC support insulators shall be provided for power distribution within the feeder pillar. The size of phase and neutral shall be equal.

(e) Outgoing FP RCBOs – 30mA sensitivity, Current limiting type, Characteristic Curve C, Breaking capacity 10 kA for 1 sec.

(f) Terminal connectors suitable for terminating the above-mentioned cables. Min 12 nos. 25 sq mm terminals for incoming cable shall be provided for tapping power. Twenty percent spare terminals shall be provided.

(g) Under voltage and Over voltage Monitoring Relay for connection and disconnection of the power during off band abnormal voltage within a time band.

(h) All connecting power & control wiring shall be carried out with stranded copper conductor PVC insulted LSHF wires. Minimum size of control wiring shall be 1.5 sq mm and power wiring shall be 4 sq mm.

(i) Space Heater with MCB and Thermostat and 7W LED Luminaries with lamp shall be provided inside with a door limit switch. The lamp and the heater shall be tapped from the outgoing of the meter with separate DP MCB circuits.

(j) An Aluminium / GI Earth bus shall be run at the bottom of the Feeder Pillar which shall be connected to the earth leads at the two extreme ends for connecting the GI earthing strip from the electrode.

(k) Cast Resin CT of appropriate rating (---/5A) shall be provided at the incomer of each phase for measurement of the current, if required. If current input can be drawn directly from incomer then separate CT is not required.

(l) Digital Tariff meter as per APDCL Standards with RS 485 and RJ 45 connectivity for measuring, Line and Phase Voltage/ Current; kW, KVAR, KVA; kWh kVAh, kVARh (L & C); Frequency, Phase wise Voltage and Current Harmonics upto min 7^{th} order; Maximum demand.

(m) CONTRACTOR shall provide provision for connection through SIM, Ethernet, RS 485 / OFC etc. to connect with server through whatever mode is available at site.

8.19 Two nos. Pipe Earthing electrode shall be provided for each Feeder pillar and connected with 25X6 mm GI earth strip. The pipe electrode shall be as per the latest version of IS 3043- 2018.

8.20 HDPE/ DWC pipe of suitable size (minimum 40 mm ID) for conveniently accommodating the above incoming and outgoing cables shall be laid upto the feeder pillar for carrying the buried cables upto the feeder pillar for termination. The GI strip for earthing shall be laid with proper dressing.

8.21 The feeder pillar shall be mounted on prefabricated Galvanised Steel Support structure duly fastened with a concrete foundation with M20 concrete suitable to sustain the local geological conditions, seismic conditions and max wind speed requirements.

8.22 All the material/equipment/accessories must confirm to the relevant IS with its latest amendments. All the material/equipment/accessories shall be supplied with manufacturer's test certificates.

8.23 Insulation resistance between live parts and earth terminal shall be 2 MΩ minimum. All power equipment shall be able to withstand high voltage (HV) test at 2.5 kV for 1 minute between live parts (current carrying parts) and earth terminal without breakdown of insulation.

8.24 In addition to the above, the feeder Pillars may enclose Smart Controller for Group controlling (ON/ OFF and ON/OFF/Dimming) & communicating with the CCMS over the mode and network provided. It shall also house Surge Protection Devise (SPD); Battery; communication module with required SMPS; etc. and their associated accessories.

8.25 Following documents needs to be submitted for approval before Manufacturing Clearance:

(a) General Arrangements drawing.

(b) Support and foundation drawings

(c) Wiring diagram.

(d) QAP (Quality assurance Plan).

(e) Datasheet for each component.

(f) Bill of material

8.26 Routine test shall be conducted as per relevant IS/IEC and shall be carried out at manufacturer place and same shall be witnessed by GSCL/GSCL's representative. Following shall be minimum check:

(a) Visual inspection Check

(b) Bill of material.

(c) Electrical Continuity check.

(d) Functional Check.

(e) HV insulation check.

(f) Functional/ Operational check

8.27 Type Test certificate like IP and IK certifications, and short circuit certifications shall be submitted for review from third party Accredited Laboratories.

9.0 TECHNICAL SPECIFICATIONS OF CENTRALISED CONTROL AND MONITORING SYSTEM (CCMS)

9.1 Scope of Works for Smart Street Lighting shall include design, supply, installation, testing at site, commissioning, Operation and maintenance of lighting controls through Centralized Control & Monitoring System – (CCMS) for LED streetlights under the scope of this RFP. Operation and Maintenance of CCMS shall be as per the terms and conditions of the RFP.

9.2 The CCMS system shall be provided for the total no. of lights as specified in the scope of works and shall be Scalable as required.

9.3 The CCMS System shall consist of the following components;

9.3.1 In the Field

(a) Controller

(b) Communication Module/ Gateway

(c) Communication Network

(d) Battery Back up

9.3.2 Server for storage of data -preferably dedicated server set-up (at Centralized Command Center/ Dedicated Server) or cloud based arrangement to ensure 100% guarantee of the data transmission, and real time data storage and archived data for the contract period.

9.3.3 Web Based Application Software

9.4 Concept of Smart Street Lighting to be implemented at Guwahati

9.4.1 CCMS shall consist of Street Light Controllers and its accessories; Gateways and Communication network to communicate with Server.

9.4.2 Wherever applicable for Group Control the Maximum quantity of luminaries controlled by each Controller shall be decided by CONTRACTOR however, it shall not be less than 40 lamps per Controller. This may be different for Individual Controlled Luminaires used for Group Control because of the available technology by the BIDDER.

9.4.3 All the LED Luminaires shall be Remotely/ Automatically/ Manually Switched ON-OFF in GROUP including Web Based Applications based on

(a) Sunrise/ sunset timing depending on geographical locations of the Switching Point / Feeder Pillar

(b) Based on preprogrammed/ Scheduled timings

9.4.4 **All the LED Luminaires which are rated above 75W and all Light fittings on roads having Carriage Way + Shoulder Width equal to or more than 11m and Road No. 36, 36A, 110, 4A, 1, 1A, 5, 24A, 40B, 14AA in Spine roads shall be Dimmable (configurable) where as the rest of the lights in Spine roads shall be non-Dimmable.**

9.4.5 Dimming should be possible from 25% to 100%. However, the settings shall be decided by the CLIENT/PURCHASER at the time of implementation. Moreover, it is expected that the light output shall be gradually decreased and increased to minimum or maximum output capacity respectively during sunrise and sunset by dimming. It should be possible to program the Dimming as desired for smooth transition.

9.4.6 The CCMS shall provide the following features;

(a) Offer Web-based solution for Remote management on Real Time basis of the Outdoor Lighting System through wired or wireless communication networks securely. CONTRACTOR shall select the communication technology as per their offering and performance requirements.

(b) Capturing and monitoring all the electrical parameters of the Feeder Pillars/ Luminaires. Calibration of the MFM shall be ensured.

(c) Monitoring of ON and OFF period; Provide On/Off control based on Sunrise and Sunset timings for burn hour optimization, Energy optimization and simplify maintenance.

(d) Shall facilitate easy and remote configuration/ programming of the system from a web based interface that can be changed as per requirement.

(e) Shall facilitate Fault Monitoring and Automatic Fault detection; Event Logging and Report generation.

(f) Alarm Generation and Alert Notifications through emails & SMSs to desired number of users.

(g) The system shall be modular and easily scalable. Presently the system shall be designed for 15000 luminaires and should be expandable up to twice the present capacities as and when required in steps.

(h) Sufficient Battery Backup shall be provided for transfer of the data to server from the field as well as for updating the status of the system at regular interval in case of/ during power failures/ communication failures.

(i) Emergency Override - Locally & Remotely.

(j) Facilitate Asset mapping through GPS coordinates of each FP/ poles on existing maps

(k) The controller shall have inbuilt memory storage to store data in case of Communication network failure and transfer it as soon as the link is resumed

(l) Shall have inbuilt protection logic to operate the hardware to automatically isolate the system during abnormal conditions/ faults and restart the system as soon as the system normalizes

(m) Server uptime should be minimum 99.99% with disaster backup and sufficient storage capacity and processing power to ensure stable operation of CCMS throughout the contract period.

(n) Minimum 60 Days data shall be stored in the CLOUD. Data Older than 60 days shall be backed up on storage devices.

(o) Should be easy to integrate with City Operation Centre (COC)/ Centralized Command Center (CCC) any other systems as desired in future.

(p) CCMS shall ensure Data authenticity, Cyber security, safe database management, data retrieval and trouble-free operation of software and allied systems. It shall have a self diagnostic and self healing feature to identify fault and resume the system by isolating it within shortest possible time.

9.5 **Features of Controller**

9.5.1 The controllers shall be programmable remotely as well as locally. All suitable device and instruments for such access shall be considered part of the scope. It should send data on Real time basis or at uniform intervals as programmed. All programming carried out shall be affected within five seconds or in less time. The controller shall be able to carry out two way communication - communicate information/ data as well as receive commands from the server.

9.5.2 Controllers if mounted inside the Luminaire shall be provided within the Luminaire in IP66 enclosure or through NEMA Socket.

9.5.3 The controller shall sustain operating temperature of (-5) to 50 deg C, operate at AC input (RMS Volts) 90-320V, 50 Hz supply conditions. Shall have the ability to communicate with remote central server/ CLOUD securely via suitable communication technology. All data shall be secured by encrypting them by **128 bit encryption**.

9.5.4 The peak power requirement of the controllers shall be less than 2.5W and average power requirement shall be less than 1.5 W.

9.5.5 The controller shall provide Class I accuracy measurement of RMS Voltage & Current, Power (kW, kVA, kVARH), energy consumption with 1% as per IS 13779/ IEC 62052/53 (KWH, kVAH, kVARH) and Power factor.

9.5.6 Controller shall provide the following minimum alerts but not limited to;

a) Load & mains failure
b) Lamp failure alert & restoration
c) High/low mains voltage alert & restoration
d) Low power factor alert & restoration

9.5.7 If the Controller fails due to any reason, the luminaire should remain 'ON' if the luminaire is healthy.

9.5.8 The controller shall not have any replaceable components for minimum 5 years from the date of installation.

9.5.9 Controller shall have the provision to store at least last 10 days data at one hour interval. All this data is accessible for reading, recording by downloading through HHT (Hand Held Unit) through optical port or USB/Bluetooth given on controller. For HHT, a smart phone-based solution for collecting /accessing data is also be provided.

9.5.10 The controller shall have a built-in calendar and a local Real Time Clock (RTC) having an accuracy of +/- 1 minute per year or better, synchronized with remote time server, to enable functionality even in case of communication network failure. A separate internal Lithium battery back-up shall be provided for continuous operation of controller RTC for at least two years under controller un-powered conditions.

9.5.11 Controller shall be able to carry out switching operations based on Astronomical calendar of the location.

9.5.12 Controller shall facilitate local operation in case of emergency or during maintenance with proper security verification.

9.5.13 Controller shall be able to detect switch weld condition and generate alarm. If due to fault if any contact melts, then the controller shall able to generate fault signal.

9.5.14 Controller shall be able to log minimum last 25 scheduled and unscheduled events including scheduled switching events, faults, abnormal power conditions and maintenance.

9.5.15 Controller shall additionally be able to log minimum last 25 power availability events.

9.5.16 The controller shall have protection logic to monitor the abnormal conditions like overload & over voltage conditions, against the benchmark/ threshold limits configured in it and carry out auto switching to disconnect the system if the abnormal condition prevails over predefined period. The controller shall reconnect after the normal system conditions are resumed. All such unscheduled switching activities shall be logged in the system.

9.5.17 Controller shall be provided with proper universal interface port (USB, Optical etc.) or device shall be provided to access all the stored data within the controller as well as to configure the controller locally either by a Hand Held Unit or by connecting to a laptop in a secured manner. Configuration allows user to set operating modes, ON/OFF timings, RTC configuration, Updating GPS locations, Astronomical Clock etc.

9.5.18 The CPU of the controller shall be well protected against overvoltage and surges upto10 kV as per EN 61000-4-5; Burst pulses up to 4 kV as per EN 61000-4-4.

9.5.19 All the controllers shall be traceable when mapped through GPS coordinate.

9.5.20 The controller shall support digital and analogue measurements such as any digital/ analogue signal from additional sensors like Photosensor and any other analogue devices.

9.5.21 Controller shall have battery back-up or equivalent suitable to sustain the stored data and transmit its own status of input failure for both power and communication failure.

9.5.22 Controller shall have following constructional specifications

(a) Controller case and terminal blocks shall be made of fire resistant material

(b) Sealing arrangement - As per IS 13779-1999(Reaffirmed 2002) and CEA Metering regulations 2006

(c) Latching Relay/Bi-Stable Switch/Isolation device should conform to IEC – 61036:1996 / 61037:1990

9.5.23 Any firmware/software upgradation which is required for the smooth operation of controller shall be done by CONTRACTOR. CONTRACTOR shall provide maintenance and upgrades of the software during the contract period & for the next 2 years beyond the contract period of five years without any additional cost.

9.5.24 Controller Certifications as per above standards for Metering Accuracy for Class 1, IP 66, Surge protection, 440 VAC withstand rating, EIRP & ETA from NABL Accredited Third Party Laboratory to be submitted along with the bid.

9.6 **Communication Network**

(i) The BIDDER shall adopt communication network which helps improve the efficiency and performance of the system offered by it and is cost effective. It should have GPRS interface to upload/ download all data & events on web/cloud network through suitable port & modem

(ii) Communication range shall be sufficient for flawless performance without assistance of any additional equipment

(iii) Bi-directional communication between server and end devices

(iv) Power level not to exceed +25dBm EIRP

(v) The end devices should be able to communicate to a gateway which will send data to the server

(vi) The gateway infrastructure site should be beyond the reach/access of general public and should be secured with lock and key (site to be fenced and should allow entry to authorized persons ONLY with proper authorization from the vendor) & must be equipped with a back up of min 2 hrs.

(vii) There should be point to point communication between Controller & Gateway

(viii) Alternatively, if the communication to the gateway fails the end devices should have fail safe mode to switch on the lights as default download rules to the end devices

9.7 **Battery Module**

9.7.1 The Controller (CPU), Communication module etc. shall be provided with battery backup or equivalent to function during failure of grid power.

9.7.2 The battery shall help CPU to store all the data and send a main power failure alarm to the remote server/ Cloud before it shuts down safely.

9.8 **Software Application Features**

9.8.1 The web application shall be offered through the GSCL web site or as may be decided by the GSCL at the time of execution.

9.8.2 The application shall enable receipt & storage of all the field data with a time stamp in Cloud or in-house local server.

9.8.3 The application shall facilitate to communicate, control and configure the each Switching point controllers remotely. The application shall be suitable to manage the data traffic from the field to the Cloud or Server.

9.8.4 Operation Time - It should be able to record LED luminaires glowing and non-glowing hours of a particular FP (Group).

9.8.5 The System should be suitable for third party integration if required.

9.8.6 Report Generation – shall enable Users to generate various reports related to the system performance parameters such as energy consumed report, lamp and system failure report, actual hours of operation, uptime (%), etc. as well as based on historical data on daily, monthly, quarterly or annually basis as the case may be from the data/readings received from the units. The reports shall be generated in Excel as well as Graphical format.

9.8.7 The application should facilitate Roles and Permissions requirements at different level of user hierarchy. It should manage system access for different levels with multiple privileges for different purpose, including Administrator access to configure, work flow access for operations, and public access for viewing and uploading status.

9.8.8 Web application shall ensure system security and safety for users at different levels with security password for various users.

9.8.9 It should be possible to configure Switching point remotely through web application. Remote configuration includes setting new ON/OFF timings, setting RTC time, viewing the Real time data of each switching point, Energy meter parameters, Resetting of the any unit, time synchronization of controller with that of Server and GPS clock etc.

9.8.10 The minimum interval for the update of data should be 5 minute but programmable up to 1 minute.

9.8.11 Asset Management –

(a) Application shall provide a map application that gives an overview of all Feeder Pillars/ Individual Luminaire on a street map or GIS map or a satellite image.

(b) Web application software shall offer asset management feature and allow user to locate SPC through GPS coordinates. It also enables user to identify each SPC with unique/Asset ID with additional information like Wattage, Make, Installation date, replacement date, Replacement defect tracking. It is also possible to link details of every street light with reference to particular switching point.

9.8.12 Dashboard – Web application shall provide a comprehensive dashboard with real time status of switching point, real time faults of various switching points, system uptime %, power consumption, graphical representation of cumulative data etc.

9.8.13 Data refresh rate should be within 5 mins; any abnormality should be updated to the application within 5 mins.

9.8.14 The application should have required protection like Firewall, Malware, Antivirus etc., as per industry security standards. The data sent by device to IoT platform and further to application should strictly follow 128-bit AES Encryption standards. The application should also follow OWASP Application Security Verification Standard. The supplier should provide documentary proof that the supplier follows Data Validation, Denial of Service. The supplier provided application should also follow OAuth2 Security based authentication process to provide customer user access to its application software.

9.8.15 The application software should be flexible to cater to customized requirement which are not foreseen at this point of time but are deemed necessary during the execution and O&M. Separate tabs shall lead to details regarding monitoring & control parameters like, Alerts, Maps, Configuration, Reports, uptime, fault penalty, history, energy savings, power failure, operational hour, lamp failure etc.

9.8.16 Each Switching Point Controller shall be represented by a separate Tab on the dashboard to show the switch point summary indicating the details, rating, location, meter parameters, history of alerts, active alerts, link to the map page, etc.

9.8.17 The application shall generate alarm and alerts through SMSs for any type of abnormal system conditions and faults as listed below to designated users which should not be less than six in numbers.

9.8.18 It should describe the abnormality or fault in short as well as highlight the same with different colours to indicate the status with respect to time – within 12 hrs, in next 12 hrs, beyond a day etc. It shall provide monthly reports on the faults through email. Penalty as indicated in the Service Benchmark for the CONTRACTOR shall be calculated based on these reports.

9.8.19 The application should display the no. of faulty lights for each phase separately instead of giving a total figure of faulty lights for all the 3 phases together.

9.8.20 Application shall protect and report Jamming/ hacking attempts and maintain status-quo in cases of such attempts i.e. if lights are ON, they should remain ON till the default OFF time recorded in the system. In case lights are OFF at the time of Jamming / hacking attempt, lights should remain OFF till default ON time recorded in the system

9.8.21 The application shall provide API based integration to GSCL Command and Control Center (CCC) in future. It would be the joint responsibility of the service provider (street light application provider and CCC provider) to jointly work to get this integration up and running. CCC shall provide remote viewing and control of street light control application for troubleshooting and support.

9.8.22 There should be an automated mechanism in the form of “Mobile App” (IOS or Android) to capture pole, controller, lamp information/field information along with the Lat Long (location) of the pole, that would help the commissioning team to activate the system immediately. The mobile app should help map Controller Device ID, Lamp No and Pole No. effortlessly.

9.8.23 Software to have complaint handling system for light failures, with citizen interface and means of communicating repair update to complaining citizen through SMS. The Complaint handling system software shall be implemented for handling and resolution of complaints during O&M period. The access for the complaint handling system shall be given to general public either through web portal of GSCL/GMC or through dedicated APP for lodging complaints.

9.8.24 Ability to remotely upgrade the CCMS device firmware from central server.

9.8.25 The system shall display the following minimum faults in alarms

(a) Phase-wise currents on crossing threshold values

(b) Phase-wise voltages on crossing threshold values - Under/over voltage detection

(c) Main breaker error

(d) Contactor fault

(e) Circuit breaker off

(f) Circuit phase errors (fuse, breaker, etc.)

(g) Main power failure

(h) Leakage to ground

(i) Manual switch activated

(j) Control cabinet door open

(k) Low Power Factor

(l) Communication failure with server

(m) Theft Alert

(n) Group failure of Lights

9.8.26 The software shall enable to divide the city lights in certain zones as per GSCL requirement and assign access to the concerned authorities for control and monitoring from their mobile or laptop.

9.8.27 All alarms shall be notified in near real-time via SMS and email to responsible maintenance team.

9.8.28 The system shall support auto switching of street light according to light sensor input if provided in future.

9.8.29 The system shall support auto switching of street light according to input. Graphical view of the electrical consumption readings shall be available online for monitoring of the hourly, daily and monthly electricity consumption

9.8.30 Bidder shall demonstrate Live Street Lighting System including LED Luminaires and CCMS of the earlier completed project with due permissions, if asked by GSCL during the stage of Bid Evaluation.

9.8.31 **All Software's shall be one time purchase in the name of GSCL. Provision for API for future integration with the command control centre shall be included in scope. CONTRACTOR shall provide maintenance and upgrades of the software for the next 2 years beyond the contract period of five years without any additional cost.**

9.8.32 **The Software Application shall be supported by the CONTRACTOR even after the contract period.**

9.8.33 **In case of CLOUD server, the CLOUD registration shall be done in the name of Client/ Owner. Only Administrative rights shall be provided to the CONTRACTOR during the contract period. The CLOUD services shall be intact upon renewal every year after the contract period. The CLOUD shall not be OEM specific and shall be independent of OEM so that after the completion of contract period there should be no dependence on OEM for cloud services. Ministry of Electronics and Information Technology (MEITY) empaneled companies for providing Cloud services shall only be considered.**

10.0 CABLE AND CABLE TERMINATION

10.1 All the LV Power cables shall be 1100V grade, multi-stranded, Al / Copper conductor, XLPE insulated, extruded inner & outer PVC sheath compound type ST2 and galvanised steel strip armoured cables.

10.2 All cables shall conform to IS 7098 – Part I, 1988 (Reaffirmed- 2015) and all armouring shall confirm to IS: 3975, 1999 (Reaffirmed- 2014).

10.3 For all LT power and control cables, double compression glands with aluminium lugs for Aluminium cables and tinned Copper lugs for Copper cables shall be used in indoor and outdoor application.

10.4 The termination shall be inclusive of miscellaneous items such as clamps, cleats, cable tags, cable markers etc.

10.5 In general cable installation works shall be carried out in accordance with IS 1255 – 1983 (Reaffirmed- 2016), latest version. At road crossings, the depth of the Pipe shall be minimum 1m else proper concrete encasing shall be provided.

10.6 For Underground cables, all cables shall be laid in minimum 63 mm ID HDPE/ DWC pipes either laid by excavation or by through horizontal directional drilling (HDD) or Micro-tunnelling (for road crossing). The top of the pipe shall be at least 750mm below the finished ground level. There should not be any joints between two pole distance. The roads shall be made good as before by following standard procedure for preparation of roads and with standard quality material.

10.7 All Railway crossings shall be carried out as per the prevailing standards of railway or as specified by the concerned Authority in writing.

10.8 Cable markers shall be provided in the vicinity or on the top of the corridor such that it should not obstruct the pedestrian/ parked or traffic vehicles. Cable markers shall project 150mm above ground and shall be spaced at an interval of 20metres, and at every change in direction. Top of cable marker/joint marker shall be sloped, to avoid accumulation of water/dust on marker. On finished surface like foot path etc. the marking shall be accomplished with a separate colour tiles/ paver block for highlighting the route of the cable.

10.9 Cable tags shall be provided on all cables both at feeder pillar end as well as on each pole JB (just before entering the equipment enclosure).

10.10 Cable Glands

(a) Double compression type cable glands with rubber hoods shall be used for the termination of all the power and control cables. Cable glands shall be brass casting, machine finished and Nickel-plated to avoid corrosion and oxidation. Rubber components used in cable gland shall be of neoprene.

(b) For single core cables, gland shall be with brass ring.

(c) Cable glands shall be with metric threads.

(d) Cable glands shall be conical (& not flange type).

10.11 Cable Lugs

(a) Cable lugs shall be of tinned Copper, solder less crimping type for Cu cables & Al lugs for the Al cables.

(b) The current rating of the lugs shall be same as that of the respective cable conductors.

(c) Ring type cable terminations shall be used.

(d) Insulated lugs are not acceptable for any cable terminations.

(e) Bi-metal strip/ Bi-metallic lug shall be used whenever two different metals are to be connected together.

(f) Double hole extended neck (long barrel neck) type lugs shall be used in case of cables above 185 sq. mm.

(g) Fork terminals shall be used for luminaries & decorative switch/ socket. Pin terminals may be acceptable during execution only in case other terminals/ lugs cannot be accommodated.

(h) Reducer / wire pin terminals shall be avoided for MCB terminations. MCB terminations shall be with 'long palm terminals.

(i) All terminations in Feeder Pillars / enclosure for earthing & neutral busbars / terminals shall be with ring type terminals.

(j) All earthing terminations shall be with ring type lugs only.

(k) All control & interlock cable terminations shall be with ring type lugs.

(l) Anticorrosion/ anti-oxidation compounds shall be used for crimping lugs [This shall especially be ensured for Al cable terminations & any bimetallic terminations (Cu cable termination using tinned Copper lugs)].

(m) If termination is done with crimping tool employing crimping die then forming dies shall be used to make the sector shaped conductor into a round conductor before crimping the lugs on the conductor. The lug must not be crimped directly on the sector conductor. Before crimping the lug, the conductor shall be thoroughly cleaned and special jelly applied over it to prevent further oxidation.

10.12 Cable Joints shall be either heat shrinkable type of reputed makes. Test certificates of the Joints shall be submitted at the time of inspection.

11.0 OPERATION & MAINTENANCE

11.1 O&M shall be initiated after completion of installation and commissioning of street lighting system on all the specified roads and issue of completion certificate by GSCL after due inspection and testing.

11.2 CONTRACTOR shall install a Help Desk minimum 30 days in advance before the initiation of the O&M period.

11.3 The CONTRACTOR shall be responsible for up-keeping/maintaining/ repair/ replacement, comprehensively, of all the Luminaires, Controllers, Poles, Switching point controller panels, cable and earthing systems along with the Cloud or In-house Server installed by it in the allocated area during the tenure of the contract.

11.4 During the Contract period, if any hardware or software needs to be replaced, the same will be replaced with same or better OEM and with same or higher configuration free of cost.

11.5 The manpower and accessories required for O&M of Spine Road shall be provided by CONTRACTOR during relevant contract period. CONTRACTOR shall maintain a service team/s with vehicle/ s to address the complaints/ accidents on SOS basis and act immediately. For Spine Road minimum Two Service team shall be provided consisting of a gang of one I.T.I./PWD/Second class wireman/electrician and one wireman helper along with two rigours. One certified electrical supervisor shall be maintained to supervise the gangs of Spine road. One manager shall be maintained to observe the activities and report to the concerned dept. Two drivers with two Tower vehicles shall be maintained. One pickup truck shall be maintained. Such an arrangement shall be provided at the beginning of the contract and only the staff shall be augmented if found insufficient during the course of the contract. CONTRACTOR shall maintain at least one wireman along with one helper to attain emergency work round the clock. The Vehicle shall be self sufficient with all the required tools and instruments, duly calibrated, to meet the maintenance requirements as per service benchmark.

11.6 CONTRACTOR shall keep adequate provision of standby team – either its own or on contract- for attending to cable faults. During rectification of cable fault if excavation of road / median / foot path, paver blocks etc. is required then the same shall be carried out by the CONTRACTOR after getting approval from GMC.

11.7 The payment terms for the O&M shall be as agreed in the Contract for the entire tenure.

11.8 **GCSL through APDCL shall ensure availability of power. Electricity charges and Connectivity charges shall be paid by GSCL to the APDCL.**

11.9 The Non -availability of incoming power supply from APDCL shall be intimated by CONTRACTOR within an hour. CONTRACTOR shall coordinate with APDCL on behalf of GSCL and GSCL shall facilitate as and when required to expedite the response from APDCL.

11.10 **Availability of communication network through the selected mode shall be ensured by the CONTRACTOR for data and SMSs. The CONTRACTOR shall bear the cost of connectivity of all such network charges and pay monthly/ annually as the case may to the telecom/ service provider. The downtime of the communication network shall be considered within the system Service Availability Benchmark.**

11.11 Any complaint for failure of luminaire due to lack of earthing, SPD, connector and loose connections shall be to CONTRACTOR's Account.

11.12 The CONTRACTOR shall upgrade the software application from time to time during the contract period in terms of features, performance & security of the system.

11.13 The CONTRACTOR shall take adequate insurance to cover themselves for the cost of O&M during the tenure of the contract including the ones due to theft.

11.14 All the electrical parameters and illuminance level of all the roads shall be monitored with calibrated Power Analyzer and Lux meter and documented for records and analysis at regular interval as decided by authorities during O & M.

11.15 All the necessary modifications that are required to be carried out for the efficient working of the system including network and Luminaires and minimise the breakdowns and issues shall be carried out by CONTRACTOR from time to time at its own cost.

11.16 CONTRACTOR shall develop training material for the GSCL technicians, impart them training from time to time as may be decided by the GSCL.

11.17 All the responsibilities related to replacement of LED lamps / cables / other accessories shall be borne by CONTRACTOR in respect of cost, managing the technical problems and other related aspect during the tenure of the project.

11.18 The maintenance work will be carried out without disturbing the street traffic and with proper work permit.

11.19 **Helpdesk Setup**

11.19.1 The CONTRACTOR shall set up a centralized helpdesk to address the O&M for the project for entire Contract period with the following;

(a) A web based **Complaint Management System** shall be installed which should enable users to log complains and monitor its status & closure. The CMS shall be updated regularly with new updates/ patches to improve the performance during the contract period.

(b) A **Toll Free Number** exclusively for the Street lighting for Spine Roads shall be finalized in consultation with the GSCL. Language Capabilities : Assamese, Hindi and English;

(c) The help desk shall **operate 24X7** to assist and guide the users.

(d) The help desk will handle user queries and issues relating to implemented solution

(e) The helpdesk shall ensure that users can log calls and complaints for any technical issues they face while accessing the system.

(f) The helpdesk shall have Interactive Voice Response (IVR) system for first level of call segregation;

(g) A Standard Operating Procedures (SOP) for O&M process shall be created by the CONTRACTOR from logging of request to closure of the request. The SOP shall address call prioritization guidelines, problem security codes and escalation procedures etc. in consultation with GSCL ;

(h) It shall be also possible to log requests by user through other channels like email and web interface;

(i) All the complaints and work carried out by the CONTRACTOR shall be logged in the system with a unique service request.

(j) The application shall be accessible to all users including general public through the GSCL portal for logging issues;

(k) CONTRACTOR shall allocate Serial No to the Pole- Lamp combination and maintain records of each one of them during the Contract period.

(l) A Report containing the operational Status of each light pole, complaints received and resolved; Preventive maintenance schedule and status, Stock of spares, man power update, etc shall be submitted to the GSCL on a weekly basis.

(m) The call statistics will be analyzed every quarter after Go-Live and the number of Customer Care Executives may be ramped up or down accordingly on a week's notice;

11.20 **COMPLAINT MANAGEMENT SYSTEM**

Complaint management system shall have the following steps

A. Client will call in the toll-free number for raising a complaint and he will be welcomed with a welcome note/Music

B. IVR shall automatically route him for language selection.

C. IVR shall then throw the call to respective agent in the customer care set up for Smart city for further detailing.

D. Agent shall pick up the call and take down the nature of complaint with the caller details. After that agent shall create an incident ticket in service desk software.

E. An acknowledgement SMS and email shall be sent with complaint no. to the respective caller along with a standard time for resolution. (SMS Gateway shall be integrated with the service software)

F. A complaint SMS with all the details and Email copy shall be sent to the respective department immediately with respective hierarchy.

G. The respective department shall review the issue and come back with an exact resolution procedure along with the timeline.

H. If problem not solved during the stipulated time then it will automatically escalate to the next higher concerned person.

I. Once complaint gets resolved the respective department shall notify Customer care through the software itself. (Accessibility of service desk software shall be with the respective department also).

J. Now customer care will finally close the ticket. An SMS notification shall go to the caller with the resolution update (Rating provision shall be there).

The CMS shall have the following features:

a) IPBX System with 20 SIP extension, IP Phone and Headset, All in One Desktop, Network Switch L2 (POE), Voice Logger, IVR system, PRI Link, Internet Lease Line min 2mbps, UPS with 6 hrs Battery back up, 42U rack,
b) IPBX - Phone Book; Gateway/Trunk Management; Easy to Configure Routing Rules; Call conference; Call pickup, Call disconnect; Working day & non-working day definition; Caller-ID; Call pickup, Call disconnect; DID Management; Music On holds; Call Hold & Call Pickup; Speed-dial; intercom Dialing.; Call Forwarding Rules; Real Time Dashboard
c) Service desk management software with access control – shall consist of Incident management; Problem management; Change Management; Email & SMS notifications; Feedback system and Report generation.
d) IVR system - Multi-level Support; Multi-language Support; Main Call Summary Report; Channel wise Call Count Report; IVR Detailed call log report; Hourly usage Report; Service usage Report; Agent Call Summary report; Agent detailed Call Log; Queue wise Report; Queue Online Status
e) Cloud/ web based server shall be considered.
f) Tracking and recording of events and work flow.
g) Mobile APP shall be developed for the system to raise complaint and Merge with the present APP of GMC.
h) Provision of integration of the CMS system with the existing CMS system or any other monitoring system shall be kept into the consideration.
i) Data archive for historical analysis up to 2 years.
j) System security.
k) Customizable.
l) Downtime shall not be more than 2% per annum.
m) All rental for PRI and Internet lines shall be borne by the CONTRACTOR.

11.21 **Service Level Benchmark**

11.21.1 A service Level Benchmark for evaluating the performance of the CONTRACTOR shall consist of the following;

(a) **Resources** - CONTRACTOR shall maintain O&M team, tools and calibrated measuring and verification instruments as specified above from the day one of the contract. In case the required resources are not deployed on time, a penalty of Rs.5000 per day shall be imposed for the first week and the same shall be doubled in the subsequent weeks till adequate resources are deployed.

(b) **System Uptime** - CONTRACTOR shall maintain sufficient resources and **achieve minimum uptime of 95% on yearly basis** (year period to be decided by GSCL) for the entire system, excluding the period of non-availability of power supply. In case the Service Level drops below 95% and within 90%, the CONTRACTOR shall be charged a penalty of 10% of the annual maintenance fee for that year. For performance below 90% - 20% of annual maintenance charges shall be levied as penalty. GSCL may consider termination of contract in the event of repeated below par performances.

(c) **Energy Consumption** – The energy consumed by the lamp shall not exceed more than as committed in the design report. CONTRACTOR shall **guarantee the total energy consumption** of the system for each road with respect to its

design offered in the design report. The same shall be monitored on daily basis and reported to the GSCL. **Any excess energy more than the guaranteed consumption plus 2% shall be recovered from the CONTRACTOR at the same rate as paid by GSCL to APDCL.** Any action required for mitigating the excess energy consumption may be immediately taken up by the CONTRACTOR with the information to the GSCL.

(d) **Lux Level –**CONTRACTOR shall **guarantee the Lux level based on Design output and offered Luminaire for each road**. There shall not be any reduction of the Lux level during the entire tenure of the contract period. Illuminance at various chainages of each road shall be checked annually as per the methods mentioned in National Lighting Code and reported to GSCL. Any reduction in the lux level shall be immediately investigated and corrective action shall be taken with information to GSCL for Spine roads.

(e) In case a reduction in the lux levels are found due to reduction in the output/ performance of the Luminaires, all the Luminaires of the same wattage and same batch offered in the project shall be investigated and rectified/ replaced if found faulty by the CONTRACTOR at its own cost within a period of time as may be agreed by GSCL.

(f) **Complaint Resolution** - All the complaints shall be redressed within next 48 hrs. In case the service provider fails to comply with the same a penalty of Rs. 500/- per day per complaint shall be imposed for a period of 7 days after which the amount will be doubled for the next subsequent days till the complaint is resolved to the satisfaction of the owner.

(g) At any given time the CONTRACTOR shall maintain spares equivalent to minimum 1% of the total number of lights installed. Failing to maintain spares and causing delay in resolution of the complaint shall be penalized as indicated above.

(h) Cleaning of the luminiare cover shall be taken up once half yearly and record shall be maintained and reported to GSCL.

(i) In case CONTRACTOR fail to make provision or fail to abide by the Safety Procedures as per Statute/ Best engineering practices, a penalty of Rs. 2000/- for every such incidence for first three incidences shall be charged. After which the amount will be doubled for the next subsequent three occurrences. Beyond which GSCL may consider suitable measures including termination of involved team members or even the contract.

(j) In Theft cases, if the CONTRACTOR fails to create new assets which are damaged by theft or any other reason, and Services are affected, then the penalties will be levied as per Penalty Clause for not meeting the desired level of Service Level.

12.0 QUALITY CONTROL PLANS

12.1 The Quality Control Plan shall list and define in sequential order all process control activities, inspection and tests proposed to be performed on the equipment/ material starting from component procurement and from testing stages to product dispatch. The Quality Control Plan shall indicate and identify the applicable standards, detailed description with diagram the procedure, acceptance criteria, extent of check and record to be generated.

12.2 The CONTRACTOR shall within Fifteen (15) days of placement of order submit the following information to the GSCL.

(a) Descriptive list of the raw material as well as bought out accessories and the names of sub suppliers selected from those furnished along with the Specification.

(b) Type test certificates of the raw material and bought out accessories.

(c) Quality Assurance Plan (QAP) with holds points for GSCL'S inspection. The QAP and hold points shall be discussed between the GSCL and the CONTRACTOR before the QAP is finalized.

13.0 INSPECTION

13.1 The inspection may be carried out by the GSCL or his representative at any stage of manufacturing. The successful CONTRACTOR shall grant free access to the GSCL/ its representative/s at a reasonable notice when the work is in progress. Inspection and acceptance of any equipment under this specification by the GSCL shall not relieve the CONTRACTOR of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

13.2 The CONTRACTOR shall keep the GSCL informed in advance regarding the time of starting and progress of manufacture of all the equipment in its various stages so that arrangements could be made for stage inspection, if desired by GSCL.

13.3 No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected and tested and approved by GSCL or an inspection waiver is given.

13.4 CONTRACTOR shall, during inspection/ at any stage as sought by GSCL, will furnish test certificates for all equipment including bought out items as included in this BID. However, the GSCL reserves the right to insist for witnessing the acceptance/routine testing of bought out items.

13.5 The CONTRACTOR shall communicate to the GSCL the details of all testing programme at least Three (3) weeks in advance. GSCL reserves the right to waive the inspection at any stage.

13.6 CONTRACTOR shall keep all his testing instruments duly calibrated against Standard Meters at designated Accredited Laboratory not earlier than 6 months from the date of test of the equipment, covered under this specification. Calibration certificates shall be made

available during inspection. The calibrating instruments used as standard shall be traceable to National/ International standards.

13.7 A joint inspection of GSCL Authority; Technical Officer, Project Manager and team of CONTRACTOR shall be carried out before commencing for operation.

13.8 Following Field Test shall be carried out on the system

(a) Visual Inspection of quality of work,

(b) Insulation resistance of the system including cable

(c) Power consumption of individual Luminaire, each feeder pillar System for a particular road.

(d) Lux level available with and without the other façade and vehicular lights. The lux level shall be tested in accordance with NLC.

(e) Operational demonstration with CCMS

(f) Earth resistance of each electrode and feeder pillar

14.0 CAPACITY BUILDING

14.1 The CONTRACTOR needs to provide training to GSCL employees and other stakeholders as directed by GSCL for capacity building;

14.2 The CONTRACTOR shall prepare all the requisite audio/visual training aids that are required for successful completion of the training for all stakeholders. These include the following for all the stakeholders:

(a) Training manuals for GSCL employees / stakeholder departments;

(b) Computer based training modules;

(c) Presentations;

(d) User manuals;

(e) Operational and maintenance manuals for Smart Components implemented;

(f) Regular updates to the training aids prepared under this project.

14.3 The CONTRACTOR shall maintain a copy of all the training material on the portal and the access will be provided to relevant stakeholders depending on their need and role. The access to training on the portal would be finalized with GSCL. CONTRACTOR has to ensure the following points:

14.3.1 For each training session, the CONTRACTOR has to provide the relevant training material copies to all the attendees.

14.3.2 The contents developed shall be the property of GSCL with all rights.

14.4 The CONTRACTOR has to ensure that the training sessions held are effective and that the attendees would be able to carry on with their work efficiently. For this purpose, it is necessary that the effectiveness of training sessions is measured. The CONTRACTOR will prepare a comprehensive feedback form that will capture necessary parameters on measuring effectiveness of the training sessions. This form will be discussed and finalized with GSCL.

14.5 After each training session, feedback will be sought from each of the attendees on either printed feedback forms or through a link available on the web portal. One member of the stakeholder group would be involved in the feedback process and he/she has to vet the feedback process. The feedback received would be reported to GSCL for each training session.

15.0 HAND-OVER OF THE SYSTEM DURING EXIT PERIOD

15.1 The CONTRACTOR shall hand over to the GSCL the following before the expiry of the contract or in the case of termination of Contract by GSCL with Justifiable reason as specified elsewhere in the RFP:

(a) A complete list of Hard and Soft Assets with its records over the past period.

(b) All the assets in good working condition as per tech specification or its upgraded version. In case any asset is not in working condition, CONTRACTOR shall ensure that the same is made good as per required standard and performance and handed over within the Exit period.

(c) All software along with the confidential information related to it like user name and passwords and hardware keys if any. It shall also hand over all the rate contract if any signed with the software company for continuity of services.

(d) Information relating to the current services rendered and technology and technical data relating to the performance of the services; Entire documentation relating to various components of the Project, any other data and confidential information related to the Project;

(e) All other information (including but not limited to documents, records and agreements) relating to the products & services related to the project to enable GSCL and its nominated agencies, or its replacing CONTRACTOR to carry out due diligence in order to transition the provision of the Project Services to GSCL or its nominated agencies, or its replacing CONTRACTOR (as the case may be).

15.1.2 The duration of 60 working days after completion of the contract period shall be considered as Handover/ Exit period during which CONTRACTOR shall give full access to its premises, records, data base and assets related to this project.

15.1.3 All the information as indicated above which is handed over to GSCL should not be copied, sold or reused by CONTRACTOR under any circumstances without any written approval from GSCL.

15.1.4 In case this handover happens within DL period, the CONTRACTOR shall ensure that the technology provider shall continue to support the assets and systems till the end of the DL Period.

15.1.5 The CONTRACTOR shall not retain any data, security codes, and other confidential documents including any type of customer survey data with them.

15.1.6 During the Exit period CONTRACTOR shall not reduce any manpower or replace any Manpower wilfully as available on the day of issue of Notice. In case the CONTRACTOR reduce the manpower then **GSCL shall charge Rs. 1000/- Per person per day as penalty** for the remaining duration of the Exit period.

16.0 PRECOMMISSIONING TESTS TO BE CONDUCTED AFTER INSTALLATION

16.1 ON-SITE TESTING:

CONTRACTOR shall have to prove the Power Consumption & the functionality mentioned in the below table as decided by GSCL and in the presence of GSCL nominated reviewers. All charges for on-site testing shall be included in the scope.

Sl. No.	Functionality	Acceptance Criteria
1	On Demand- Switching ON, OFF & DIM lamp manually	The offered Smart Light should switch on & off when user clicks on button provided in Web/Cloud application. The bidder will also have to showcase dimming feature availability in the application software. The lights should respond in < 5 sec.
2	Switching ON, OFF & DIM lamp based on predefined schedule	The offered Smart Light should switch ON & OFF based on trigger/input from predefined schedule.
3	Switching on lamp based on photodiode mode, if provided	The offered Smart Light should switch ON & OFF based on trigger/input from connected photodiode based on ambient lighting conditions.
4	Switching on of lamp based Astronomical data	The offered Smart Light should switch ON & OFF based on astronomical data-based calendar/schedule stored in the application.

5	Fault monitoring	The application should showcase faults by fault type (Mains failure and Luminaire failure) and show this alert on the application screen. The alert should be triggered in the application software in less than 5 mins.
6	Application software - login, Dashboard & reports	User login to read & see the data to be provided to GSCL and they should be able to see data & monitor performance from street lights on various IOT based devices including Mobile App. Demonstrate the logical grouping of working of street lights for their performance (ON/OFF by group)
7	Report Generation Check	Phase wise currents, Phase wise voltages, Circuit breaker off, Communication failure with server, Group failure of lights, Dashboard with real time status check, API based integration check
8	Power Metering for the lamp	The CONTRACTOR shall demonstrate the Guaranteed power consumption as declared in the BID for the entire system. The CONTRACTOR shall demonstrate the power consumption (W) before and after dimming the light starting from full intensity. The CONTRACTOR shall demonstrate Voltage (LN), Current (I), Energy (kWh), Power Factor (PF) and other parameters as asked for in the specifications.
9	Fail-Safe Mode	In case the controller fails, lights should be On if the light is healthy. CONTRACTOR shall demonstrate the storage & transfer of data in case of power failure and Communication Failure from field to Server.
10	Lighting Design	The CONTRACTOR shall demonstrate lighting design parameters and above functionalities post installations of the system. The on-site lighting measurement shall be carried out in accordance to CIE 140:2000 standards and the above parameters in the presence of GSCL nominated reviewers. Lux Level shall be measured considering the maintenance factor. All charges for such on site testing shall have to be borne by the CONTRACTOR.
11	Helpdesk operation	CONTRACTOR shall demonstrate the entire features of the Helpdesk by simulating various cases.

17.0 DOCUMENTS REQUIRED TO SUBMITTED BY CONTRACTOR DURING TECHNICAL BID

(a) Offered Solution for Smart Lighting with details of the technology

(b) Typical Design report highlighting the solution & calculations for each category of road as specified in the RFP above

(c) Summary statement of Road, Road width, Height of pole, Mounting arrangement, Wattage of LED Luminaire offered, Calculated Lux level

(d) MoU with one or more Luminaire and Lighting Management System OEMs, whose products are being offered by the BIDDER for the project. and technical details regarding the product offered including the following;

- (i) Details of the LED chip offered, technical data sheet, Type test report,
- (ii) Details of LED Luminaire, technical Data sheet of the offered ratings, Type test reports
- (iii) Driver test report for all dimming stages
- (iv) Guarantee/ warrantee offered

(e) LED Data sheet and Third party NABL accredited Lab Type test reports of the Luminaire as follows;

- (i) IES-LM-79 Reports
- (ii) IES-LM-80 Report for LED Chip
- (iii) BIS/CRS Registration Certificate for IS 15885 (Part 2 Sec 13) and IS 10322 (Part 5 Sec 3) for Driver/ Control gear and Luminaire
- (iv) Resistance to humidity, Dust and Moisture
- (v) Insulation resistance test/ electrical strength
- (vi) HV test
- (vii) Over voltage protection
- (viii) Surge protection
- (ix) Reverse polarity
- (x) Temperature rise Test
- (xi) Colour Rendering Index measurement test
- (xii) Heat resistant test
- (xiii) Fire retardant Test (Including Wiring)
- (xiv) Test for IP 66 protection
- (xv) Test report confirming to Impact resistance

(xvi) Endurance Test

(xvii) Life Test

(xviii) Photometric Measurements Test Report (IES LM 79)

(xix) LED Lumen Maintenance Test Report (IES LM 80) (As provided by LED manufacturer)

(xx) Vibration test as per ANSI

(xxi) Drop Test

(f) Guaranteed Energy consumption for each Luminaire and its system including the losses. Tabulated list of Guaranteed Energy consumption per Road as well as Total Energy Consumption for the offered system.

(g) Data sheet of all the Luminaires, drivers & Controllers offered along with their respective type test reports as specified above. **IES files of the Luminaires offered must be submitted along with the Bid.**

(h) Driver/ Control gear Data sheet and Third party NABL accredited Lab type test reports of the driver as follows;

(i) Over voltage protection

(ii) Open circuit protection

(iii) Short circuit protection

(iv) Surge protection

(v) Over temperature protection

(i) Technical Write up on Lighting Management system/ software and its technical details including features, architecture, performance, security, programming, administration, user hierarchy, MIS and report generation, License etc.

(j) Technical Write up on Method of communications, proposed system for data transfer/ storage/ uploading/ downloading/ archiving/ access from the local in-house server or cloud based server, Range & maximum capacity of gateways, response time etc.

(k) Write up on proposed Data storage system in cloud or otherwise including its capacity, ownership, integration with other command centers, its components, it's technical configurations

(l) Write up on Approach Methodology for carrying out the Project implementation, Project Management & Schedule and Operation & Maintenance of the entire project i.e, Spine Road during the contract period including

(i) Preliminary reconnaissance Survey carried out before bidding,

(ii) Survey methodology for the Spine Road after award of Contract

(iii) Execution methodology proposed for various roads

(iv) Project schedule & deployment of resources to comply with the same

(v) Operation and Maintenance Methodology of the project during the contract period including deployment of resources; compliance to the Service Benchmarks; Deployment of Service teams and deployment of special tools to expedite implementation and reduce downtime during breakdown; Predictive/ preventive maintenance

(vi) Call Center set up & its operations

(vii) O&M Schedule

(viii) Training and documentation, handing over procedure

(m) Earthing and Surge suppression solutions offered

(n) Details of the Complaint Management System Offered

(o) Sustainability of the System offered

(p) Makes of component and systems offered

(q) Exit management plan

18.0 DOCUMENTS REQUIRED TO BE SUBMITTED BY SUCCESSFUL CONTRACTOR

18.1.1 Detailed Field Survey Report along with findings with maps.

18.1.2 Detailed Survey report with proposed solution as found in the Site Survey including the following;

(a) Road details – Total RoW width, Width of carriage way/ foot path/ drains, road length etc.

(b) Design calculations for each road

(c) Summary of Road, road width as above, Design lux, Pole height, calculated lux level, uniformity ratio, threshold (TI), no. of FP, Luminaire wattage,

(d) Guaranteed Energy consumption for each FP/ road including the losses.

(e) Identified source of power, single line diagram and space provisions for Switching points for each road

(f) Location drawings for poles, Switching points and cable laying corridor

(g) Offered systems, components, their technical data sheets and type test reports;

(h) System Architecture drawing

(i) Details regarding Cloud Server and Lighting management Software-compatibility for integration with Command Control Centre

(j) Communication Protocol- FP to server, FP to fixture etc.

(k) O&M SOP – Procedure, description of works to be carried out, Regular Inspection Plan, regular Quality Control Plan, regular maintenance plan for Predictive & Preventive maintenance.

(l) Office / Storage space General arrangement layout

(m) Resource Deployment plan for manpower and tools

(n) Details of Call centre & Complaint management system – system and component technical details

(o) Organisation structure and team CVs

(p) Detailed execution micro schedule to meet the target dates with milestones & deadlines – Order of roads for installation

(q) BOQ & Makes offered

18.1.3 Mock up with installation and commissioning of minimum 3 nos. of Street light pole and LED luminaire to confirm the offered lighting design is as per requirement for each type of road. Clearance for the completion of street lighting system for entire length of each type of the road will be given upon the successful achievement of desired Lux level.

18.1.4 Execution drawing with coordinates of each pole and Switching point for each road

18.1.5 Civil foundation drawings with Calculations for each height of pole

18.1.6 Equipment Manuals: Original Manuals from OEMs

18.1.7 Installation Manual: For all the application systems

18.1.8 User Manuals: For all the application software modules, required for operationalization of the system.

18.1.9 System Manual: For all the application software modules, covering detail information required for its administration.

18.1.10 Control schematic diagram and interconnection diagrams for switching points

18.1.11 Test reports of bought out components

18.1.12 Inspection reports of the components, luminaires and system

18.1.13 All drawings shall carry GSCL's name, purchase order no. with date, project title, consulting engineer's name and adequate space for drawing approval.

18.1.14 Training Material: Training Material will include the presentations used for trainings and also the required relevant documents for the topics being covered. Training registers should be submitted for same.

18.1.15 Standard Operational Procedure (SOP) Manuals: The draft process (SOP) document for O&M and all other services shall be formally signed off by GSCL before completion of Final Acceptance Test. This SOP manual will be finalized by the CONTRACTOR within 2 months of operationalization, in consultation with the GSCL and formally signed off by the GSCL.

18.1.16 The CONTRACTOR shall ensure upkeep & update all documentation and manuals during the Contract period. The ownership of all documents, supplied by the CONTRACTOR, will be with GSCL. Documents shall be submitted in two copies each in printed (duly hard bound) & in softcopy formats

18.1.17 Data sheet to be filled by CONTRACTORS as per Annexure 7 and Annexure 8.

19.0 APPROVED MAKES

TABLE NO: 4– Approved Make

Sr.No	Description	Approved Make
1.	GI Octagonal Lighting Pole	Bajaj/ Philips/ Keslec/ Valmont/ Jindal Power/ Aster/ Transrail Ltd/Utkarsh/ Nezone or APWD approved make, but final decision on selection of make will be at the discretion of GSCL.
2.	LED Chip	Cree, Osram, Nichia, Philips Lumileds
3.	Lighting Fixtures	Philips (Signify)/ Wipro/ Bajaj/ Havells/Lighting Technology/ Crompton/ Keslec or Equivalent brand of repute which have been used in other Smart City / City Lighting Projects or any other makes of repute and meeting all specifications as stipulated in the Bid Document will also be considered, but final decision on selection of make will be at the discretion of GSCL.
4.	Cable	UNIVERSAL/ RPG/ CCI/ KEI/ FINOLEX/ POLYCAB
5.	Cable Termination Kit/ Cable Joining Kit	Raychem / 3M
6.	Gland/Lugs	As per APWD Approved list or Dowells, Commet, Connectwell
7.	Earthing Material	As per APWD Approved list
8.	MCCB , MCB, RCCB, RCBO and other Switchgears	Schneider, Siemens, ABB. L&T, MDS, Hager, Havells, Legrand
9.	Time Switch	L&T GIC, Siemens, Schneider, Legrand, Hager, ABB, Havells
10.	Energy meter, MFM	Schneider, Siemens, ABB, L&T
11.	Contactor and other switchgears	L&T, Siemens, Schneider, ABB

12.	HDPE/ DWC Pipe	Rex, Gemini, Duraline, Alcorr, Nobel Polytec or APWD/ CPWD Approved
13.	GI Pipe	Tata, Asian, CTC, Jindal, Zenith, Apollo, GST, Nezone

20.0 ANNEXURE 1

TABLE NO. 5 - LUMINAIRE DATA SHEET

Sr. No.	Parameters	Requirements / Value
1.	Type	LED Luminaries complete with all accessories including driver, internal wiring and protections
2.	LED chip make	Nichia, Philip Lumiled, Osram, CREE
3.	Rated Voltage	230-240V
4.	Operating Voltage Range	Single phase 140-280 volt AC. But luminaries shall be tested for 100V to 300 V AC
5.	Frequency	50 Hz +/- 3%
6.	Power Factor	> 0.95
7.	LED wattage	>1Watt & <3 Watt
8.	LED chip Efficacy	>135 Lm/Watt system lumen output at 25 degree C, supported by LM80report, to be submitted.
9.	LED Drive current	>=350 mA<750 mA
10.	LED Beam Angle	CONTRACTOR to decide
11.	Colour Temperature	≥5500K and within ± of tolerance limit as per relevant standards
12.	Rated Minimum LED Life (L70)	50000 Burning Hours **(With only 30% Lumen Degradation or 70% Lumen maintenance**)

13.	System efficacy	≥ 110 Lm/Watt
14.	Total Lumen Output	CONTRACTOR to offer
15.	Colour Rendering Index of Luminaires	>70
16.	System Power Efficiency	≥ 90%
17.	Driver Type	Constant Current based Electronic Driver
18.	Driver Efficiency	>90%
19.	Driver Life	**Same as LED Luminaire Life.**
20.	Maximum temperature rise for Driver	<30 Deg C at 45 Deg C ambient
21.	Operating Temperature Range	-20 Deg C to + 50 Deg C
22.	Luminaries body temperature after 12 hours of continuous operation	≤ 30 Deg C from ambient
23.	Junction temperature	< 85 Deg C - self certified by Manufacturer
24.	Heat Sink Temperature	≤ 75 Deg C from ambient
25.	Solder point temperature	< 78 Deg C
26.	Operating Humidity	10% to 95% RH

27.	Operating Hours	Dusk to Dawn (max 12 Hrs.)
28.	Total Harmonics Distortion (THD)	<10%
29.	Construction	High power LED must be mounted on Copper MCPCB for high thermal conductivity and fastest heat transfer from the LED junction
30.	IP Protection	IP66 or more; no water stagnation anywhere
31.	Luminary Housing	Pressure Die Cast Aluminum (grade 5000 or similar) housing with corrosion resistant polyster powder coating & safety as per IEC 60598:2014 and 2017 / IS 10322, 1982 (Reaffirmed 2005). Mounting bracket with aiming & locking facilities. Large surface area with fins to dissipate the heat to ambient air
32.	Heat Sink	Well-designed thermal management system with defined heat sink
33.	Clip / Fasteners	Corrosion free/ Stainless steel.
34.	Wire	The connecting wires used inside the luminaries, shall be Low Smoke Halogen Free, fire retardant e-beam cable or as per IS 10322 part 5 sec 3 which ever is stringent shall be provided in input side.
35.	Materials	As per relevant standard and specifications whichever is stringent
36.	Optics	As specified in the Specifications.
37.	IK protection for Optic Cover	>IK07

38.	Photometric measurements	LM-79/IS16105, 2012.
39.	Minimum in-built Surge Protection; Min Surge protection required for luminaires	4 kV; 10kV/10 kA
40.	Min Surge protection at Feeder Pillar	20kV/10kA

21.0 ANNEXURE 2

TABLE NO. 6 – DRIVER/ CONTROL GEAR DATA SHEET

Sr. No.	Parameters	Requirements / Value
1.	Type	Constant Current based Electronic Driver (Dimmable and Non-dimmable, inbuilt in Luminaire housing)
2.	Driver Efficiency	>90%
3.	Driver Life	**Minimum 50000 Hours or Same as LED Luminaire Life.**
4.	Operating Voltage Range	100V to 300 V AC
5.	Frequency	50 Hz +/- 3%
6.	Power Factor	> 0.95
7.	Total Harmonic Distortion (THD)	<10%
8.	Protection Class	Class I
9.	Operating Temperature Range	-20 Deg C to + 50 Deg C
10.	Minimum in-built Surge Protection	4 kV
11.	IP Protection	IP65 or more
12.	Output Current Range	<750 mA

13.	Output Voltage Range	150 V DC – 215 V DC
14.	Output Power	< 150 W
15.	Short Circuit Protection	Yes; Constant current limit mode.
16.	Open Circuit Protection	Yes
17.	Over Voltage Protection	Yes; Auto Isolation
18.	Over Temperature Protection	Yes; Auto Shut Off.
19.	Under Voltage Protection	Yes
20.	String Open Protection	Yes
21.	EMI Compliant	Yes

22.0 ANNEXURE 3

TABLE NO. 7- MINIMUM REQUIREMENTS OF THE GI POLES

HEIGHT	TOP DIA (A/F)	BOTTOM DIA (A/F)	SHEET THICKNESS	BASE PLATE DIMENSIONS (LxBxT)	FOUNDATION BOLT			
					BOLT SIZE (NO. x DIA)	PITCH CIRCLE DIA (PCD)	BOLT LENGTH (MM)	PROJECTED BOLT LENGTH
(mtr)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
5	70	130	3	200 x 200 x 12	4 x 16 Dia	200	600	80
6	70	130	3	220 x 220 x 12	4 x 20 Dia	205	600	100
7	70	130	3	220 x 220 x 12	4 x 20 Dia	205	750	100
8	70	135	3	225 x 225 x 16	4 x 20 Dia	210	750	100
9	70	155	3	260 x 260 x 16	4 x 24 Dia	250	750	125
10	70	175	4	275 x 275 x 16	4 x 24 Dia	270	750	125
11	90	210	4	300 x 300 x 20	4 x 24 Dia	300	750	125
12	90	240	4	320 x 320 x 20	4 x 24 Dia	325	850	125
14	90	240	4	As per manufacturer Recommendations				

23.0 ANNEXURE 4

TABLE 8: LIST OF STANDARDS FOR LED LUMINAIRES

S. No.	Brief Title	IS/IEC Code
1.	Testing procedure of photometric testing for LED Luminaires	LM 79
2.	Testing procedure on the lifespan of LED Luminaires	LM 80
3.	National Lighting Code	NLC 2010
4.	Method of Measurement of Lumen Maintenance of Solid State Light (LED) Sources	IS:16105 – based on IES-LM-80-2008
5.	Method of Electrical and Photometric Measurements of Solid-State Lighting (LED) Products	IS:16106 – based on IES-LM-79-2008
6.	Limits of Harmonic Current Emissions	IS 14700-3-2
7.	DC or AC supplied electronic control gear for LED modules - Performance requirements	IEC 62384
8.	Lamp control gear: Particular requirements for DC or AC supplied electronic control gear for LED modules	IEC 61347-2-13
9.	Environmental Testing: Tests – Test Db: Damp heat, Cyclic (12h+12h cycle)	IEC 60068-2-38
10.	Electro Magnetic compatibility (EMC)- Limits for Harmonic current emission-– (equipment input current ≤ 16 A per phase)	IEC 61000-3-2
11.	Equipment for general lighting purposes - EMC Immunity requirements	IEC 61547
12.	LED Modules for General Lighting-Safety Specifications	IEC 62031
13.	Degrees of Protection provided by enclosures (IP Code)	IEC 60529

14.	Particular Requirements - Fixed general purpose Luminaires/ Specification for Luminaires	IEC 60598-2-1/ IS10322
15.	General Lighting - LEDs and LED modules – Terms and Definitions/ General lighting – Light emitting diode (LED) products and related equipment –Terms and definitions	IS:16101 / IEC TS 62504
16.	LED Modules for General Lighting - Safety Requirements	IS:16103(Part1)
17.	LED Modules for General Lighting - Performance Requirements	IS:16103(Part2)
18.	Safety of Lamp Control Gear - Particular Requirements of D.C. or A.C. Supplied Electronic Control gear for Led Modules	IS:15885(Part2/ Sec13)
19.	Luminaire Performance – Particular Requirements – LED Luminaire	IS 16107-2-1

24.0 ANNEXURE 5

TABLE NO. 9–LIST OF IDENTIFIED ROADS UNDER SPINE ROAD

Sr.No	Rd. No.	Name of The Road	Ward No	Left drain (m)	Left Shoulder (m)	CW (m)	Right Shoulder (m)	Right drain (m)	Avg. Road Width (m)	CW + Shoulders (m)	Road Length (m)
1	114	Assam Engineering College Road	1		1	5	1		7	7.0	4973.0
2	7	Pandu Port Road(Hanuman Mandir to Rly colony Post Off)	2	1	1	6	1	1	10	8.0	1381.0
3	7A	Pandu Port Road(Rly Colony Post Office to AdabariTiniali Shiv Mandir)	3	1		6		1	8	6.0	1147.0
4	7AA	Pondu Bara bazar Road	4	1		11		1	13	11.0	1210.0
5	2A	Lokhra Road	6	1.8	2.5	13	1	1.8	20	17.0	1413.0
6	2D	LalGanesh Road	6	1.8	4	12	5.8	2	26	22.0	1293.0
7	41	Boragaon Road(NH27-Krishna Mandir- Shiv Mandir-Jai Mata Vaishnav Devi temple-Gosala Nepali Mandir-Gol Park Goshala)	6	1	1	5		1	8	6.0	3529.0
8	71	Kula Basumatary Path	6	2	1	7	2	1.5	14	10.0	717.0
9	71A	Itabhata Road/	16	1.2	1.3	7	1.5	1.5	13	10.0	470.0
10	33	PNGB Road(NH 27 to Don Bosco School)	6		1	5	1		7	7.0	2090.0
11	108	Boragaon Industrial Road	6	1	1	8	1	1	12	10.0	920.0
12	111	GarchukPamohi Road	6		1	7	1		9	9.0	13071.0

Sr.No	Rd. No.	Name of The Road	Ward No	Left drain (m)	Left Shoulder (m)	CW (m)	Right Shoulder (m)	Right drain (m)	Avg. Road Width (m)	CW + Shoulders (m)	Road Length (m)
13	3	A K Dev Road/Dhirenpara main road/Katabari main road	7	1.5	2	7	2.5	2.5	16	12.0	6013.0
14	117	Shantipur Main Road	7	2		9		2	12	9.0	1342.0
15	36	NS Road (From Borosola to Kumharpara at the bend to PH)	8	1.5	1	9		1.5	13	10.0	1276.0
16	36A	NS Road - from Kumharpara to AT Rd			1	8	1		10	10.0	585.0
17	48	Faiyaz Ahmad Road	8	1.5		10		1.8	13	10.0	790.0
18	48A	Faiyaz Ahmad Road	8	1.2	0.5	7	0.5	1.2	10	8.0	340.0
19	49	KRC Road	8	1.5		10		1.5	13	10.0	536.0
20	50	BR Phukan Road	8	1.5	0.5	7	0.5	1.5	11	8.0	632.0
21	115	S Chowdhury Road	8	1.5		6.5		1.5	10	7.0	398.0
22	117D	KRB Road	8	1	0.5	10	1	1.2	14	12.0	400.0
23	51	Chatribari Road/KC Road	9	2	1	7.5	0.5	1.5	13	9.0	559.0
24	51A	Chatribari Road/KC Road	9	1.5		7		1.5	10	7.0	603.0
25	117E	MS Road	9	1		8		1	10	8.0	429.0
26	117F	SRCB Road	9	2		9		2	12	9.0	683.0
27	117G	KEDAR Road	9	2		9		2	12	9.0	734.0
28	93	Motilal Nehru Road	10	2		9		2	12	9.0	910.0
29	96	Lamb Road	10	1		9		1	11	9.0	702.0
30	109	Mahapurush Srimanta Sankardeva Path (from AT Road Bridge to Paltan bazar Police Stn)	10	1.9	4.9	10.7		2	20	16.0	1308.0
31	109A	Thane Road- Paltan bazar Police Stn to B Baruah RD	10	1.5	2	7		1	12	9.0	371.0

Sr.No	Rd. No.	Name of The Road	Ward No	Left drain (m)	Left Shoulder (m)	CW (m)	Right Shoulder (m)	Right drain (m)	Avg. Road Width (m)	CW + Shoulders (m)	Road Length (m)
32	110	Paltan Bazar Rd from GS road to AT Rd	10	1.5	0.5	9	0.5	1.7	13	10.0	799.0
33	76	Dr Bhupen Hazarika Path/Guwahati Refinery Road	11		1	7	1		9	9.0	1460.0
34	94	FC Road	11	1.2	2	7	2	1.2	13	11.0	400.0
35	95	MC Road	11	1.2		10		1.2	12	10.0	1106.0
36	78	Nabagraha Hill Road	12	0.75		6		0.75	8	6.0	1350.0
37	78A	Nabagiri Path	12	0.75		5		0.75	7	5.0	230.0
38	44	Pub Sarania Path/S Sarania Road/Ashram Road	13	1		6		1	8	6.0	2369.0
39	4	B.K.Kakati Road	14	1.5	4.6	10	4	1.7	22	19.0	288.0
40	4A	B.K.Kakati Road	14	2		10		2	14	10.0	522.0
41	4AA	B.K.Kakati Road	14	1.5	1	9	1	1.5	14	11.0	728.0
42	4B	Sati Joymati Road	14	1.5	0.8	11	0.8	1	15	13.0	1242.0
43	117H	AT Rd (From Athgaon Bridge end to KRB Rd)	8	2	1.5	12	1.5	1.5	19	15.0	556.0
44	64	Lachit Nagar Main Road	13	1.0		6.0		1.0	8	6.0	1100.0
45	86	Bishnupur Main Road	15	1.0	1.0	7.0	0.8	0.8	11	9.0	978.0
46	113	Fayal Ahmad Road/Ambari Road	15	1.5	2	9	1.5	1.5	16	13.0	818.0
47	2AA	Lokhra Road	16	1.8	2.5	13.0	1.0	1.8	20	17.0	2163.0
48	2B	AK Azad Road	15	1.5	1.0	9.0	1.5	2.0	15	12.0	1285.0
49	2C	Netaji Subash Chandra Bose Road	16	1.8	2.5	13.0	1.0	1.8	20	17.0	1375.0
50	1	Ganeshguri-Kahilipara OdalBakra Road	17	1.9		10		1.8	14	10.0	3326.0
51	15	Rajib Nagar Path	17		1.0	7.0	1.0		9	9.0	2963.0

Sr.No	Rd. No.	Name of The Road	Ward No	Left drain (m)	Left Shoulder (m)	CW (m)	Right Shoulder (m)	Right drain (m)	Avg. Road Width (m)	CW + Shoulders (m)	Road Length (m)
52	5	Freedom Fighter Road/ASEB Road	18	1.0	1.0	8.0	1.0	1.0	12	10.0	1207.0
53	12	GMC Hospital Road from GMCH Circle to AK Azad Road	18	1.5	1	7	1	1.5	12	9.0	1641.0
54	24A	Rajgarh Road	18	1.2		9		1.2	11	9.0	1268.0
55	116	Ram Krishna Mission Road	18	1.0		10.0		1.0	12	10.0	520.0
56	116A	Ram Krishna Mission Road	18	1.5		7.2		1.5	10	8.0	570.0
57	117A	Harabala Path	18	1.2		6		1.2	8	6.0	504.0
58	117	Harabala Path	18	1		9		1	11	9.0	489.0
59	117B	Kali Mandir Road	18			7		1	8	7.0	766.0
60	117C	Harbala Rd to Bhangagarh road	18	0.5		6		1	8	6.0	765.0
61	1A	Ganeshguri-Kahilipara OdalBakra Road	19	1.9		10		1.8	14	10.0	2030.0
62	13A	GMCH Hostel Road/Dispur College Road/Kachari Basti Road	19	1.4	1	5.7	0.8	1.2	10	8.0	1508.0
63	20	Japorigog Road/Dr. Nirmal Prabha	20	1.0		6.0		1.0	8	6.0	1832.0
64	43A	Rajgarh Link Road	20	1		6.7		2.5	10	7.0	500.0
65	6	Zoo-Narengi Road(Geeta Nagar Road)upto BG Chowk	21	2.0		21.5		2.0	26	22.0	2266.0
66	24B	Rajgarh Road	21	1.5	1.5	10.5	3	3	20	15.0	845.0

Sr.No	Rd. No.	Name of The Road	Ward No	Left drain (m)	Left Shoulder (m)	CW (m)	Right Shoulder (m)	Right drain (m)	Avg. Road Width (m)	CW + Shoulders (m)	Road Length (m)
67	24	Rajgarh Road to RG Baruha Link Road	21	0.9		7	0.5	0.5	9	8.0	109.0
68	28	Ambikagiri Nagar Path	21	1.0		6.0		1.0	8	6.0	987.0
69	43	Rajgarh Link Road	21	1		6.7		2.5	10	7.0	700.0
70	65	Railway Colony Road	21	1.0	1.0	5.0	1.0	1.0	9	7.0	1250.0
71	38	Maniram Dewan Road	22		1.5	8	1.5		11	11.0	1567.0
72	76AA	DrBhupen Hazarika Path/Guwahati Refinery Road	22	1.0		7.0		1.0	9	7.0	4236.0
73	22	Salbari Main Road	22	1		6		1	8	6.0	1598.0
74	6A	Zoo-Narengi Road(Geeta Nagar Road)upto BG Chowk	24	2.0		21.5		2.0	26	22.0	960.0
75	19	Satgaon Main Road	25	3	2.5	9	2.5	1.5	19	14.0	1740.0
76	27A	DrZakir Hussain Road	25	1.0		6.0		1.0	8	6.0	811.0
77	27B	Hari Mandir Path (Sarumotoria)	25	1.0		5.0		1.0	7	5.0	800.0
78	54	From Japorigog Road to Japorigog Jama Masjid	25	1.0		6.0		1.0	8	6.0	1400.0
79	40A	Dakhingaon Road	26	1.9	5.2	7	2.3	1.9	18	15.0	359.0
80	40B	Dakhingaon Road	26	1.9	1	7	1.5	2	13	10.0	2266.0
81	45	Lakshmi Mandir Path(Beltola Road to GS Road)	26	1.0		5.0		1.0	7	5.0	1250.0
82	14A	Hockey Stadium Road/Bishnu Rava Path(From Hatigaon to Saukuchi)	27	1.4		8.8	2.5	1.4	14	12.0	2179.0
83	40D	Dakhingaon Road	27	1.0		6.0		1.0	8	6.0	534.0

Sr.No	Rd. No.	Name of The Road	Ward No	Left drain (m)	Left Shoulder (m)	CW (m)	Right Shoulder (m)	Right drain (m)	Avg. Road Width (m)	CW + Shoulders (m)	Road Length (m)
84	77	Central Jail Road,Sarusajai(Lokhra Road from NH 37+ Nalapara Road+And road joining above mention two road)	27	1.0		9.0		1.0	11	9.0	1194.0
85	14AA	Hockey Stadium Road/Bishnu Rava Path(From Hatigaon to Saukuchi)	29	1.5	1	7	1.3	1.4	12	10.0	2181.0
86	14B	AG Colony Road	29	1.0		7.0		1.0	9	7.0	864.0
87	14D	Nizara Path	29	1		7		1	9	7.0	1236.0
88	57	Dargah Road/Chaolung Sukaphaa Path	29	1.0		7.0		1.0	9	7.0	1474.0
89	30	Latakata Road & Pillingkata Road,Bakrapara	30	1.0		8.0		1.0	10	8.0	2927.0
90	30A	Latakata Road & Pillingkata Road, Bakrapara	30	1.0		8.0		1.0	10	8.0	953.0
91	101	From Panjabari Road to Shilpgram	31	1.0		6.0		1.0	8	6.0	410.0
92	102	Bhagabari Rd upto Shiv mandir Diversion	31	1.0		8.0		1.0	10	8.0	1419.0
93	103	Radha Nagar Road	31	1.0		6.0		1.0	8	6.0	826.0
94	104	Arunodoy Path	31	1.5		9.0		1.5	12	9.0	765.0
95	105	From Pankhabari Path-Hari Mandir -Shilpgram	31	1.0		8.0		1.0	10	8.0	886.0
96	54A	Nayanpuri Road	20	1.0		7.0		1.0	9	7.0	800.0
97	118A	Kamarpatty Rd	10	1	0.5	7	0.3	1	10	8.0	432.0

Sr.No	Rd. No.	Name of The Road	Ward No	Left drain (m)	Left Shoulder (m)	CW (m)	Right Shoulder (m)	Right drain (m)	Avg. Road Width (m)	CW + Shoulders (m)	Road Length (m)
98	118C	Col J Ali Rd	10	1.8	0.8	6	2.8	1.8	13	10.0	692.0
99	118D	HC Rd	10	1.2	2	7	2	1.2	13	11.0	554.0
100	118E	Jorpukuri Uzan Bazar Rd	11	1.2	2	5	2	1.5	12	9.0	597.0
101	111A	DPS Road	6	2.0		8.0		2.0	12	8.0	974.0
102	111B	Moinakhurong Road	6	2.0		6.0		1.0	8	6.0	1380.0
		TOTAL									**135904.0**

25.0 ANNEXURE 6

TABLE NO: 10 – BOQ OF ROADS

Sr. No.	Carriage way + Shoulder Width (m)	Length (m)	Lux Level
1	5-6 m	22822 m	15
2	7-9 m	62177 m	20
3	10-11 m	23192 m	20
4	12-13 m	11937 m	20
5	14-15 m	3500 m	20
6	16-18 m	6259 m	20
7	19-20 m	288 m	20
8	20-22 m	1293 m	20
9	11-13 m (2 X 5.5 m) with median	1210 m	20
10	22 m (2 X 10 m) with median	3226 m	20
	TOTAL	**135904 m**	

26.0 ANNEXURE 7

TABLE NO: 11 – LUMINARIES DATASHEET TO BE FILLED BY CONTRACTOR

Sr. No.	Parameters	Requirements / Value
1.	Type	
2.	LED chip make	
3.	Rated Voltage	
4.	Operating Voltage Range; Test report enclosed (Y/N)	
5.	Frequency	
6.	Power Factor; Test report enclosed (Y/N)	
7.	LED wattage; Test report enclosed (Y/N)	
8.	LED chip Efficacy; Test report enclosed (Y/N)	
9.	LED Drive current; Test report enclosed (Y/N)	
10.	LED Beam Angle	
11.	Colour Temperature	
12.	Rated Minimum LED Life (L70); Test report enclosed (Y/N)	

13.	Total Lumen Output; Test report enclosed (Y/N)	
14.	System Efficacy; Test report enclosed (Y/N)	
15.	Colour Rendering Index of Luminaires; Test report enclosed (Y/N)	
16.	System Power Efficiency; Test report enclosed (Y/N)	
17.	Driver Type	
18.	Driver Efficiency; Test report enclosed (Y/N)	
19.	Driver Life; Test report enclosed (Y/N)	
20.	Maximum temperature rise of Driver; Test report enclosed (Y/N)	
21.	Operating Temperature Range of LED & Driver; Test report enclosed (Y/N)	
22.	Luminaries body temperature after 12 hours of continuous operation; Test report enclosed (Y/N)	
23.	Junction temperature; Test report enclosed (Y/N)	

24.	Heat Sink Temperature; Test report enclosed (Y/N)	
25.	Solder point temperature; Test report enclosed (Y/N)	
26.	Operating Humidity	
27.	Control Gear	
28.	Whether NEMA Socket is provided	
29.	Whether Controller is provided in Luminaire	
30.	Total Harmonics Distortion (THD); Test report enclosed (Y/N)	
31.	LED Construction	
32.	IP Protection of Luminaire & controller; Test report enclosed (Y/N)	
33.	Luminary Housing Construction	
34.	Heat Sink	
35.	Clip / Fastners	
36.	Wire size, Insulation, Conductor	

37.	Materials	
38.	Optics	
39.	IK protection for Optic Cover; Test report enclosed (Y/N)	
40.	Photometric measurements; Test report enclosed (Y/N)	
41.	Minimum Surge Protection; Test report enclosed (Y/N)	
42.	Surge protection provided in the Feeder Pillar in kV	

27.0 ANNEXURE 8

TABLE NO: 12 – DRIVER/ CONTROL GEAR DATASHEET TO BE FILLED BY CONTRACTOR

Sr. No.	Parameters	Requirements / Value
1.	Type	
2.	Driver Efficiency	
3.	Driver Life	
4.	Operating Voltage Range	
5.	Frequency	
6.	Power Factor	
7.	Total Harmonic Distortion (THD)	
8.	Protection Class	
9.	Operating Temperature Range	
10.	Minimum in-built Surge Protection	
11.	IP Protection	
12.	Output Current Range	
13.	Output Voltage Range	

14.	Output Power	
15.	Short Circuit Protection	
16.	Open Circuit Protection	
17.	Over Voltage Protection	
18.	Over Temperature Protection	
19.	Under Voltage Protection	
20.	String Open Protection	
21.	EMI Compliant	