4X270 MW TSGENCO BHADRADRI TPS

TECHNICAL SPECIFICATION

FOR

STATION LIGHTING SYSTEM

SPECIFICATION NO.: PE-TS-411-558-E001 (REV-00)

VOLUME II

BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA – 201301

CONTENTS

IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO, & THAT THERE ARE NO TECHNICAL DEVIATIONS.

BIDDER'S STAMP & SIGNATURE
(REFER INSTRUCTION NO. 1 OF 'INSTRUCTIONS TO BIDDERS)

1 The Tender documents contain three (3) volumes. The bidder shall meet the requirements of all three volumes.

1.1 **VOLUME - I** **CONDITIONS OF CONTRACT**

This consists of four parts as below:

Volume – IA This part contains Instructions to bidders for making bids to BHEL.

Volume – IB This part contains General Commercial Conditions of the Tender & includes provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume – IC This part contains Special Conditions of Contract.

Volume – ID This part contains Commercial Conditions for Erection & Commissioning site work, as applicable.

1.2 **VOLUME – II** **TECHNICAL SPECIFICATIONS**

Technical requirements are stipulated in Volume – II, which comprises of:

Volume – IIA General Technical Conditions.

Volume – IIB Technical Specification including Drawings, if any.

1.3 VOLUME – IIB

This volume is sub-divided in to following sections:-

Section – A: This section outlines the Intent of Specification.

Section – B: This section provides “Projection Information”.

Section – C: This section indicates Technical Requirements specific to Contract, not covered in Section – D.

Section – D: This section comprises of Technical requirements specific to Contract.

Data Sheet-A: Specific data and other requirements pertaining to the equipments.

Data sheet–C: Indicates data / documents to be furnished after the award of Contract as per agreed schedule by the vendor (as applicable)

Note: The requirements mentioned in Section-C / Data Sheet-A of Volume-IIB shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section-D.

INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. In line with clause no. 27.0 of section-C, Volume-IIB of the specification, two signed and stamped copies of the following shall be furnished by all bidders as technical offer:

    a. Unpriced Price Schedule (Annexure-E of BOQ enclosed with specification) with bidder's signature and company stamp.

    b. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer"), with bidder's signature and company stamp.

    c. A copy of previous sheet ("Contents"), with bidder's signature and company stamp.

    d. Type of bidder's lighting fixtures shall be furnished with respect to the BHEL fixture type indicated in BOQ (Annexure-E).

2. No other technical submittal such as copies of type test certificates, data Sheets, write-up, drawing, technical literature, etc. is required during tender stage. Any such submission, even if made, shall not be considered as part of offer.

3. Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/ covering letter of technical offer shall not be considered by BHEL.

4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

5. Any changes made by the bidder in the price schedule with respect to the material description/ quantities, notes etc. from those given in Annexure-E to Section-C of specification (Bill of Quantities) shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

SECTION – 'A'

SCOPE OF ENQUIRY

SCOPE OF ENQUIRY

1. This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to site, unloading & storage at site, erection, testing and commissioning of STATION LIGHTING SYSTEM as mentioned in different sections of this specification for **4X270 MW TSGENCO BHADRADRI TPS**.

2. It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee.

3. The general terms and conditions, instructions to bidders and other attachment referred to elsewhere are hereby made part of the Technical Specification.

4. The bidders shall be responsible for and governed by all requirements stipulated hereinafter.

5. Requirements of the specification including the QP shall be agreed upon for total compliance by bidders without any deviations. Price offers of only those bidders complying with this requirement shall be acceptable

6. The documents shall be in English language and MKS system of units.

7. For every shipment made to site, a shipping list, containing item reference [item number and description as per specification Bill of Materials or package drawings], and quantity of the same [in nos./ weight] shall be provided by vendor at the time of despatch of materials to site.

SECTION - B

PROJECT INFORMATION

INTRODUCTION

4x270 MW BHADRADRI TPS is being set up by Telangana State Electricity Corporation Limited (TSGENCO) at Manuguru in the district of Khammam, Telangana, India.

The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on BHEL/Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.

APPROACH TO SITE

The distance from Manuguru to Major cities in state: Hyderabad-345KM, Warangal-180km, Bhadrachalam-38km, Kothagudem-70km and Khammam-130km, Vijayawada-195km.

District: KHAMMAM

State: TELANGANA

Nearest Airport: The nearest airport is Vijayawada Airport but the most used airport is the Hyderabad International Airport.

Nearest Railway Station: Manuguru railway station is 10KM from nearby town. However Warangal/Vijaywada railway Station is major railway station near to Manuguru.

1. **Owner** TSGENCO
2. **Owner Consultant** DESEIN PRIVATE LIMITED, NEW DELHI

3. **Project Title** 4X270 MW MANUGURU TPS
4. **Location** 16 Km from Manuguru Railway station
5. **Nearest Railway Stn**. Manuguru
6. **Temperature**
   a. Mean daily minimum ambient temperature during oldest month of the year=11.5 Deg.C
   b. Mean daily minimum ambient temperature during hottest month of the year=45.1 Deg.C
7. **Rainfall**

   Intensity of rainfall @ 80 mm/hr considering heaviest fall in 24 hrs
8. **Wind Data**
   a. Basic wind speed at 10m height

      44 m/sec
   b. Wind pressure As per IS: 875 Part III- 1987

9. **Seismic Zone** Zone III as defined in IS:1893 (part-1)-2002according to Indian Standard Seismic Zoning Map

10.0	**Power Supply** **The power supplies for distribution and auxiliaries shall be as under:**	
	a) In plant generation	16.5kV ±5%, 3ph, 50Hz ±5%, high resistance earthed.
	b) MV distribution	6.6kV ±6 %, 3ph, 3w , 50 Hz, + 5 % to – 5%, Non-effectively earthed
	c) LT distribution	415V ±10%, 3ph, 4W, 50Hz + 5% to –5%, Effectively earthed
	d) Motor rated above 160kW	6.6kV ±6 %, 3 ph 50Hz +5% to -5%.
	e) Motor rated 160kW and below all motorized actuators.	415V ±10%, 3 ph, 50Hz +5% to -5%.
	f) For motors equal and below 30kW winding heating	24V AC ±10%, 50 Hz, [to be generated in 415V switchgear by vendor]
	g) DC Motors	220V DC + 10% to - 15%, 2 wire unearthed
	h) Control supply for relay panel/ 6.6kV	220V DC + 10% to - 15%, 2 wire

	breakers/415V breakers and DC emergency lighting.	ungrounded system
	i) UPS for instrumentation & Control system	240V AC ±1 %, 1 ph , 50Hz ±0.5% 2 Wire AC system
	j) Control supply for 415V Motor contactors/AC Control circuits [to be generated in MCC /panel by vendor]	110V AC ±10%, 50Hz + 5% to –5%.
	k) Diesel Generator emergency supply	415V ±10%, 3ph, 3W, 50Hz +5%to –5%.
11.0	**Fault levels**	
	a) 400kV	40kA rms for 1 sec
	b) 6.6kV	44 kA rms for 1 sec.
	c) 415V	50 kA rms for 1 sec.
	d) DC Supply	25 kA

SECTION – 'C'

SPECIFIC TECHNICAL REQUIREMENTS

1.0 This specification covers the design, manufacture, assembly, testing and inspection at vendor's/sub-vendor's works, packing and despatch to site, site unloading & handling, site storage including storage facility (only graded land shall be provided by purchaser), erection and commissioning of lighting system as described in the various sections of this specification. Lighting system shall generally conform to IS. It is not the intent to completely specify all details of design and construction herein. However, the equipment shall conform to acceptable standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to Contractor, who shall be entitled to reject any work or materials, which in his opinion is not in conformity with the duty requirements.

2.0 SCOPE OF SUPPLY AND SERVICES

The scope of supply and services covers the complete supply of equipment and services for lighting and low voltage power services in accordance with the requirements of various sections of this specification.

2.1 The scope of supply and E&C shall be as per Price Schedule for Station Lighting System (Annexure-E). The complete installation, testing, commissioning and performance testing of lighting and low voltage power services as per Schedule of Equipment & Services enclosed shall be in bidder scope.

2.2 All consumable such as conduit accessories, conduit boxes, saddles, clamps, screws, switch boxes, supports, down rods, ball and sockets, PVC conduits, fixing hardware etc, as described in various clause shall deemed to be included by the bidders.

3.0 TERMINAL POINTS

Incoming power supply to lighting distribution boards. Cable lugs & glands for termination at LDB end is in bidder's scope.

4.0 EXCLUSIONS

4.1 Civil foundations of lighting distribution boards.

4.2 Supply and laying of incoming cables to LDBs and welding DBs (fed from MCC).

4.3 Supply of power cables:
a) From LDBs to LPs
b) From LDBs to street lighting panels
c) From street lighting panels to poles JBs.
d) From Welding DBs to Welding receptacles

4.4 Supply of control cables from DC LDB to emergency board.

4.5 Supply of 3Cx2.5 mm^2 Cu PVC armoured cables for sockets & fixtures in hazardous area, outdoor lighting on buildings & buried cables for floodlight.

4.6 Supply & erection of cable trays.

5.0 Review of the sub-contractor's documents by the contractor shall not relieve the sub-contractor from his responsibility for the design, supply and construction/ installation.

6.0 LIGHTING SYSTEM DESIGN

6.1 Lighting system will be designed to ensure adequate uniform visual performance, safety & reliability and will be free from excessive glare and flicker from discharge lamp. In main control room, particular attention will be given to ensure that illumination is proper and aesthetic. Control room lighting will be such as to prevent any glare/ luminous patch on control board /panel when viewed from an angle

6.2 Fluorescent fixtures with electronic ballast shall be used wherever required, including main control room. All fluorescent fixtures will be energy-efficient T5 (28W) type. All fixtures shall be of a proven design for applications in power plant environment. All outdoor fixtures will be weatherproof type with DOP-IP55.

6.3 High-pressure sodium vapour lighting fixtures will be installed in areas with sufficient headroom of 5m or more. However, this 5M headroom may or may not be feasible in HRSG/boiler area and fixture will be mounted on columns/bottom of platform as per site requirement.

6.4 High-pressure mercury vapour lighting fixtures will be installed in hazardous area as per area classifications.

6.5 In general, the type of fixtures, type of luminaries and illumination levels to be achieved will be as per enclosed Annexure-A.

6.6 The lighting fixtures in the plant area will be group controlled from lighting panel by miniature circuit breakers. The lighting fixtures in office areas, control rooms etc. will be controlled by switches.

6.7 Indoor & outdoor lighting system will have timer arrangement in lighting panel (LP) for controlling lights with additional provision for manual control.

6.8 Outdoor areas like Fuel oil tank area, open store etc. shall have flood light fixtures mounted on flood light poles.

7.0 ILLUMINATION DESIGN CALCULATION

7.1 Lighting design for indoor areas will be done by LUMEN method only.

For a given indoor area, number of luminaires is calculated as follows:

$$\text{Number of luminaires} = \frac{L \times W \times \text{LUX LEVEL (Average)}}{\text{LUMEN} \times \text{COU} \times \text{MF}}$$

Where

L = Length of room (Restricted to Max. 5 times of width)
W = Width of room
COU = Coefficient of utilisation
LUMEN = Lumen output of each lamp
MF = Maintenance Factor

Coefficient of Utilisation (COU) is determined from the COU chart for a particular luminaire of the manufacturer, corresponding to selected reflection factors and calculated Room Index. The working plane shall be considered at 0.85m from the floor level. The Room Index is calculated by the following formula:

$$\text{Room Index} = \frac{L \times W}{(L + W) \times MH}$$

Where MH = Mounting height of luminaire.

The Reflection Factor (RF) will be considered as given below:

	Ceiling (rc)	Wall (rw)	Floor (rf)
For White & very light colour	70	70	10
For Light colour	50	50	10
For Middle tints	30	30	10
For Dark colours	10	10	10

Values of Maintenance Factor (MF), which includes the luminaire depreciation factor also as per IS-3646, will be considered as given below:

a) Boiler area : 0.55

b) Control room & air conditioned area : 0.75

c) Indoor area non-AC (except fluorescent fixture) : 0.65

d) Indoor area non-AC (fluorescent fixture) : 0.57$

$: (0.65X0.87 = 0.57).
where 0.87 is the ambient temperature correction factor for fluorescent fixture at 40°C in motionless air.

7.2 Lighting design for outdoor area, open area shall be done by computer programme as per standard norms for lighting design to meet the specified lux level. Maintenance factor shall be generally 0.6 under average condition. For outdoor lighting and road lighting, ratio of minimum to average illumination shall not be less than 0.3 and for minimum to maximum shall not be less than 0.05.

8.0 LIGHTING SYSTEM DESCRIPTION

a) Lighting system will be provided with AC normal, AC emergency and DC emergency as listed against various areas as per Annexure-B enclosed.
b) The sources of power lighting are as below :

i) AC Normal Lighting (ACN) (415V)

ii) AC Emergency lighting (ACE) (415V)

iii) DC Emergency Lighting (220V)

iv) 24V AC lighting (for maintaince).

For main plant area normally all AC luminaries (approximately 80% on ACN and 20% on ACE) luminaries shall be in service and DC luminaries shall be dark. Upon failure of AC normal lighting, DC luminaries shall be automatically switched 'ON'. On restoration of AC Emergency lighting through DG, DC luminaries shall be put-off automatically after a time gap of about three minutes following the restoration of lighting to ACN or ACE lighting system. For other auxiliary areas ACN lighting shall provide 100% illumination level and normally all AC lighting fixture shall remain "ON" as long as normal AC lighting is available. In DG room 100% AC emergency lighting shall be provided.

Lighting level by DC emergency lighting will be provided to meet functional/ operational requirements. Fittings will be located at strategic locations for safe personnel movement during emergency. All emergency DC lighting shall be through compact fluorescent lamps (CFL).

In off-site areas/odd locations, for safe movement of personal during emergency, self contained maintenance free Ni-Cd battery operated emergency lighting units (ELUs) with 2 hours duration capacity is envisaged. Each ELU shall have battery charger & 2x6W fluorescent lamp.

8.1 Normal AC Lighting:

AC Normal lighting fixtures are fed through a number of conveniently located AC Lighting panel (ACNLP) which are fed from Lighting Distribution Board (LDB). Each LDB, consisting of 2x100% 100kVA/50kVA dry type non-encapsulated isolation transformer & distribution boards, shall have TPN MCCB for two nos. incomers, one no. buscoupler & required number of TPN MCCB for outgoing feeders. The ACLPs will have three-phase, TPN MCCB as incomer and number of single-phase outgoing circuits controlled by SPN MCBs. The fault level at LP will be restricted to 10kA. Earth leakage circuit breaker (ELCB) shall be provided in incomer of LPs. Each LPs shall be provided with timer for ON/OFF control.

8.2 Emergency AC lighting:

AC Emergency lighting fixtures fed through suitable numbers of conveniently located AC Emergency Lighting panel (ACELP) which are fed from AC Emergency Lighting Distribution Board (ACELDB). Each ACELDB, consisting of two nos. 100kVA/50kVA dry type non-encapsulated isolation transformer & distribution boards, shall have TPN MCCB for two nos. incomers, one no. buscoupler & required number of TPN MCCB for outgoing feeders. The ACLPs will have three-phase, TPN MCCB as incomer and number of single-phase outgoing circuits controlled by SPN MCBs. The fault level at LP will be restricted to 10kA. Earth leakage circuit breaker (ELCB) shall be provided in incomer of LPs. Each LPs shall be provided with timer for ON/OFF control.

8.3 Emergency DC Lighting:

Emergency DC lighting fixture fed through suitable number of conveniently located DC emergency lighting panel (DCELP) which are fed through DC lighting distribution board (DCDB). Each DCLDB will have 2 pole SFU and contactor for incoming & 2 pole MCB for outgoing.

8.4 24V AC lighting:

24 V AC lighting for maintenance purposes (for hand lamps and/or hand operated tools) shall be supplied from 240/24V fixed/ portable lighting module. 240/24V lighting module will consist of one incoming switch with 6A HRC fuses / MCBs, one 240/26.5 V dry type transformer of 500VA rating and 16A HRC fuses on 26.5 V side of the transformer. A group of 5A, 24V AC sockets shall identified with colour coding in order to distinguish them from the 240V AC sockets shall be provided Boiler area, TG Hall, ESP area, Near deaerator etc.

9.0 STREET LIGHTING / OUTDOOR LIGHTING

9.1 The roads within the station plant boundary and as per contract will be considered for lighting.

9.2 Street lights / outdoor lighting will be fed from separate panel located at suitable places. Automatic switching ON/OFF of these circuits shall be done through timers with manual control facility.

9.3 For street lighting, 13 meter high lighting pole will be used for primary roads. For secondary roads lighting 11 meter lighting pole will be used. The poles will be as per IS-2713.

9.4 Street/flood light poles will be fabricated, painted, swaged, steel tubular poles with swan neck arrangement. The poles will be painted with anti-corrosive treatment & paint.

9.5 The poles will be located 1.5m away from the road edge. The buried cable will run in Hume pipe wherever it is crossing the roads.

10.0 LOW VOLTAGE POWER SERVICES

10.1 240V AC, 5/15A universal socket (at least two number) shall be provided in office, store, cabin etc. The receptacles shall be provided at interval of 20m or part thereof for hand tools etc. One number 20A, 240V AC industrial type receptacles shall be provided at suitable location in all other area as required. The receptacles shall be controlled through switch/MCBs. In hazardous area receptacles will be flame proof as per IS 2148 (suitable for hazardous area).

10.2 Suitable nos. of 63A, 3 phase, 415 V industrial receptacle with switch shall be provided at specific points in the power plant area for welding purposes. At least one 63A receptacle shall be provided in each off-site building. Maximum three (3) nos. 63A receptacles shall be fed through one feeder by loop-in loop-out of cable.

10.3 1200mm sweep ceiling fans with stepped electronic regulator shall be provided for office rooms, store rooms and social buildings which are not covered by air-conditioned and ventilation system.

11.0 WIRING / CONDUITS

11.1 Wiring of lighting system will be done as follows:

a) Wiring installation will be by multi-stranded, PVC insulated, colour coded wires laid in GI conduits of 20mm dia min size. Wires shall conforming to IS-694 & wiring installation as per IS: 732.

b) Conduits will be heavy-duty type hot dip galvanised steel conforming to IS-9537. Conduit accessories will be hot dip galvanised. In corrosive area, conduits will have suitable epoxy coating additionally.

c) Conduits in control room and other air-conditioned areas will be surface mounted on the roof above false ceiling, however vertical drops of conduits will be through column flanges or grooved to the wall, finally covered for better aesthetics.

d) Filling area of wires in conduit shall not exceed 40% of the conduit area.

e) GI conduits with earth wire shall be as per IS 1239.

f) Wiring for ACN, ACE and DC lighting system shall be carried out in separate conduits.

g) Lighting and receptacles will be fed from separate circuits. No two different phase circuits will be run in the same conduit. However, different circuits of same phase may be laid in the same conduit.

h) Maximum three number of receptacles will be loop in & loop out in a circuit.

11.2 Following sizes of copper conductor wires will be used.

a) 2.5 sq. mm, 1100V grade, PVC insulated, single core, stranded copper conductor, for lighting fixtures from Panel/switch/JB to fixture.

b) 4.0 sq. mm, 1100V grade, PVC insulated, single core, stranded copper conductor, for lighting fixtures from panels to switch/JB.

c) 4.0 sq. mm, 1100V grade, PVC insulated, single core, stranded copper conductor for 5/15A & 20A sockets.

11.3 Wiring in hazardous area, transformer area or outdoor will be done using 3Cx2.5 sq m PVC armoured cable. In outdoor areas like transformer yard and road lighting, connection through cable shall be adopted.

12.0 EARTHING

12.1 Earthing of lighting system will be done by using of following sizes of GS wire / flat:

a) 16 SWG GS wire for earthing of lighting fixtures, Single phase receptacles, conduits, junction boxes & switch boxes.

b) 25x3 mm size galvanised MS flat for lighting panels, Welding receptacles & flood light/street light poles earthing. As electrode for pole earthing 2 Nos, 20 mm dia & 3M long MS rod will be used.

c) 50x6 mm size galvanised MS flat for earthing of LDB.

13.0 NOT USED

14.0 STATUTORY & REGULATORY REQUIREMENTS

14.1 All Statutory and regulatory requirements shall be adhered to.

15.0 Areas for which lighting design engineering is to be done are as per Annexure-B. The list is tentative only and areas may be added or deleted during detailed engineering.

16.0 Bidder after award of contract shall prepare and submit the area drawings as per various sections of this specification within 2 weeks of the input given by the purchaser. The total engg. along with freezing of BOM shall be completed in line with specification requirement. Complete engineering shall be as per the guidelines of the purchaser and shall be subject to purchaser's approval.

Vendor after completion of work at site shall prepare 'AS BUILT' drawings based on these inputs.

17.0 Design engineering includes submission of data sheets, GA drawings of equipment, mounting details, various schedules, lighting design calculation sheets, lighting distribution scheme, lighting layout drawings and bill of material drawings. Conduit layout drawings shall be submitted to meet the E&C schedule.

18.0 INSPECTION & TESTING

18.1 Inspection shall be carried out as per BHEL Quality Plan no: PED-558-00-Q-001/01 enclosed with the specification. The bidder shall sign this quality plan for compliance and submit the same along with the technical offer.

All material used for the construction of the equipment shall be new and shall be in accordance with the requirements of this specification. Materials utilised shall be those which have established themselves for use in such applications.

18.2 All acceptance and routine tests as per relevant standards and specification shall be carried out by the manufacturer. Charges for all these routine and acceptance tests for all the materials shall be deemed to be included in the bid price.

18.4 Reports of the Type tests already carried out by the manufacturer on various equipment identical/similar to those offered by the bidder shall be furnished along with the bid.

18.5 For all components / materials, for which Type tests have not been specified in the specification, only type test reports shall be furnished by the bidder. Such Type tests should have been carried out within last five years, as on the date of bid opening, on identical components / materials. In absence

of such type tests reports or in case such reports are not found to be meeting the specification/standards requirements, bidder shall conduct, free of cost to the purchaser, all such type tests according to the relevant standards and reports shall be submitted to the owner for approval.
All the components and completely assembled switchboards shall be tested as per the latest edition of standards.

19.0 Vendor shall select the make of components of lighting system from the list of sub vendors (as per Annexure-C). However, names of the sub vendors may be added or deleted from the list without intimation to the vendor and therefore it is mandatory on the part of the vendor to take approval on the make of items during detailed engineering stage. The list of sub vendors equipment/components (shall be subject to BHEL/ customer approval).

20.0 Bidder shall furnish Field QP after award of contract for purchaser's approval.

21.0 Bidder shall furnish various schedules/data, completely filled and QP duly stamped and signed as per various sections of this specification

22.0 Number of copies of documents/data to be submitted by the successful bidder shall be as per enclosed Annexure-D.

23.0 Bidders shall provide BOQ in soft copy (computer based) and hard print for area wise/dwg wise actual quantity consumption for various items as per conduit layout dwg after completion of installation of that area.

24.0 BHEL shall provide area wise input drawings in soft / hard form for preparation of lighting design & layout dwgs in soft form by the bidder. On approval of lighting design & layout dwgs from customer, bidder will prepare conduit layout drawings in soft form.

25.0 Various sizes & quantities of structural steel as per mounting arrangement drawings (enclosed) shall be identified for quantity clearance to complete the work in all respects and has to be included in their scope. Steel shall be of good quality SAIL steel or equivalent subject to Customer approval.

26.0 **PRICES**

26.1 The bidder shall quote prices for supply of complete lighting system as per format attached with the specification.

26.3 The unit rates of supply & installation for all equipment and service quoted by the bidder shall be firm for a variation of quantities limited to

a) ±30% of total order value till finalisation of engineering details & BOQ.

b) +10% of the total order value in addition to (a) above, till the completion of job.

26.4 Purchaser reserves the right to delete/add any equipment or services from the bidders scope, and for price adjustment in such cases, unit prices quoted by the bidder shall be considered.

26.5 The bidder shall furnish unpriced price schedule of all equipment and services inclusive of Erection & commissioning spares and recommended spares for 3 years along with the technical bid.

26.6 Bidder to note that the price quoted for System Engineering Design for lighting system shall be fixed for the project and shall not vary with the change in scope of supply of equipment. The areas for which lighting system design engineering to be done are listed in Annexure-B. However the list is tentative only which may vary (added/deleted) during detailed engineering.

27.0 COMPLAINCE TO SPECIFICATION

27.1 Bidder shall confirm total compliance to the specification without any deviation from the technical/ quality assurance requirements stipulated.

27.2 Type of bidder lighting fixtures shall be furnished along with offer with respect to the BHEL fixtures type indicated in BOQ.

28.0 AS BUILT DRAWINGS

Bidder may note that all as-built corrections (as given by purchaser to vendor) shall have to be incorporated in the originals by the vendor and copies of the as-built corrected drawings / documents as per requirement shall be submitted by the vendor.

29.0 DELIVERY SCHEDULE

Engineering and supply schedule as per NIT (Notice Inviting Tender).

ANNEXURE-A

AVERAGE LUX LEVEL & TYPE OF FIXTURES

S. No.	LOCATION	AVERAGE LUX LEVEL	TYPE OF LIGHTING FIXTURES
01	TG Hall operating floors	200	HPSV, high bay fixture with anodised Al reflector
02	TG hall ground, mezzanine floor	200	HPSV, Industrial well glass with integral control gear
03	Switchgear/ Charger rooms	200	FTL, Industrial type with vitreous enamel reflector
04	Central control room	300	FTL, Decorative recessed with wide angle, mirror optics, anti-glare type
05	Office areas, Conference rooms	300	FTL, Decorative recessed with wide angle, mirror optics, anti-glare type
06	UPS/ Operator room	300	FTL, Industrial type with vitreous enamel reflector
07	Battery rooms	200	FTL, corrosion proof, totally enclosed type with sheet aluminium housing.
08	Cable Vault	100	FTL, Industrial type with vitreous enamel reflector
09	Transformer yard	30 (General) 50 (On Equip)	HPSV, flood light, general purpose.
10	Boiler platforms	100	HPSV, dust proof/ dust tight well glass fixture
11	Boiler platforms	100	HPSV, dust proof/ dust tight well glass fixture
12	ESP platforms	100	HPSV, dust proof/ dust tight well glass fixture
13	ESP control room	300	FTL, Decorative recessed with wide angle, mirror optics, anti-glare type
14	DG room	200	HPSV, medium bay, industrial type.
15	AC plant/ Air washer room	200	FTL, industrial box type base without any cover.
16	Compressor room	150	HPSV, dust proof/ dust tight well glass fixture
17	Electrical/ Electronic Lab	300	FTL, Decorative recessed with wide angle, mirror optics, anti-glare type

18	Chemical Lab	300	FTL, corrosion proof, totally enclosed type with sheet aluminium housing.
19	Pump houses	150	HPSV, medium bay, industrial type.
20	Fuel Oil Pump house*	150	HPMV, well glass, flame proof with vitreous enamelled reflector and cast aluminium housing.*
21	Coal Mill area, feeder floor, bunker floor	100	HPSV, well glass, dust proof with vitreous enamelled reflector.
22	Street lighting	20 (Primary roads) 10 (Secondary roads)	HPSV, street light fixture
23	Corridors walk ways, staircase, toilets, wash rooms etc	100	FTL, Industrial type with vitreous enamel reflector
24	Unloading and maintenance bay	200	HPSV, high bay, industrial type.

* The fixture will be suitable for Division-2, Group IIA/IIB of hazardous area as per IS-2148.

Note: (i) Decorative type fixtures will be provided for false ceiling areas.

(ii) Compact Flouorescent fixture shall be used for emergency DC lighting. DC lighting fittings will be located at strategic locations for safe personnel movement during emergency.

ANNEXURE-B

LIGHTING & LV POWER SERVICES IN DIFFERENT AREAS

S. No.	AREA	ACN	ACE	DCE	5/15A Socket	20A Socket	63A Socket	ELU $
01	TG building	Y	Y	Y	Y*	Y	Y	-
02	Boiler platforms & boiler area	Y	Y	Y	-	Y	Y	-
03	ESP platforms & Mill area	Y	Y	Y	-	Y	Y	-
04	ID, FD & PA FAN area	Y	Y	Y	-	Y	Y	-
05	Transformer Yard	Y	Y	Y	-	Y	Y	-
06	ESP control room	Y	Y	Y	Y*	Y	Y	-
07	DG room	-	Y	Y	Y*	Y	Y	-
08	Compressor house	Y	Y	Y	Y*	Y	Y	-
09	Fuel oil area	Y	-	-	Y*	Y	Y	Y
10	Outdoor area	Y	-	-	-	-	-	-
10	Fire station, CW chlorination, CW treatment, Chemical Lab, Main gate, Watch Towers, DM plant, PTP, ETP, STP, CWPH, ACWPH, FWPH, RWPH, DM Transfer PH, Foam PH, Booster PH,	Y	-	-	Y*	Y	Y	Y
12	Administrative building	Y	-	-	Y*	Y	Y	Y
13	Service building/ Canteen/ Security Building	Y	-	-	Y*	Y	Y	Y

LEGEND:

ACN:	AC Normal Lighting
ACE:	AC Emergency Lighting
DCE:	DC Emergency Lighting
Y:	YES
Y*:	YES, Only in control room, offices & toilets
$:	Emergency Lighting Unit (ELU) & 5/15A Switch socket for ELU

ANNEXURE-C

LIST OF SUB-VENDORS

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
AC CONTACTORS	1	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
AC CONTACTORS	2	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
AC CONTACTORS	3	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
AC CONTACTORS	4	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
AC CONTACTORS	5	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	
AC LOAD BREAK SWITCH	1	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
AC LOAD BREAK SWITCH	2	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
AC LOAD BREAK SWITCH	3	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
AC LOAD BREAK SWITCH	4	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	Rajiv Sharma-9312004687	
AC LOAD BREAK SWITCH	5	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
AC MCCB	1	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
AC MCCB	2	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
AC MCCB	3	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
AC MCCB	4	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
AC MCCB	5	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
AC MCCB	6	CROMPTON GREAVES	RAIL TRANSPORTATION SYSTEMS,VANDANA BUILDING, 11, TOLSTOY MARG, TOLSTOY MARG, NEW DELHI, DL 110001	011 3041 6300	
AUXILIARY RELAYS	1	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
AUXILIARY RELAYS	2	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
AUXILIARY RELAYS	3	JYOTI LTD.	JYOTI LIMITED, E&CS DIVISION,3/15, BIDC, GORWA,VADODARA - 390 016, E-MAIL ID: ECS@JYOTI.COM	Ph. No.:+91-265-2281214 , Fax No.:+91-265-2281214	
AUXILIARY RELAYS	4	OEN INDIA LTD	29/1479, VYTILLA, COCHIN - 682 019 KERALA, INDIA	Phone : +91 484 2301132, 2303709 Fax : +91 484 2302287, 2302221 sales@oenindia.com	
AUXILIARY RELAYS	5	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
CABLE GLANDS	1	ALLIED TRADERS & EXPORTERS	C-124 A, SECTOR-2, NOIDA -201 301, UTTAR PRADESH, INDIA	Mr. Vijay Mohan Sood +(91)-(120)-2525694 +(91)-(120)-3052594 +(91)-(11)-23287156 vijay_mohansood@yahoo.com	
CABLE GLANDS	2	ARUP ENGG & FOUNDARY WORKS	391/119,PRINCE ANWAR SHAH ROAD, CALCUTTA-700068	033 2473 0850	
CABLE GLANDS	3	BALIGA LIGHTING EQPT.PVT.LTD.	63A,CP RAMASWAMY ROAD, ALWARPET,P.B.No 6910, CHENNAI-600018	44-24995505,22680990-4	
CABLE GLANDS	4	COMMET BRASS PRODUCTS	NUTAN CHEMICAL COMPOUND, WALBHAT ROAD, GOREGAON, MUMBAI-400063	91-022-26852961/62/63 comet@vsnl.net	
CABLE GLANDS	5	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST). MUMBAI 400 063.	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/ 022-29270878.	
CABLE GLANDS	6	ELECTROMAC INDUSTRIES	27/28AF NEW EMPIRE IND.ESTT., R.KRISHNA MANDIR RD.JB NGR ,ANDHERI(E),MUMBAI-400059	91-22-28324829 / 66919034 devang@electromacglands.com	
CABLE GLANDS	7	INCAB	HARE STREET,KOLKATA,WEST BENGAL-700001	91-33-2480161/62/63/64 Fax : 91-33-2485766	
CABLE LUGS	1	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST).	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/ 022-29270878.	
CABLE LUGS	2	UNIVERSAL MACHINES LTD.	4,B.B.D.BAG (EAST) 90,STEPHEN HOUSE,5TH FLR CALCUTTA-700001	033 2282 2540	
D.C. MCCB	1	CROMPTON GREAVES	RAIL TRANSPORTATION SYSTEMS,VANDANA BUILDING, 11, TOLSTOY MARG, TOLSTOY MARG, NEW DELHI, DL 110001	011 3041 6300	
D.C. MCCB	2	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
D.C. MCCB	3	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL,	044-49681447	
D.C. MCCB	4	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
EARTH LEAKAGE CB	1	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
EARTH LEAKAGE CB	2	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
EARTH LEAKAGE CB	3	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
EARTH LEAKAGE CB	4	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
EARTH LEAKAGE CB	5	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
EARTH LEAKAGE CB	6	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
EARTH LEAKAGE CB	7	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
EARTH LEAKAGE CB	8	MDS SWITCHGEAR LTD	314-317SHAH NAHAR ESTATE	011 - 25793021	
EARTH LEAKAGE CB	9	S&S POWER SWITCHGEAR LTD,	NEW NO. 67, OLD NO. 19, DR. RANGA ROAD, MYLAPORE, CHENNAI - 600004	044 - 24988056, 044 - 24988057, 044 - 24988058	
GI CONDUITS	1	M. CHANDRA & CO	22, RABINDRA SARANI, SHOP NO. G-15, Kolkata	03322350741 (Mr. Siddharth) mccompany.raisurana@yahoo.com	
GI CONDUITS	2	BEC INDUSTRIES	C-108 MAYA PURI, INDUSTRIAL AREA PHASE-II, NEW DELHI-110064	47113333, 2811 6280 becin@becconduits.com	
GI CONDUITS	3	S.N. SEN & CO.	18/1,SHIB NARAYAN DAS LANE, CALCUTTA-700006	03323501790,033 23503097 sudipsen90@hotmail.com	
GI CONDUIT (EPOXY PAINTED)	BIS APPROVED MAKE				
FLEXIBLE CONDUITS (LEAD COATED)	1	PLICA INDIA PVT. LTD.	V.P.AGARWAL MANAGING DIRECTOR, PLICA INDIA PVT. LTD. 149, MODEL TOWN EAST GHAZIABAD - 201009	M - 9810052131 / 0120-4563979 / 9810557567 Mail: agr@plicaindia.com	
FLEXIBLE CONDUIT (PVC COATED)	REPUTED MAKE				
DC CONTACTORS	1	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
DC CONTACTORS	2	BHEL (BHOPAL)	HEAVY ELECTRICAL PLANT		
DC CONTACTORS	3	ELECTROMAC INDUSTRIES	27/28AF NEW EMPIRE IND.ESTT., R.KRISHNA MANDIR RD.JB NGR ,ANDHERI(E),MUMBAI-400059	91-22-28324829 / 66919034 devang@electromacglands.com	
DC CONTACTORS	4	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
DC CONTACTORS	5	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
DC CONTACTORS	6	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
DC CONTACTORS	7	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
CONTROL SWITCHES/ SELECTOR SWITCH	1	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	Rajiv Sharma-9312004687	
CONTROL SWITCHES/ SELECTOR SWITCH	2	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
CONTROL SWITCHES/ SELECTOR SWITCH	3	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479000	
CONTROL SWITCHES/ SELECTOR SWITCH	4	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
CONTROL SWITCHES/ SELECTOR SWITCH	5	M/s Shrenik & Co.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR,		
CONTROL SWITCHES/ SELECTOR SWITCH	6	RECOM PVT. LTD.	M/S RECOM PVT. LTD.,16A , 2ND FLOOR A, WING RAJ INDUSTRIAL COMPLEX, MILITARY	Mr. Chandrashekar Kamath (MD) : 09820249503	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	1	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	2	INDCOIL	PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	3	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., 14, CART TRACK ROAD, MADUVANKARAI, CHENNAI - 600 042, INDIA.	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795 FAX: +91 - 44 - 22351662, 22451693 E-MAIL: mira@kappaelectricals.com sales@kappaelectricals.com	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	4	LOGICSTAT	B-160, INDUSTRIAL AREA, C BLOCK RD, OKHLA I, OKHLA INDUSTRIAL AREA, NEW DELHI, DL 110020	011 2681 0032	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	5	PRECISE ELECTRICALS	47A-49A,CHAKALA ROAD ANDHERI(E),MUMBAI-99 MUMBAI, MAHARASHTRA, INDIA PIN-400 099	022-8323402 / 022-8216433	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	6	UNILEC ENGINEERS PVT. LTD.	PLOT NO: R-247, T.T.C. INDUSTRIAL AREA, M.I.D.C , RABALE, NAVI MUMBAI- 400 701 INDIA	+91-22- 27607787 / 27607927 +91-22- 27607997	
LT- CURRENT TRANSFORMER	1	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
LT- CURRENT TRANSFORMER	2	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
LT- CURRENT TRANSFORMER	3	INDCOIL	PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	
LT- CURRENT TRANSFORMER	4	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., SOUTHERN ELECTRIKS 14, CART TRACK ROAD, MADUVANKARAI, CHENNAI - 600 042, INDIA.	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795 FAX: +91 - 44 - 22351662, 22451693 E-MAIL: mira@kappaelectricals.com sales@kappaelectricals.com	
LT- CURRENT TRANSFORMER	5	PRAGATI ELECTRICALS	280/3,II POKHRAN RD	5341779,5427041	
LT- CURRENT TRANSFORMER	6	PRECISE ELECTRICALS	47A-49A,CHAKALA ROAD ANDHERI(E),MUMBAI-99 MUMBAI, MAHARASHTRA, INDIA PIN-400 099	022-8323402 / 022-8216433	
LT- CURRENT TRANSFORMER	7	SILKAANS ELECT.MFG.CO.PVT.LTD	PLOT NO: R-247, T.T.C. INDUSTRIAL AREA, M.I.D.C , RABALE, NAVI MUMBAI- 400 701 INDIA	+91-22- 27607787 / 27607927 +91-22- 27607997	
LT- CURRENT TRANSFORMER	8	PRAYOG ELECTRICALS PVT. LTD.	GROUND FLOOR, THAKORE INDUSTRIAL COMPUND, STATION ROAD, VIDYA VIHAR (W), NATHANI ROAD , OPP. AMIBIKA TEMPLE,MUMBAI Mumbai - 400086, Maharashtra, India	91-22-25164288/25133146 Mr. P. U. PATWARDHAN (MANAGING DIRECTOR)	
LT- CURRENT TRANSFORMER	9	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
LT- POTENTIAL TRANSFORMER	1	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
LT- POTENTIAL TRANSFORMER	2	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
LT- POTENTIAL TRANSFORMER	3	INDCOIL	PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
LT- POTENTIAL TRANSFORMER	4	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., SOUTHERN ELECTRIKS 14, CART TRACK ROAD, MADUVANKARAI, CHENNAI - 600 042, INDIA.	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795 FAX: +91 - 44 - 22351662, 22451693 E-MAIL: mira@kappaelectricals.com sales@kappaelectricals.com	
LT- POTENTIAL TRANSFORMER	5	PRAGATI ELECTRICALS	280/3,II POKHRAN RD	5341779,5427041	
LT- POTENTIAL TRANSFORMER	6	PRECISE ELECTRICALS	47A-49A,CHAKALA ROAD ANDHERI(E),MUMBAI-99 MUMBAI, MAHARASHTRA, INDIA PIN-400 099	022-8323402 / 022-8216433	
LT- POTENTIAL TRANSFORMER	7	SILKAANS ELECT.MFG.CO.PVT.LTD	PLOT NO: R-247, T.T.C. INDUSTRIAL AREA, M.I.D.C , RABALE, NAVI MUMBAI- 400 701 INDIA	+91-22- 27607787 / 27607927 +91-22- 27607997	
LT- POTENTIAL TRANSFORMER	8	PRAYOG ELECTRICALS PVT. LTD.	GROUND FLOOR, THAKORE INDUSTRIAL COMPUND, STATION ROAD, VIDYA VIHAR (W), NATHANI ROAD , OPP. AMIBIKA TEMPLE,MUMBAI Mumbai - 400086, Maharashtra, India	91-22-25164288/25133146 Mr. P. U. PATWARDHAN (MANAGING DIRECTOR)	
DC SWITCH	1	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
DC SWITCH	2	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	Rajiv Sharma-9312004687	
DC SWITCH	3	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
EMER. PORTABLE LTG. SET	1	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srabans@bajajelectricals.com;	
EMER. PORTABLE LTG. SET	2	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srabans@bajajelectricals.com;	
FUSE BASE	1	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
FUSE BASE	2	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
FUSE BASE	3	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
FUSE BASE	4	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
FUSE BASE	5	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 ;amit.bhadauria@siemens.com	
FUSE BASE	6	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
FUSE BASE	7	SPACEAGE SWITCHGEARS LTD.	68 & 13-A INDUSTRIAL DEVELOPMENT COLONY, MEHRAULI ROAD GURGAON, HARYANA-122001	0124-2302711, 4085091	
FUSE BASE	8	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
FUSE BASE	9	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
FUSE BASE	10	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
HRC FUSES	1	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
HRC FUSES	2	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
HRC FUSES	3	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
HRC FUSES	4	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
HRC FUSES	5	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 ;amit.bhadauria@siemens.com	
HRC FUSES	6	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
HRC FUSES	7	SPACEAGE SWITCHGEARS LTD.	68 & 13-A INDUSTRIAL DEVELOPMENT COLONY, MEHRAULI ROAD GURGAON, HARYANA-122001	0124-2302711, 4085091	
HRC FUSES	8	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
HRC FUSES	9	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
HRC FUSES	10	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
GI WIRE & FLAT	1	APT ENGINEERING WORKS	C-38/1, WAZIRPUR INDUSTRIAL AREA, NEAR ASHOK VIHAR, WAZIRPUR INDUSTRIAL AREA, WAZIRPUR INDUSTRIAL AREA RD, BLOCK B, WAZIRPUR INDUSTRIAL AREA, WAZIRPUR, NEW DELHI, DL 110052	011 2737 3579	
GI WIRE & FLAT	2	ARUN ENGG WORKS	BHARAT VELVET COMPOUND,SAFED POOL,KAURLA ANDHERI ROAD,MUMBAI-	022-28511704	
GI WIRE & FLAT	3	GRAM ENGINEERING	22, J.N. MUKHERJEE ROAD HOWRAH 711106	033-22426920/ Mr. Ashok Pachamiya; windows@vsnl.net	
GI WIRE & FLAT	4	INDIANA CABLE TRAYS CORPORATION	INDIANA HOUSE,PB NO.7409 ,MAROL NAKA,ANDHERI MUMBAI-400059	022-28504743,28505611 sales@indianagroup.com, service@indianagroup.com	
GI WIRE & FLAT	5	JAMNA METAL COMPANY	10A,HAIDERPUR IND. AREA,MAIN ROAD,HAIDERPUR, DELHI-110052	011 2749 0316	
GI WIRE & FLAT	6	M.J. WORKS	B-132 OKHLA INDUSTRIAL, ESTATE, PHASE-I, NEW DELHI- 110020	011-26817536	
GI WIRE & FLAT	7	METTALITE INDUSTRIES	3, ANSARI ROAD,DARYA GANJ,DELHI-110002	011-23272233	
GI WIRE & FLAT	8	NATIONAL GALVANISING CO.	66,BARRACKPORE TRUNK RD,CALCUTTA-700058	033 2553 1254	
GI WIRE & FLAT	9	PRESS METAL CORPORATION	N.N. VASANJI ROAD,ANDHERI-KURLA ROAD, MUMBAI-400059	022 - 26230814	
GI WIRE & FLAT	10	SYSTEM ENCL.ENTERPRISES	P-23,CIT ROAD, CALCUTTA-700014	91-33-2446433/2462684 'systencl@cal2.vsnl.net.in	
HIGH MAST	1	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID :rabans@bajajelectricals.com;	
HIGH MAST	2	TLL	M/S TRANSRAIL LIGHTING LIMITED (TLL), GAMMON INDIA LIMITED 2ND FLOOR , CENTRIC PLAZA, PLOT NO.8 POCKET-4, SECTOR-11 DWARKA , NEW DELHI -110075	hemant.jain@transrailltd.com'	
IND.POWER & WLDG SOCKETS	1	CROMPTON GREAVES	3RD FLOOR, EXPRESS BUILDING,9-10, BAHADUR SHAH ZAFAR MARG, NEAR ITO CROSSING,NEW DELHI-110002, INDIA	91 11 23460700 - 999 'Sunil.Das@cgglobal.com	
IND.POWER & WLDG SOCKETS	2	CYCLO ELECTRIC DEVICE & SERV.CO.	: A-3, NEAR ANTHEM BIOSCIENCE, KSSIDC INDUSTRIAL AREA, BOMMASANDRA, BOMMASANDRA INDUSTRIAL AREA, BANGALORE, KARNATAKA 560099	Mr. H.Jaishanker +919845039081, 080 - 27833102 , 080 - 27833103 : +91 80 41460985 'cycloelectric@gmail.com	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
IND.POWER & WLDG SOCKETS	3	BCH	20/4, MATHURA ROAD, FARIDABAD - 121006, HARYANA, INDIA	0(129)-4063000, 9015800189(Ramesh Giri) 'ramesh.giri@bchindia.com	
IND.POWER & WLDG SOCKETS	4	BEST & CROMPTON	Best & Crompton Engineering Ltd	Ph : +91 44 4551 4724 , MRKT DGM Mr. VI	BEST & CROMPTON
IND.POWER & WLDG SOCKETS	5	AJMERA INDUSTRIES & ENGG. WORKS	AJMERA INDL. AND ENGG. WORKS. AJMERA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	Tel : 022 27620299 / 97 / 96 'mail@ajmera.net	
INDICATING LAMPS	1	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	
INDICATING LAMPS	2	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	6832259,6918834-37	
INDICATING LAMPS	3	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
INDICATING LAMPS	4	VAISHNO(HOTLINE SWGR.& CONTROL)	G-19, SECTOR - 11, NOIDA - 201301, UTTAR PRADESH, INDIA	8377805157 9818338922	
INDICATING LAMPS	5	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	9818338922	
INDICATING LAMPS	6	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
INDICATING LAMPS	7	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
JUNCTION BOXES (NON FLAME PROOF)	1	JASPER ENGNIREES PVT. LTD.	A-23, SECTOR - 8, NOIDA-201301	0120-4033520/533	
JUNCTION BOXES (NON FLAME PROOF)	2	Electro Controls & Devices	M/S ELECTRO CONTROLS & DEVICES, F-41, SITE-C, SURAJPUR INDUSTRIAL AREA GREATER NOIDA, UTTAR PRADESH :201308	Mr. Sanjay Sharma (Chief Promoter) 0120-2569487, 2560100,2560300	
JUNCTION BOXES (NON FLAME PROOF)	3	M/s Shrenik & Co.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR, AHMEDABAD – 382 213	020-026708100	
JUNCTION BOXES (NON FLAME PROOF)	4	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	Awasthi(09971119006) Tel: ++91 20 6674 5103, Mobile: +91 90499 95985, Fax: ++91 20 6674 5126 contact person : Vishwa bandhu	
JUNCTION BOXES (NON FLAME PROOF)	5	Adroit Control Engineers Pvt.Ltd.	M/S ADROIT CONTROL ENGINEERS PVT.LTD. PLOT-3, KRISHNA INDL. AREA, SECTOR-25 FARIDABAD – 121004	011-47600700, 0129-4251400	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
JUNCTION BOXES (NON FLAME PROOF)	6	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	Tel: ++91 20 6674 5103, Mobile: +91 90499 95985, Fax: ++91 20 6674 5126 contact person : Vishwa bandhu E-mail:d.gupta@pmipl-online.com ;admin@pmipl-online.com	
JUNCTION BOXES (NON FLAME PROOF)	7	MIKA ENGINEERS	BRANCH OFFICE : 'D'-101, DHEERAJ HERITAGE RESIDENCY II, SHASTRI NAGAR, SANTACRUZ (W), MUMBAI 400 054.	Director : Mr. Asgar Karimi Email: asgar@mikaengineers.com E-mail : mika@mtnl.net.inTelfax : 022-26610081/82/83/84Tel : 02527-249066/70 Cell : 099230 74373	TYPE-S ONLY
JUNCTION BOXES (NON FLAME PROOF)	8	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	TEL.- +912066745000 Awasthi(09971119006) Tel: ++91 20 6674 5103, Mobile: +91 90499 95985, Fax: ++91 20 6674 5126 contact person : Vishwa bandhu E-mail:d.gupta@pmipl-online.com ;admin@pmipl-online.com	
JUNCTION BOXES (FLAME PROOF)	1				
LIGHTING DISTRIBUTION BOARDS	1	ADVANCE ENGG. COMPANY	38,SETHI IND. ESTATE 10/E,SUREN RD,ANDHERI MUMBAI-400097	91 - 22 - 24360086	
LIGHTING DISTRIBUTION BOARDS	2	Sterling Generators Pvt. Ltd.	C-56/38, INSTITUTIONAL AREA, SECTOR-62, NOIDA -201307, U.P.	Nityanand Engineer-Sales & Marketing (Panel Division) Noida, UP | 201307, India Mobile-+91-8510022170	
LIGHTING DISTRIBUTION BOARDS	3	MIKA ENGINEERS	BRANCH OFFICE : 'D'-101, DHEERAJ HERITAGE RESIDENCY II, SHASTRI NAGAR, SANTACRUZ (W), MUMBAI 400 054.	Director : Mr. Asgar Karimi E-mail : mika@mtnl.net.inTelfax : 022-26610081/82/83/84Tel : 02527-249066/70 Cell : 099230 74373 ; Email: asgar@mikaengineers.com	
LIGHTING DISTRIBUTION BOARDS	4	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
LIGHTING DISTRIBUTION BOARDS	5	KMG ATOZ SYSTEMS	"ATOZ HOUSE" C-49, SECTOR-81, GAUTAM BUDDH NAGAR, NOIDA – 201 305 U. P. (INDIA)	Tel : +91-120-4207920 Fax : +91-120-4207921, 4327958 Phone:098 10 802710	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
LIGHTING DISTRIBUTION BOARDS	6	UNILEC ENGINEERS PVT. LTD.	BEHRAMPUR INDUSTRIAL AREA, BEGAMPUR KHATOLA ROAD, GURGAON-122001	0124-4030247,248, 4559700, 9911087173	
LIGHTING DISTRIBUTION BOARDS	7	AVAIODS TECHNOVATORS LTD.	PLOT NO.25 ,SECTOR-3,IMT-MANESAR, GURGEON-122050 (HARYANA)	KRISHNA KALRA- 09958096168	
LIGHTING DISTRIBUTION BOARDS	8	Adroit Control Engineers Pvt.Ltd.	M/S ADROIT CONTROL ENGINEERS PVT.LTD. PLOT-3, KRISHNA INDL. AREA, SECTOR-25 FARIDABAD – 121004	011-47600700, 0129-4251400	
LIGHTING DISTRIBUTION BOARDS	9	JACKSON ENGINNEERS	A-43, HOSEIRY COMPLEX, OPPOSITE NSEZ, NOIDA-201305	0120-4302600, 2568923,27	
LIGHTING DISTRIBUTION BOARDS	10	Adlec Systems Private Limited	PLOT NO-277, SWARN PARK, UDYOG NAGAR, MUNDKA, MAIN ROHTAK ROAD, UDYOG NAGAR, NEW DELHI, DELHI 110041	011 2834 5061	
LIGHTING DISTRIBUTION BOARDS	11	Popular Switchgears Pvt Ltd	712, ARUN CHAMBERS, TARDEO MAIN ROAD, TARDEO, NEAR TARDEO AIRCONDITIONER MARKET, MUMBAI - 400034	-9362634406	
LIGHTING DISTRIBUTION BOARDS	12	CANDS	J/202, ANSA INDUSTRIAL ESTATE, SAKI VIHAR ROAD, SAKINAKA, ANDHERI (EAST), MUMBAI-72	022-28570858	
LIGHTING DISTRIBUTION BOARDS	13	Pyrotech Electronics Pvt. Ltd.	E-329, ROAD NO. 12, M.I.A., MADRI UDAIPUR, RAJASTHAN – 313001	Tel No. +91-294-3290603, 6450147, 6450180, 9351305343 Email Id – pyrotech@pyrotechindia.com	
LIGHTING DISTRIBUTION BOARDS	14	Positronics Control Systems Pvt Ltd	POSITRONICS HOUSE ,882/ 2, G.I.D.C. MAKARPURA,VADODARA 390010 GUJARAT	+91 265 2642496 Fax: +91 265 264 7033 / 234 0944 E- mail : info@positronicsindia.com Website:www.positronicsindia.com	
LIGHTING DISTRIBUTION BOARDS	15	Industrial Switchgears & Control Pvt Ltd	S-02 AMARDEEP MAHAL, NANDA PATKAR RD, VILE PARLE EAST, MUMBAI - 400057	(91)-22-26182011	
LIGHTING DISTRIBUTION BOARDS	16	M/s Vidhyut Control (I) Pvt.Ltd.	D-12 & 13, SECTOR-17, KAVI NAGAR INDL.AREA, GHAZIABAD – 201002 (DELHI NCR) U.P. INDIA		
LIGHTING DISTRIBUTION BOARDS	17	MILESTONE SWITCHGEARS PVT. LTD.	MILESTONE SWITCHGEARS PVT. LTD. 97, UDYOG VIHAR, PHASE-1, GURGEON HARYANA - 122016	Phone Nos.: 0124-4994900 (30 Lines) Fax: 0124-4002973 Email: jaideep.ahuja@milestonesindia.com URL: www.milestonesindia.com	
LIGHTING FIXTURES (NON LED)	2	BALIGA LIGHTING EQPT PVT LTD	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	44-24995505,22680990-4	
LIGHTING FIXTURES (NON LED)	3	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
LIGHTING FIXTURES (NON LED)	4	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srabans@bajajelectricals.com;	
LIGHTING FIXTURES (NON LED)	5	CROMPTON GREAVES	3RD FLOOR, EXPRESS BUILDING,9-10, BAHADUR SHAH ZAFAR MARG, NEAR ITO CROSSING,NEW DELHI-110002, INDIA	91 11 23460700 - 999 Sunil.Das@cgglobal.com	
LIGHTING FIXTURES (NON LED)	6	EVERGREEN ENGG. CO.	EVERGREEN ENGG COMPANY WORKS-5, PLOT NO. 9,10,11,12, SURVEY NO. 242, CHINCH PADA, VASAI EAST-401208	(0250) 6458250	
LIGHTING FIXTURES (NON LED)	7	PHILIPS	9TH FLOOR,DLF 9B, DLF CYBER CITY, DLF PHASE-III,GURGAON-122002	01244606001, Sharad (+919871150447)	
LIGHTING FIXTURES (NON LED)	8	WIPRO LTD.	WIPRO CONSUMER CARE AND LIGHTING, 5TH FLOOR, GODREJ ETERNIA -C, OLD PUNE-MUMBAI ROAD, SHIVAJINAGAR, PUNE -411005	020-66098700	
LIGHTING FIXTURES (NON LED)	9	HPL	M/S HPL ELECTRIC & POWER PVT. LTD. PLOT NO. 76-B,PHASE-IV, SEC-57, HSIIDC, INDL. AREA , KUNDLI, DIST.- SONEPAT (HARYANA) - 131028	mohitsharma@hplindia.com'	
LIGHTING FIXTURES (NON LED)	10	SURYA ROSHNI LIMITED	PADMA TOWER, RAJENDRA PLACE, RAJENDRA PLACE NEW DELHI	011-25810093	
LIGHTING FIXTURES (NON LED)	11	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA-201301	GIRISH KUMAR SHRIVASTAVA +91-9810528922	
LIGHTING FIXTURES (FLAME PROOF)	1	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA-201301	GIRISH KUMAR SHRIVASTAVA +91-9810528922	
LIGHTING LAMP (NON LED)	1	WIPRO LTD.	WIPRO CONSUMER CARE AND LIGHTING, 5TH FLOOR, GODREJ ETERNIA -C, OLD PUNE-	020-66098700	
LIGHTING LAMP (NON LED)	2	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	9818338922	
LIGHTING LAMP (NON LED)	3	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA-201301	GIRISH KUMAR SHRIVASTAVA +91-9810528922	
LIGHTING LAMP (NON LED)	4	INSTA POWER	PLOT NO. - 457 PHASE - V, UDYOG VIHAR, GURGAON - 122016	124-4124000	
LIGHTING LAMP (NON LED)	5	HPL	M/S HPL ELECTRIC & POWER PVT. LTD. PLOT NO. 76-B,PHASE-IV, SEC-57, HSIIDC, INDL. AREA , KUNDLI, DIST.- SONEPAT (HARYANA) - 131028	mohitsharma@hplindia.com'	
LIGHTING POLES	1	BOMBAY TUBE & POLES CO.	BOMBAY TUBES & POLES CO. 2ND LANE, DARUKHANA, PLOT NO. 100, MAZGAON, MUMBAI - 10	Tel. : +91 22 23729802, email ID: btpc1954@hotmail.com	
LIGHTING POLES	2	RIDHDHI POLES	4/5 INDUSTRIAL ESTATE, GORWA, VADODRA-390016	0265 - 2283768	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
LIGHTING POLES	3	MIKA ENGINEERS	BRANCH OFFICE : 'D'-101, DHEERAJ HERITAGE RESIDENCY II, SHASTRI NAGAR, SANTACRUZ (W), MUMBAI 400 054. WORKS : AT POST AGHAI, SHED NO. 2, VILLAGE AGHAI JILLA, SHAHPUR, DIST. THANE 421 601 TEL : 02527-249066/70 CELL : 099230 74373	**Director :** Mr. Asgar Karimi Email: asgar@mikaengineers.com;mika@mtnl.net.in Telfax : 022-26610081/82/83/84 Tel : 02527-249066/70 Cell : 099230 74373	
LIGHTING POLES	4	KL INDUSTRIES	B1 1001 LOK GAURAV, LBS MARG, VIKHROLI WEST, MUMBAI - 400083	(91)-9821013736 (91)-22-25774272	
LIGHTING POLES	5	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srabans@bajajelectricals.com;	
LIGHTING POLES	6	TLL	M/S TRANSRAIL LIGHTING LIMITED (TLL), GAMMON INDIA LIMITED 2ND FLOOR , CENTRIC PLAZA, PLOT NO.8 POCKET-4, SECTOR-11 DWARKA , NEW DELHI -110075	hemant.jain@transrailltd.com'	
LIGHTING SWITCH , SOCKET & S/F UNIT	1	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
LIGHTING SWITCH , SOCKET & S/F UNIT	2	ANCHOR KENWOOD ELECTRICAL	STEEL HOUSE, B WING, PLOT NO. 24, MAHAL INDUSTRIAL ESTATE, MAHAKALI CAVES ROAD, NEAR PAPER BOX, ANDHERI (E), MUMBAI, MAHARASHTRA.- 400093	022-30418888.	
LIGHTING SWITCH , SOCKET & S/F UNIT	3	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	Rajiv Sharma-9312004687	
LIGHTING SWITCH , SOCKET & S/F UNIT	4	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
LIGHTING SWITCH , SOCKET & S/F UNIT	5	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
LIGHTING SWITCH , SOCKET & S/F UNIT	6	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
LIGHTING TRANSFORMER	1	AUTOMATIC ELECTRIC LTD.	ADDRESS : 96 AB LONAVLA INDUSTRIAL ESTATE	Phone : +91 2114323665 Fax : +91 2114273482	
LIGHTING TRANSFORMER	2	INDCOIL	PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
LIGHTING TRANSFORMER	3	POWER PACK ENTERPRISES	POWER PACK ENTERPRISES MR. NEHAL SHAH / MR. SHARAD SHAH (PARTNER) NO. 3, JAYSHREE SADAN, 1ST FLOOR, OLD NAGARDAS ROAD, ANDHERI EAST MUMBAI - 400069, MAHARASHTRA, INDIA	Call Us:08447573761 Mobile: +(91)-9821787821 +(91)-9821035604	
LIGHTING TRANSFORMER	4	VIJAY ELECTRICALS LTD.	6-3-648/1&2, OFF RAJ BHAVAN ROAD, SOMAJIGUDA, HYDERABAD - 500 082. ANDHRA PRADESH, INDIA.	Vijay Electricals Mr. Bharat Giri / Ajay Giri (CEO) B 79, Gali No. 60, Sanjay Colony, Sector- 23 Faridabad - 121005, Haryana, India Call Us: 09953353612 websales@vijaielectricals.com	
LIGHTING TRANSFORMER	5	GILBERT & MAXWELL	WORKS PLOT G-28 , M.I.D.C., AMBAD NASHIK - 422010, MAHARASHTRA, INDIA	Mr. Sanjeev Kulkarni, (Marketing Manager) | Cell: 9822586724 sanjeevkulkarni@gilbert-maxwell.in Phone : + 91 - 253 - 238 25 51 Fax : + 91 - 253 - 238 25 52	
LIGHTING TRANSFORMER	6	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., SOUTHERN ELECTRIKS 14, CART TRACK ROAD, MADUVANKARAI, CHENNAI - 600 042, INDIA.	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795 FAX: +91 - 44 - 22351662, 22451693 E-MAIL: mira@kappaelectricals.com sales@kappaelectricals.com	
LIGHTING TRANSFORMER	7	Ames Impex Electricals Pvt. Ltd	C-1B/1207, PHASE IV, GIDC NARODA, AHMEDABAD, GUJARAT 382330	Phone:079 2282 1648	
LIGHTING PANEL (NON FLAME PROOF)	1	MIKA ENGINEERS	D'-101, DHEERAJ HERITAGE RESIDENCY II, SHASTRI NAGAR, SANTACRUZ (W), MUMBAI 400 054.	Director : Mr. Asgar Karimi E-mail : mika@mtnl.net.inTelfax : 022-26610081/82/83/84Tel : 02527-249066/70 Cell : 099230 74373;asgar@mikaengineers.com	
LIGHTING PANEL (NON FLAME PROOF)	2	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
LIGHTING PANEL (NON FLAME PROOF)	3	Vidhyut Controls (India) Pvt. Ltd.	M/S VIDHYUT CONTROL (I) PVT.LTD. D-12 & 13, SECTOR-17,KAVI NAGAR INDL.AREA,GHAZIABAD – 201002 (DELHI NCR) U.P. INDIA	0120-4186400, 0120-4186423, 8527005590(DK GUPTA)	
LIGHTING PANEL (NON FLAME PROOF)	4	KMG ATOZ SYSTEMS	"ATOZ HOUSE" C-49, SECTOR-81, GAUTAM BUDDH NAGAR, NOIDA – 201 305 U. P. (INDIA)	Tel : +91-120-4207920 Fax : +91-120-4207921, 4327958 Phone:098 10 802710	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
LIGHTING PANEL (NON FLAME PROOF)	5	UNILEC ENGINEERS PVT. LTD.	BEHRAMPUR INDUSTRIAL AREA, BEGAMPUR KHATOLA ROAD, GURGAON-122001	0124-4030247,248, 4559700, 9911087173	
LIGHTING PANEL (NON FLAME PROOF)	6	AVAIODS TECHNOVATORS LTD.	PLOT NO.25 ,SECTOR-3,IMT-MANESAR, GURGEON-122050 (HARYANA)	KRISHNA KALRA- 09958096168	
LIGHTING PANEL (NON FLAME PROOF)	7	Adroit Control Engineers Pvt.Ltd.	M/S ADROIT CONTROL ENGINEERS PVT.LTD. PLOT-3, KRISHNA INDL. AREA, SECTOR-25 FARIDABAD – 121004	011-47600700, 0129-4251400	
LIGHTING PANEL (NON FLAME PROOF)	8	JACKSON ENGINNEERS	A-43, HOSEIRY COMPLEX, OPPOSITE NSEZ, NOIDA-201305	0120-4302600, 2568923,27	
LIGHTING PANEL (NON FLAME PROOF)	9	MILESTONE SWITCHGEARS PVT. LTD.	MILESTONE SWITCHGEARS PVT. LTD. 97, UDYOG VIHAR, PHASE-1, GURGEON HARYANA - 122016	Phone Nos.: 0124-4994900 (30 Lines) Fax: 0124-4002973 Email: jaideep.ahuja@milestonesindia.com URL: www.milestonesindia.com	
MCB	1	MDS SWITCHGEAR LTD	314-317SHAH NAHAR ESTATE	011 - 25793021	
MCB	2	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
MCB	3	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
MCB	4	S&S POWER SWITCHGEAR LTD,	NEW NO. 67, OLD NO. 19, DR. RANGA ROAD, MYLAPORE, CHENNAI - 600004	044 - 24988056, 044 - 24988057, 044 - 24988058	
RECEPTACLES - DECORATIVE	1	ANCHOR KENWOOD ELECTRICAL	STEEL HOUSE, B WING, PLOT NO. 24, MAHAL INDUSTRIAL ESTATE, MAHAKALI CAVES ROAD, NEAR PAPER BOX, ANDHERI (E), MUMBAI, MAHARASHTRA.- 400093	022-30418888.	
RECEPTACLES - DECORATIVE	2	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
RECEPTACLES - DECORATIVE	3	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srabans@bajajelectricals.com;	
RECEPTACLES - DECORATIVE	4	AJMERA INDUSTRIES & ENGG. WORKS	AJMERA INDL. AND ENGG. WORKS. AJMERA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	Tel : 022 27620299 / 97 / 96 'mail@ajmera.net	
SWITCH BOX	1	ANCHOR KENWOOD ELECTRICAL	STEEL HOUSE, B WING, PLOT NO. 24, MAHAL INDUSTRIAL ESTATE, MAHAKALI CAVES ROAD, NEAR PAPER BOX, ANDHERI (E), MUMBAI, MAHARASHTRA.- 400093	022-30418888.	
SWITCH BOX	2	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
SWITCH BOX	3	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srabans@bajajelectricals.com;	
SWITCH BOX	4	AJMERA INDUSTRIES & ENGG. WORKS	AJMERA INDL. AND ENGG. WORKS. AJMERA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	Tel : 022 27620299 / 97 / 96 'mail@ajmera.net	
TERMINAL BLOCKS	1	WAGO-CONTROLS	C 27, GREATER NOIDA, SECTOR 58, C BLOCK, SECTOR 58, NOIDA, UTTAR PRADESH 201307	0120-2580409/10	
TERMINAL BLOCKS	2	CONNECT WELL	309A/4, 3RD FLOOR, KALKAJI, OKHLA IND AREA PH-2, GOVINDPURI, NEW DELHI, DL 110019	9811881085 09871419996 011-65908877	
TERMINAL BLOCKS	3	ELMEX CONTROLS PVT. LTD.	12,G.I.D.C.ESTATE,MUKARPURA ROAD,VADODARA-390010	9374631074	
TERMINAL BLOCKS	4	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
TERMINAL BLOCKS	5	TECHNOPLAST	OPP.I.M.INTER COLLEGE, BEGUM SARAI KHURD ROAD, AMROHA - 244221, U.P.	PH:- 05922 264006 CELL NO:- 9012676000, 9319520799, 9319582467	
TERMINAL BLOCKS	6	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	TEL.- +912066745000 Awasthi(09971119006) Tel: ++91 20 6674 5103, Mobile: +91 90499 95985, Fax: ++91 20 6674 5126 contact person : Vishwa bandhu E-mail:d.gupta@pmipl-online.com ;admin@pmipl-online.com	
TERMINAL BLOCKS	7	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
TIMERS - PNEUMATIC	1	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	
TIMERS - PNEUMATIC	2	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
TIMERS - PNEUMATIC	3	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
TIMERS - PNEUMATIC	4	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
TIMERS - PNEUMATIC	5	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
TIMERS - PNEUMATIC	6	ELECTRONIC AUTOMATION PVT. LTD.	20, KHB INDUSTRIAL AREA YELAHANKA BANGLORE-560064	080 -28567561 / 080 -28567562 / 080 -42802345	
TIMERS - ELECTRONIC	1	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
TRANSDUCERS	1	AUTOMATIC ELECTRIC LTD.	ADDRESS : 96 AB LONAVLA INDUSTRIAL ESTATE	Phone : +91 2114323665 Fax : +91 2114273482	
TRANSDUCERS	2	SOUTHERN TRANSDUCERS	INTERTECH B-83, FLATTED FACTORY COMPLEX, NEAR MODI MILLS, OKHLA, NEW DELHI-110020	Mr. Gurmohit Singh 011-41020365 / 9891402128	
RECEPTACLE (FLAME PROOF)	1	BALIGA ELECTRICALS	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	44-24995505,22680990-4	
RECEPTACLE (FLAME PROOF)	2	SUDHIR SWITCHGEAR	305/6, APEEJAY HOUSE, 130, BOMBAY SAMACHAR MARG, MUMBAI - 400 023. INDIA	Telephone Nos. : 40460000 (100 lines) Fax Nos. : ++-91-22-22049381 Email : md@sudhirswitchgears.com ; works@sudhirswitchgears.com ; scud@vsnl.com	
RECEPTACLE (FLAME PROOF)	3	FCG FLAME PROOF CONTROL GEAR	A1/53, SHAH & NAHAR INDUSTRIAL ESTATE, SITARAM JADHAV ROAD, LOWER PAREL (W), MUMBAI-400 013	Mr. N. G. Patel CMD Office No: +91-22-43443200 Fax No: +91-22-24960313	
RECEPTACLE (NON FLAME PROOF)	1	AJMERA INDUSTRIES & ENGG. WORKS	AJMERA INDL. AND ENGG. WORKS. AJMERA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	Tel : 022 27620299 / 97 / 96 'mail@ajmera.net	
RECEPTACLE (NON FLAME PROOF)	2	CROMPTON GREAVES	3RD FLOOR, EXPRESS BUILDING,9-10, BAHADUR SHAH ZAFAR MARG, NEAR ITO CROSSING,NEW DELHI-110002, INDIA	91 11 23460700 - 999 'Sunil.Das@cgglobal.com	
RECEPTACLE (NON FLAME PROOF)	3	CYCLO ELECTRIC DEVICE & SERV.CO.	: A-3, NEAR ANTHEM BIOSCIENCE, KSSIDC INDUSTRIAL AREA, BOMMASANDRA, BOMMASANDRA INDUSTRIAL AREA, BANGALORE, KARNATAKA 560099	Mr. H.Jaishanker +919845039081, 080 - 27833102 , 080 - 27833103 : +91 80 41460985 'cycloelectric@gmail.com	
RECEPTACLE (NON FLAME PROOF)	4	BCH	20/4, MATHURA ROAD, FARIDABAD - 121006, HARYANA, INDIA	0(129)-4063000, 9015800189(Ramesh Giri) 'ramesh.giri@bchindia.com	
RECEPTACLE (NON FLAME PROOF)	5	BEST & CROMPTON	BEST & CROMPTON ENGINEERING LTD 28C, AMBATTUR INDUSTRIAL ESTATE (NORTH) AMBATTUR, CHENNAI - 600 098	Ph : +91 44 4551 4724 , MRKT DGM Mr. VI Raj:- 9840593411 'bestcromptonviraj@gmail.com	
EMERGENCY LIGHTING UNIT (FIXED & PORTABLE TYPE)- NON FLAME PROOF	1	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srabans@bajajelectricals.com	
EMERGENCY LIGHTING UNIT (FIXED & PORTABLE TYPE)- NON FLAME PROOF	2	PROLITE ENGINEERS PRIVATE LIMITED,	PLOT A- 41 B, SIPCOT INDUSTRIAL GROWTH CENTRE , ORAGADAM, SRIPERUMBUDHUR TALUK, KANCHEEPURAM DIST – 603 109 INDIA	Telephone: +91 44 7101 8134 Mobile: +91 98840 11862, +9198840 11863 E-mail: Marketing Enquiries : balaji@pro-lite.co.in Customer Support : sales@pro-lite.co.in	
EMERGENCY LIGHTING UNIT (FIXED & PORTABLE TYPE)- FLAME PROOF	1				

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
24V SUPPLY MODULE WITH COMPLETE ACCESSORIES & HAND LAMP UNIT	1	POWER PACK ENTERPRISES	POWER PACK ENTERPRISES MR. NEHAL SHAH / MR. SHARAD SHAH (PARTNER) NO. 3, JAYSHREE SADAN, 1ST FLOOR, OLD NAGARDAS ROAD, ANDHERI EAST MUMBAI - 400069, MAHARASHTRA, INDIA	Call Us:08447573761 Mobile: +(91)-9821787821 +(91)-9821035604	
24V SUPPLY MODULE WITH COMPLETE ACCESSORIES & HAND LAMP UNIT	2	INDCOIL	ADDRESS: PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	
24V SUPPLY MODULE WITH COMPLETE ACCESSORIES & HAND LAMP UNIT	3	Ames Impex Electricals Pvt. Ltd	C-1B/1207, PHASE IV, GIDC NARODA, AHMEDABAD, GUJARAT 382330	Phone:079 2282 1648	
AMMETER	1	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
AMMETER	2	RISHABH INST.PVT LTD	RISHABH INSTRUMENTS PVT. LTD. F-31, MIDC, SATPUR NASHIK - 422007 MAHARASHTRA INDIA	marketing@rishabh.co.in 91-253 2202202/203 Fax: 91 253 2351064	
VOLTMETER	1	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
VOLTMETER	2	RISHABH INST.PVT LTD	RISHABH INSTRUMENTS PVT. LTD. F-31, MIDC, SATPUR NASHIK - 422007 MAHARASHTRA INDIA	marketing@rishabh.co.in 91-253 2202202/203 Fax: 91 253 2351064	
RCCB	1	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
RCCB	2	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
RCCB	3	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
RCCB	4	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
RCCB	5	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
RCCB	6	CROMPTON GREAVES	RAIL TRANSPORTATION SYSTEMS,VANDANA BUILDING, 11, TOLSTOY MARG, TOLSTOY MARG, NEW DELHI, DL 110001	011 3041 6300	
PVC WIRES	BIS APPROVED MAKE				
PEDESTAL FAN & CEILING FAN	REPUTED MAKE				

Sub-vendor List

ITEM DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
EXIT SIGN (FLAME PROOF)	REPUTED MAKE				
EXIT SIGN (NON FLAME PROOF)	REPUTED MAKE				
LADDER	REPUTED MAKE				
HUME PIPE	REPUTED MAKE				
PHOTOELECTRIC SWITCH	REPUTED MAKE				
DICHORIC SPOT LIGHTING FIXTURE	REPUTED MAKE				

ANNEXURE-D

(VENDOR DRAWING/DOCUMENT SCHEDULE)

S. No.	DESCRIPTION	THROUGH DMS	HARD PRINTS	CD-ROMs
1	Docs. /drgs. for approval (First submission)	YES	-	-
2	Docs. / drgs. for approval (Second & subsequent submission till approval)	YES	-	-
3	Final approved docs. / drgs. for Distribution	YES	As per NIT	As per NIT
4	As-built prints	YES	As per NIT	As per NIT

4x270 MW TSGENCO BHADRADRI TPS
BOQ-cum-PRICE SCHEDULE FOR STATION LIGHTING SYSTEM

(A) MAIN ITEMS (SUPPLY)

Sr. No	Item Code	Item Description	Unit	Quantity	Unit price	Total price	Remarks
1	558-11001-A	20 MM DIA MS ROD	NOS	1300			
2	558-11002-A	24V SUPPLY MODULE & LAMP UNIT FIX TYPE	NOS	60			
3	558-11003-A	24V SUPPLY MODULE & LAMP UNIT PORTABLE	NOS	10			
4	558-11005-A	25X3 MM GI FLAT	MTR	2500			
5	558-11008-A	50X6 MM GI FLAT	MTR	1500			
6	558-11010-A	AC LDB TYPE -F (O/G 8)	NOS	16			
7	558-11011-A	AC LDB TYPE-H (O/G 12)	NOS	25			
8	558-11013-A	AC WDB TYPE -H (O/G 12)	NOS	4			
9	558-11014-A	CEILING FANS 1200 MM SWEEP	NOS	25			
10	558-11019-A	DC LDB TYPE-D (O/G 6)	NOS	8			
11	558-11024-A	EMERGENCY LIGHTING UNIT	NOS	40			
12	558-11025-A	EXIT SIGN	NOS	15			
13	558-11026-A	EXIBLE CONDUITS ELECTRO GALV. 20MM DIA	MTR	13,000			
14	558-11029-A	GI CONDUITS 1.6MM THK EPOXY 25MM DIA	MTR	3,000			
15	558-11030-A	GI CONDUITS,1.6MM THICK, 20MM DIA	MTR	3,00,000			
16	558-11031-A	GI CONDUITS,1.6MM THICK, 25MM DIA	MTR	17,000			
17	558-11032-A	GI CONDUITS,2.0MM THICK, 40MM DIA	MTR	10,000			
18	558-11033-A	GI CONDUITS,2.0MM THICK, 50MM DIA	MTR	1,000			
19	558-11035-A	GI WIRE 16 SWG WIRE	MTR	4,35,000			
20	558-11037-A	HUME PIPE 100 MM DIA	MTR	500			
21	558-11038-A	JUNCTION BOXES TYPE JB-F	NOS	12,500			
22	558-11039-A	JUNCTION BOXES TYPE JB-FE	NOS	275			
23	558-11042-A	JUNCTION BOXES TYPE JB-S	NOS	650			
24	558-11273-A	14W T5 FL TUBE	NOS	4600			
25	558-11047-A	LIGHTING LAMP 18W CFL	NOS	890			
26	558-11049-A	LIGHTING LAMP 125W HPMV (SON-E)	NOS	575			
27	558-11051-A	LIGHTING LAMP 150W HPSV (SON-E)	NOS	1,990			
28	558-11052-A	LIGHTING LAMP 150W HPSV (SON-T)	NOS	1000			
29	558-11055-A	LIGHTING LAMP 250W HPSV (SON-E)	NOS	575			
30	558-11056-A	LIGHTING LAMP 250W HPSV (SON-T)	NOS	265			
31	558-11059-A	LIGHTING LAMP 28W T5 FL. TUBE	NOS	7,460			
32	558-11062-A	LIGHTING LAMP 400W HPSV (SON-E)	NOS	305			
33	558-11067-A	LIGHTING LAMP 70W HPSV (SON-E)	NOS	5,750			
34	558-11068-A	LIGHTING LAMP 70W HPSV (SON-T)	NOS	20			
35	558-11070-A	PEDESTAL FAN	NOS	5			
36	558-11071-A	LIGHTING MAST OCTGANAL SHAPE, TYPE LM30	NOS	10			
37	558-11072-A	LIGHTING PANEL (DECORATIVE) TYPE-A (12)	NOS	41			
38	558-11073-A	LIGHTING PANEL (DECORATIVE) TYPE-A (6)	NOS	1			
39	558-11074-A	LIGHTING PANEL INDOOR TYPE- LP-A (12)	NOS	62			
40	558-11075-A	LIGHTING PANEL INDOOR TYPE-LP-A (18)	NOS	40			
41	558-11076-A	LIGHTING PANEL INDOOR TYPE-LP-A (6)	NOS	46			
42	558-11150-A	LIGHTING PANEL INDOOR TYPE LP-D (6)	NOS	24			
43	558-11077-A	LIGHTING PANEL OUTDOOR TYPE- LP-A (12)	NOS	28			
44	558-11079-A	LIGHTING PANEL OUTDOOR TYPE LP-D (6)	NOS	12			
45	558-11080-A	LIGHTING PANEL OUTDOOR TYPE-LP-A (18)	NOS	40			
46	558-11081-A	LIGHTING PANEL OUTDOOR TYPE-LP-A (6)	NOS	1			
47	558-11082-A	LIGHTING PANEL STREET TYPE LP-S (6)	NOS	15			
48	558-11088-A	LUMINAIRES TYPE FC02	NOS	230			
49	558-11088-A	LUMINAIRES TYPE FC06	NOS	2700			
50	558-11089-A	LUMINAIRES TYPE FC26	NOS	550			
51	558-11090-A	LUMINAIRES TYPE FC32	NOS	50			
52	558-11091-A	LUMINAIRES TYPE FC81	NOS	200			
53	558-11097-A	LUMINAIRES TYPE MW96	NOS	575			
54	558-11100-A	LUMINAIRES TYPE SB02	NOS	400			
55	558-11101-A	LUMINAIRES TYPE SB03	NOS	175			
56	558-11102-A	LUMINAIRES TYPE SB11	NOS	940			
57	558-11103-A	LUMINAIRES TYPE SF63	NOS	175			
58	558-11105-A	LUMINAIRES TYPE SF66	NOS	65			
59	558-11106-A	LUMINAIRES TYPE SS61	NOS	20			
60	558-11107-A	LUMINAIRES TYPE SS62	NOS	1000			
61	558-11108-A	LUMINAIRES TYPE SS63	NOS	265			
62	558-11109-A	LUMINAIRES TYPE SW41	NOS	5750			

4x270 MW TSGENCO BHADRADRI TPS BOQ-cum-PRICE SCHEDULE FOR STATION LIGHTING SYSTEM							
63	558-11110-A	LUMINAIRES TYPE SW42	NOS	1050			
64	558-11267-A	LUMINAIRES TYPE FC33	NOS	75			
65	558-11268-A	LUMINAIRES TYPE FC34	NOS	400			
66	558-11269-A	LUMINAIRES TYPE FC07	NOS	415			
67	558-11270-A	LUMINAIRES TYPE FC30	NOS	1150			
68	558-11167-A	LUMINARES TYPE DICHROIC SPOTLIGHT	NOS	85			
69	558-11115-A	POLES TYPE PF1	NOS	5			
70	558-11116-A	POLES TYPE PF2	NOS	45			
71	558-11117-A	POLES TYPE PS1	NOS	400			
72	558-11118-A	POLES TYPE PS2	NOS	200			
73	558-11120-A	PORTABLE HALOGEN LAMP UNIT	NOS	10			
74	558-11121-A	RECEPTACLES TYPE RA	NOS	685			
75	558-11122-A	RECEPTACLES TYPE RA (FLAME PROOF)	NOS	30			
76	558-11123-A	RECEPTACLES TYPE RB	NOS	540			
77	558-11124-A	RECEPTACLES TYPE RC	NOS	170			
78	558-11127-A	STRUCTURAL STEEL	MT	100			
79	558-11132-A	SWITCH BOXES TYPE SWB1	NOS	270			
80	558-11133-A	SWITCH BOXES TYPE SWB2	NOS	115			
81	558-11134-A	SWITCH BOXES TYPE SWB3	NOS	40			
82	558-11136-A	TRANSFORMER 100 KVA	NOS	58			
83	558-11139-A	TRANSFORMER 50 KVA	NOS	32			
84	558-11145-A	WIRES 1X2.5 MM2 CU PVC	MTR	5,15,000			
85	558-11146-A	WIRES 1X4.0 MM2 CU PVC	MTR	2,65,000			
86	558-11028-A	FREE STANDING LADDER	NOS	2			
87	558-11142-A	WHEEL MOUNTED LADDER	NOS	2			

Notes:

1. All Fluorescent fixtures shall have electronic ballast.
2. The unit rates of supply & installation for all equipment and services quoted by the bidder shall be firm for a variation of quantities limited to:
   a) ±30% of total order value till finalization of engineering details & BOQ.
   b) +10% of the total order value in addition to (a) above, till the completion of work at site.
3. 'Basic Design Documents' cover: Drawings/ documents schedule, technical data sheets, GA dwgs. of equipments, quality plan, type test reports and type test proposal (as required) for Station Lighting System.
4. Items shall be cleared for manufacturing and supply in stages on the basis of engineering information to be furnished by the vendor, who is responsible for engineering of the Lighting system.

4x270 MW TSGENCO BHADRADRI TPS
BOQ-cum-PRICE SCHEDULE FOR STATION LIGHTING SYSTEM

(B) MAIN ITEMS (ERECTION & COMMISSIONING)

Sr. No	Item Code	Item Description	Unit	Quantity	Unit price	Total price	Remarks
1	558-11001-C	20 MM DIA MS ROD	NOS	1300			
2	558-11002-C	24V SUPPLY MODULE & LAMP UNIT FIX TYPE	NOS	60			
3	558-11005-C	25X3 MM GI FLAT	MTR	2500			
4	558-11008-C	50X6 MM GI FLAT	MTR	1500			
5	558-11010-C	AC LDB TYPE -F (O/G 8)	NOS	16			
6	558-11011-C	AC LDB TYPE-H (O/G 12)	NOS	25			
7	558-11013-C	AC WDB TYPE -H (O/G 12)	NOS	4			
8	558-11014-C	CEILING FANS 1200 MM SWEEP	NOS	25			
9	558-11019-C	DC LDB TYPE-D (O/G 6)	NOS	8			
10	558-11024-C	EMERGENCY LIGHTING UNIT	NOS	40			
11	558-11025-C	EXIT SIGN	NOS	15			
12	558-11026-C	FLEXIBLE CONDUITS ELECTRO GALV. 20MM DIA	MTR	13,000			
13	558-11029-C	GI CONDUITS 1.6MM THK EPOXY 25MM DIA	MTR	3,000			
14	558-11030-C	GI CONDUITS,1.6MM THICK, 20MM DIA	MTR	3,00,000			
15	558-11031-C	GI CONDUITS,1.6MM THICK, 25MM DIA	MTR	17,000			
16	558-11032-C	GI CONDUITS,2.0MM THICK, 40MM DIA	MTR	10,000			
17	558-11033-C	GI CONDUITS,2.0MM THICK, 50MM DIA	MTR	1,000			
18	558-11035-C	GI WIRE 16 SWG WIRE	MTR	4,35,000			
19	558-11037-C	HUME PIPE 100 MM DIA	MTR	500			
20	558-11038-C	JUNCTION BOXES TYPE JB-F	NOS	12,500			
21	558-11039-C	JUNCTION BOXES TYPE JB-FE	NOS	275			
22	558-11042-C	JUNCTION BOXES TYPE JB-S	NOS	650			
23	558-11071-C	LIGHTING MAST OCTGANAL SHAPE, TYPE LM30	NOS	10			
24	558-11072-C	LIGHTING PANEL (DECORATIVE) TYPE-A (12)	NOS	41			
25	558-11073-C	LIGHTING PANEL (DECORATIVE) TYPE-A (6)	NOS	1			
26	558-11074-C	LIGHTING PANEL INDOOR TYPE- LP-A (12)	NOS	62			
27	558-11075-C	LIGHTING PANEL INDOOR TYPE-LP-A (18)	NOS	40			
28	558-11076-C	LIGHTING PANEL INDOOR TYPE-LP-A (6)	NOS	46			
29	558-11150-C	LIGHTING PANEL INDOOR TYPE LP-D (6)	NOS	24			
30	558-11077-C	LIGHTING PANEL OUTDOOR TYPE- LP-A (12)	NOS	28			
31	558-11079-C	LIGHTING PANEL OUTDOOR TYPE LP-D (6)	NOS	12			
32	558-11080-C	LIGHTING PANEL OUTDOOR TYPE-LP-A (18)	NOS	40			
33	558-11081-C	LIGHTING PANEL OUTDOOR TYPE-LP-A (6)	NOS	1			
34	558-11082-C	LIGHTING PANEL STREET TYPE LP-S (6)	NOS	15			
35	558-11088-C	LUMINAIRES TYPE FC02	NOS	230			
36	558-11088-C	LUMINAIRES TYPE FC06	NOS	2700			
37	558-11089-C	LUMINAIRES TYPE FC26	NOS	550			
38	558-11090-C	LUMINAIRES TYPE FC32	NOS	50			
39	558-11091-C	LUMINAIRES TYPE FC81	NOS	200			
40	558-11097-C	LUMINAIRES TYPE MW96	NOS	575			
41	558-11100-C	LUMINAIRES TYPE SB02	NOS	400			
42	558-11101-C	LUMINAIRES TYPE SB03	NOS	175			
43	558-11102-C	LUMINAIRES TYPE SB11	NOS	940			
44	558-11103-C	LUMINAIRES TYPE SF63	NOS	175			
45	558-11105-C	LUMINAIRES TYPE SF66	NOS	65			
46	558-11106-C	LUMINAIRES TYPE SS61	NOS	20			
47	558-11107-C	LUMINAIRES TYPE SS62	NOS	1000			
48	558-11108-C	LUMINAIRES TYPE SS63	NOS	265			
49	558-11109-C	LUMINAIRES TYPE SW41	NOS	5750			
50	558-11110-C	LUMINAIRES TYPE SW42	NOS	1050			
51	558-11267-C	LUMINAIRES TYPE FC33	NOS	75			
52	558-11268-C	LUMINAIRES TYPE FC34	NOS	400			
53	558-11269-C	LUMINAIRES TYPE FC07	NOS	415			
54	558-11270-C	LUMINAIRES TYPE FC30	NOS	1150			
55	558-11167-C	LUMINARES TYPE DICHROIC SPOTLIGHT	NOS	85			
56	558-11115-C	POLES TYPE PF1	NOS	5			
57	558-11116-C	POLES TYPE PF2	NOS	45			
58	558-11117-C	POLES TYPE PS1	NOS	400			
59	558-11118-C	POLES TYPE PS2	NOS	200			
60	558-11121-C	RECEPTACLES TYPE RA	NOS	685			
61	558-11122-C	RECEPTACLES TYPE RA (FLAME PROOF)	NOS	30			
62	558-11123-C	RECEPTACLES TYPE RB	NOS	540			

4x270 MW TSGENCO BHADRADRI TPS BOQ-cum-PRICE SCHEDULE FOR STATION LIGHTING SYSTEM							
63	558-11124-C	RECEPTACLES TYPE RC	NOS	170			
64	558-11132-C	SWITCH BOXES TYPE SWB1	NOS	270			
65	558-11133-C	SWITCH BOXES TYPE SWB2	NOS	115			
66	558-11134-C	SWITCH BOXES TYPE SWB3	NOS	40			
67	558-11136-C	TRANSFORMER 100 KVA	NOS	58			
68	558-11139-C	TRANSFORMER 50 KVA	NOS	32			
69	558-11145-C	WIRES 1X2.5 MM2 CU PVC	MTR	5,15,000			
70	558-11146-C	WIRES 1X4.0 MM2 CU PVC	MTR	2,65,000			
71	558-11173-C	3.5C-50 AL ARM (LAID ON TRAY)	MTR	25000			
72	558-11175-C	3.5C-95 AL ARM (LAID ON TRAY)	MTR	15000			
73	558-11185-C	2C-25 CU ARM (LAID ON TRAY)	MTR	6000			
74	558-11207-C	3C-2.5 CU ARM	MTR	6000			
75	558-11205-C	3.5C-25 AL ARM (LAID UNDER GROUND)	MTR	15000			
76	558-11193-C	3.5C-95 AL ARM (LAID UNDER GROUND)	MTR	3000			
77	558-11191-C	3.5C-50 AL ARM (LAID UNDER GROUND)	MTR	1000			
						-	

Notes:

1. Erection & commissioning materials (such as double compression cable glands, conduit fittings viz. couplers, elbows, bends, tees, circular boxes etc., conduit accessories viz. clips, saddles, spacing plates, entry bushes, lock nuts, plugs, heavy duty lugs, ferrules, expansion fastners, ball & sockets, earth clips, fan boxes, clamps, screws etc. form part of erection activities) and accessories including commissioning & operational spares upto system handing over to customer has to be worked out for complete and successful erection & commissioning of the total supply as per BOQ. The price to be quoted for E & C accordingly for equipment and fittings.
2. The unit rates of installation for all equipment and services quoted by the bidder shall be firm for a variation of quantities limited to:
   a) ±30% of total order value till finalization of engineering details & BOQ.
   b) +10% of the total order value in addition to (a) above, till the completion of job
3. Fabrication & painting charges of structural steel shall be part of erection charges of those equipment for which the same is being used.
4. All measuring and testing instruments required during erection, testing, commissioning and performance testing shall be arranged by the successful bidder and taken back.
5. Cost of E&C for lighting fixture shall be inclusive of cost of lamp installation.

4x270 MW TSGENCO BHADRADRI TPS *BOQ-cum-PRICE SCHEDULE FOR STATION LIGHTING SYSTEM*					
(C) MANDATORY SPARES (SUPPLY)					
Sr. No	**Item Description**	**Unit**	**Quantity**	**Unit price**	**Total price**
1	**LAMPS**				
(a)	18 W CFL	NOS	2% 0R 2 NOS. WHICHEVER IS MORE		
(b)	28 W fluorescent 'T5' type	NOS	2% 0R 2 NOS. WHICHEVER IS MORE		
(c)	70 W HPSV elliptical	NOS	2% 0R 2 NOS. WHICHEVER IS MORE		
(d)	150 W HPSV tubular	NOS	2% 0R 2 NOS. WHICHEVER IS MORE		
(e)	150 W HPSV elliptical	NOS	2% 0R 2 NOS. WHICHEVER IS MORE		
(f)	250 W HPSV tubular	NOS	2% 0R 2 NOS. WHICHEVER IS MORE		
(g)	250 W HPSV elliptical	NOS	2% 0R 2 NOS. WHICHEVER IS MORE		
(h)	400 W HPSV tubular	NOS	2% 0R 2 NOS. WHICHEVER IS MORE		
(i)	400 W HPSV elliptical	NOS	2% 0R 2 NOS. WHICHEVER IS MORE		
(j)	125 W HPMV	NOS	2% 0R 2 NOS. WHICHEVER IS MORE		
2	**LIGHTING FIXTURE PARTS**				
(a)	**Fixture type-1B (FC07)**				
	Front glass	NOS	5		
	Lamp holder	NOS	5		
(b)	**Fixture type-1R (FC33)**				
	Lamp holder	NOS	7		
(c)	**Fixture type-1W (FC34)**				
	Glass bowl	NOS	7		
	Lamp holder	NOS	15		
(d)	**Fixture type FC02, FC06, FC26, FC81 & FC32 (with electronic ballast)**				
	Electronic ballast (2x28 W) for T5 lamps	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	T5 Lamp holders	NOS	100		
	Acrylic cover (fixture type FC) FC-81	NOS	5		
	Louver (fixture type FD) FC-32	NOS	8		
	Louver (fixture type FR1) FC-26	NOS	4		
	Louver (fixture type FR2) FC-26	NOS	1		
(e)	**Fixture type (SS-61)**				
	Glass bowl	NOS	2		
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	4		
(f)	**Fixture type SF2 (SF-63)**				
	Front glass	NOS	2		
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	2		
(g)	**Fixture type SF3 (SF 64)**				
	Front glass	NOS	2		
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	2		
(h)	**Fixture type SF4 (SF-66)**				
	Front glass	NOS	3		
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	3		
(i)	**Fixture type SH1 (SB-01)**				
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	8 NOS		
(j)	**Fixture type SH2 (SB-02)**				
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	1		
(k)	**Fixture type SH3 (SB-03)**				
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	3		
(l)	**Fixture type SS1 (SS-62)**				
	Glass bowl	NOS	3		
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	3		
(m)	**Fixture type SS2 (SS-63)**				
	Glass bowl	NOS	1		
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	1		
(n)	**Fixture type SW1 (SW-41)**				
	Glass bowl	NOS	75		

4x270 MW TSGENCO BHADRADRI TPS *BOQ-cum-PRICE SCHEDULE FOR STATION LIGHTING SYSTEM*					
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	75		
(o)	**Fixture type SW2 (SW-42)**				
	Glass bowl	NOS	10		
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	10		
(p)	**Fixture type MP (MW-96)**				
	Glass bowl	NOS	1		
	Ballast	NOS	1% OR 2 NOS. WHICHEVER IS MORE		
	Lamp holder	NOS	1		
3	**LIGHTING PANELS**				
(a)	Synchronous timer 24 hrs.	NOS	3		
4	**LIGHTING CONTROL SWITCH/RECEPTACLES**				
(a)	20 Amp receptacles with plug	NOS	10		
(b)	20 Amp rotary switches	NOS	10		
5	**JUNCTION BOXES**				
(a)	Type-F	NOS	50		
(b)	Type-FE	NOS	50		
(c)	JB type –S	NOS	3		

Note: The requirements of Mandatory spares as per the above annexure shall be fully complied with. Any additional items/ quantity required to comply with the above requirement shall be included & supplied without any cost implications to BHEL/customer.

PRICE SCHEDULE TYPE TEST FOR STATION LIGHTING SYSTEM (OPTIONAL)

Item	DESCRIPTION	QTY.	Unit	TOTAL TYPE TEST CHARGES Excluding Taxes & Duties (Rs)
1.0	**Following tests as per relevant standards on each type & rating of lighting fixtures:** a) Visual examination b) Dimensional checking c) Insulation resistance (dry) test d) High voltage tests e) Test for mechanical strength f) Heating test g) Endurance test h) Photometric test i) Protection against electric shock j) Thermal shock proof test for glass (as applicable) k) Rain proof test followed by IR test l) Test for dust tightness m) Wind loading test on street light fixture n) Luminous output and light distribution test 0) Power factor measurement test	1	No.	
2.0	**Lamp:** Rating and life test for each type and rating of lamp (at rated voltage)	1	No.	
3.0	**Test on following items as per relevant standards:**			
3.1	Lighting panel of each type (including IP-55 DOP test)	1	No.	
3.2	IP-55 DOP test on JBs of each type	1	No.	
3.3	IP-55 DOP test on receptacle boxes of each type	1	No.	
3.4	Electronic ballast	1	No.	
3.5	Lighting transformer	1	No.	
3.6	Conduits of each size	1	No.	
3.7	Poles of each size	1	No.	
3.8	Receptacles of each rating	1	No.	
3.9	Wires of each size	1	No.	
3.10	MCB of each rating	1	No.	
4.0	**All type tests as per relevant standard:**			
4.1	Wellglass vapour proof, dust tight fixtures	1	No.	
4.2	Flood light fixtures	1	No.	
4.3	Street light fixtures	1	No.	
4.4	Industrial type fluorescent fixtures	1	No.	
4.5	High bay type fixtures	1	No.	

NOTE:
1. Bidder to indicate lump sum charges for conducting all type tests as per relevant standard on one piece.

UNIT PRICE SCHEDULE FOR STATION LIGHTING SYSTEM

Item No.	DESCRIPTION UNIT PRICE EQUIPMENT [OPTIONAL]	QTY.	Unit	SUPPLY and E&C	
				Unit Ex-works Supply (Rs)	Unit E&C (Rs)
1.0	**Lighting Luminaires (complete with accessories)**				
	Purchasers type reference (* Bidders type reference)				
1.1	Luminaire Type FC01 (*) for 20W Fluorescent lamp & electronic ballast	1	No.		
1.2	Luminaire Type FC02 (*) for 28W T5 Fluorescent lamp & electronic ballast	1	No.		
1.3	Luminaire Type FC26 (*) for 36W Fluorescent lamp & Cu ballast	1	No.		
1.4	Luminaire Type SP21 (*)	1	No.		
1.5	Luminaire Type MP22 (*)	1	No.		
1.6	Luminaire Type HF61 (*)	1	No.		
1.7	Luminaire Type HF62 (*)	1	No.		
1.8	Luminaire Type SF64 (*)	1	No.		
1.9	2x36W CFL light fixture	1	No.		
1.10	4x36W CFL light fixture	1	No.		
1.11	1x70W Metal halide light fixture	1	No.		
1.12	1x150W Metal halide light fixture	2	No.		
1.13	1x250W Metal halide light fixture	1	No.		
1.14	1x400W Metal halide light fixture	1	No.		
1.15	TX05	1	No.		
1.16	MW-98	1	No.		
2.0	**Lamps**				
2.1	20W fluorescent tube lamp	1	No.		
2.2	36W fluorescent tube lamp	1	No.		
2.3	70W metal halide lamp	1	No.		
2.4	150W metal halide lamp	1	No.		
2.5	250W metal halide lamp	1	No.		
2.6	400W metal halide lamp	1	No.		
2.7	36W CFL	1	No.		
3.0	**Ballast**				
3.1	Cu ballast	1	No.		
3.2	Electronic ballast	1	No.		
4.0	**Lighting Mast with mounting arrangement for lighting fixtures & required accessories**				
4.1	Flood light tower of Lattice structure type with 30 meter height, maintenance platform and approach ladder.	1	No.		
4.2	Flood light tower of Lattice structure type with 20 meter height, maintenance platform and approach ladder.	1	No.		
5.0	**Junction Box**				
5.1	Type JB-M	1	No.		
5.2	Type JB-M1	1	No.		
6.0	**GI wires / Flat**				
6.1	8 SWG GI wire	1	Km		
6.2	12 SWG GI wire	1	Km		
6.3	35x6 GI flat	1	Mtr		
7.0	**TESTING EQUIPMENT**				
7.1	BUZZER	2	Nos.		
7.2	500V MEGGER	2	Nos.		
7.3	Earth Megger	2	Nos.		
8.0	Vibration Damper for High bay fitxure	1	No.		

DATA SHEET- A

1.0 **SYSTEM DESIGN DATA**

1.1 Design Ambient : 50^0C

1.2 Details of Operating Parameters

a) AC Supply

i. Rated Voltage : 415 V

ii. Rated Frequency : 50 HZ

iii. Voltage variation: (Permissible) : $\pm$ 10%

iv. Frequency variation (Permissible) : +5% to - 5%

v. Combined voltage & frequency variation (sum of absolutes permissible) : 10 %

vi. System fault level at rated voltage : 50 KA for 1sec

b) DC Supply

i. Rated Voltage : 220 V

ii. Voltage variation (Permissible) : + 10% to - 15%

iii. System fault level at rated voltage at rated voltage : 25 KA

2.0 **APPLICABLE STANDARDS** : As per specification

3.0 **LIGHTING CONCEPT**

3.1 Areas

a) Location : [ ] Indoor [ ] Outdoor [√] Both

b) Street Lighting : [√] Yes [ ] No

c) Boiler/ESP Platforms : [√] Yes [ ] No

3.2 Types of supplies considered (other than AC Normal)

a) DC Normal : [ ] Yes [√] No

b) DC Emergency : [√] Yes [ ] No

c) AC Emergency : [√] Yes [ ] No

3.3 Diversity Factor Considered for Sockets : 25%

4.0 **SCOPE OF SYSTEM DESIGN ENGG**. : [√] Included in vendor's scope
[ ] Excluded from vendor's scope

5.0 **LUMINAIRES, LAMPS & ACCESSORIES**

5.1 Whether all type of luminaires as per BOQ offered : [√] Yes [ ] No

5.1.1 If no, Types of luminaires not offered as per BOQ : NA

5.2 List of lamps which can be installed only specified angle. : None

5.3 Type of false ceiling for recessed fluorescent luminaire : After award of contract

5.4 Degree of Protection for drip proof luminaires : IP55

5.5 Flame proof luminaires

a) Hazardous area classification : IS-2148 Zone II Group-IIA & IIB

b) Degree of Protection : IP-55

c) Mounting type for well glass. : [ ] eye-bolt [√] screw neck

5.6 Non-Integral/Separate control gear box for HPSV/HPMV lamps

a) Location : Accessible level

b) Sheet thickness : 2 mm

c) Degree of protection : IP-55

d) Surface treatment : [ ] Painted [√] Galvanised

e) If galvanised

i. Wt. of Zinc : 460 gm/m^2
ii. Process : Hot dip

f) If painted

i. Colour to IS : Shade

ii. Minimum paint thickness : Microns

5.7 Type of lamp holder for incandescent luminaires : [√] Screw type
[ ] Pin type

5.8 Tap setting for Ballasts

a) HPSV luminaires : 220 V

b) HPMV Luminaires : 220 V

5.9 Lamps

a) Type of Fluoroscent Lamps : [√] Cool Daylight
[√] White Light

b) Type of cap for incandescent lamp : [√] Screw Type [ ] Pin type

c) Type of HPMV lamp : [√] Clear
[ ] Fluorescent powder coated

d) Type of lamp cap for HPMV & HPSV : [√] Screw Type

e) Type of beam for

i. HPMV lamps : [ ] Short beam [ ] Long beam
[√]Both

ii. HPSV lamps : [ ] Short beam [ ] Long beam
[√]Both

5.10 Emergency lighting unit/ Exit sign

5.10.1 Wattage and No. of incandescent lamp : 2x6 W FLT

5.10.2 Type of battery : Ni-Cd

5.10.3 Emergency duration of unit : 2 Hours

6.0 DESIGN PARAMETERS OF MAIN EQUIPMENT

6.1 Lighting Distribution Boards

6.1.1 Sheet Thickness : 2 mm

6.1.2 Degree of Protection

a) Main Panel : IP-54
b) Transformer cubicle : IP-42

6.1.3 Type of Incomers & Buscoupler : [√] MCCB
[ ] Switch-Fuse

6.1.4 Type of Outgoing feeders : [ ] Switch-Fuse
[√] MCCB
For AC LDB TYPE-H: 100A-4 Nos., 63A-8 Nos.
For AC WDB TYPE-H: 63A-12 Nos.
For AC LDB TYPE -F: 100A-3 Nos., 63A-5 Nos.

6.1.5 Bus bar material : [√] Aluminium [ ] Copper

6.1.6 Cable entry : [√] Bottom [ ] Top

6.1.7 Whether under voltage relay required in DC LDB : [√] Yes [ ] No [√] Contactor & timer

6.1.8 Range of time delay relay : 5-180 sec

6.1.9 Whether hinged door with locking facility provided : [√] Yes [ ] No

6.1.10 Whether earth busbar provided : [√] Yes [ ] No

6.1.11 Earth busbar material : [√] GI steel strip [ ] No

6.1.12 Fault current and duration : 50 kA for 1 sec

6.1.13 Lighting Transformer

a) Voltage Rating : 415/415 V, $\pm$ 5% taps in steps of 2.5%.

b) Whether encapsulated : [ ] Yes [√] No

c) Transformer impedance : 4% for 100 kVA, 3% for 50 kVA

6.2 Lighting Panel

6.2.1 Application : [ ] Indoor [ ] Outdoor [√] Both

6.2.2 Sheet thickness : 2 mm for structures/frame

1.6 mm for covers & doors

6.2.3 Degree of protection
a) Indoor : IP-54

b) Outdoor : IP-55 with canopy

6.2.4 Type of Incomer : [ ] Switch-Fuse [√] MCCB
For LP-A (18) & LP-S (6)-100A
For LP-A (12) & LP-A (6)-63A

6.2.5 MCB type for street lighting panel : [ ] 1 pole [√] 3 pole TPN

6.2.6 Busbar material : Copper

6.2.7 Whether hinged door with locking facility provided : [√] Yes [ ] No

6.2.8 Whether earthing studs provided : [√] Yes [ ] No

6.3 **Lighting Poles**

6.3.1 Type as per IS : IS-2713

a) PS-1 (11m) : 410 SP51

b) PS-2 (13 m) : 410 SP67

c) PS-4 (13 m) : 410 SP67

c) PF-1 (11m) : 410 SP51

d) PF-2 (11m) : 410 SP51

6.3.2 Surface Treatment : [ ] Galvanised [√] Painted

6.3.2.1 Galvanisation details(if applicable) Not Applicable

a) Process : Hot dip

b) Wt. of Zinc deposited : As per applicable standard

6.3.2.2 Painting details (if applicable)
a) Shade as per IS : As per spec.

b) Paint thickness : As per spec.

6.4 **Lighting Masts** :

6.4.1 Number of luminaires on each mast : Minimum 10 nos.

6.4.2 Type of design : Telescopic tubular, Polygonal shape

6.4.3 Material : GI

6.4.4 Height : 30 meter

6.4.5 Galvanization

a) Process : Hot dip

b) Wt. of Zinc deposited : 610gm / m^2 (As per spec)

6.4.6 Lightning rod : To be provided at top of the mast as per IS-2309

6.5 Street Lighting Pole Junction Boxes

6.5.1 Material : Sheet steel

6.5.2 Sheet thickness : 2 mm

6.5.3 Galvanization

a) Process : Hot dip

b) Wt. of zinc deposited : 610gm / m^2 (As per spec)

6.5.4 Degree of protection : IP-55

6.6 Fuse Boxes

6.6.1 Material : Sheet steel

6.6.2 Sheet thickness : 2 mm

6.6.3 Galvanization

a) Process : Hot dip

b) Wt. of zinc deposited : As per spec.

6.6.4 Degree of Protection : IP-55

6.7 **Receptacles**

6.7.1 Material : Sheet steel

6.7.2 Sheet thickness : 2 mm

6.7.3 Galvanization

a) Process : Hot dip

b) Wt. of zinc deposited : As per spec.

6.7.4 Degree of protection : IP-55

6.8 **24 V Supply Module**

6.8.1 Enclosure

a) Material : Sheet steel

b) Sheet Thickness : 2 mm

6.8.2 Transformer

a) Rating : 500 VA
b) Primary Voltage : 240 V

c) Secondary voltage : 24 V

6.8.3 Lamp

a) Rating : As required

b) Type : Portable halogen lamp

6.8.4 No. of outgoing sockets : As per spec.

6.8.5 Whether cord coiling arrangement considered : [√] Yes air cooled [ ] No

6.8.6 Louvers : [√] Provided [ ] Not Provided

7.0 **COMPONENT OF LIGHTING SYSTEM EQUIPMENT**

7.1 **Moulded Case Circuit Breakers(MCCB)** :

7.1.1 Rated voltage : 415V

7.1.2 Number of poles : TPN

7.1.3 Rated Short circuit duty : 50kA

7.1.4 Rated breaking capacity (rms) at 415V : 50 kA

7.1.5 Rated making current (peak) : 105kA

7.1.6 Releases provided

a) Over load : [√] Yes [ ] No

b) Under voltage : [ ] Yes [ ] No

c) Short circuit : [√] Yes [ ] No
d) Shunt trip : [ ] Yes [ ] No

7.2 **Switch-Fuse Unit**

7.2.1 Utilisation category for main contacts : AC 23

7.3 **Indicating Meters**

7.3.1 Ammeter

a) Type : As per IS-1248

b) Shape : Square

c) Size : 96 X 96 mm

d) Accuracy class : 2

e) Current coil rating : 1A

f) Angle of deflection : 240º

7.3.2 Voltmeter

a) Type : As per IS-1248

b) Shape : Square

c) Size : 96 X 96 mm

d) Accuracy class : 2

e) Voltage Coil rating : 0-500V AC, 0-250V DC

f) Angle of deflection : 240º

7.4 **Power Contactors**

7.4.1 Coil Voltage (nominal)

a) AC contactors : 240 V

b) DC contactors : 220 V

7.5 **Under Voltage Relay**

7.5.1 Type : [ ] Static [√] Electromagnetic

7.5.2 Coil Voltage Rating : 110V

7.5.3 Means for in-built testing provided : [√] Yes [ ] No

7.6 **Current Transformers**

7.6.1 Type : Cast resin

7.6.2 Secondary Rating : [√] 1 Amp [ ] 5 Amp

7.6.3 Output : 10VA

7.6.4 Accuracy Class : 1

7.7 **Voltage Transformers**

7.7.1 Type : Cast resin

7.7.2 System Earthing : [√] Effective [ ] Non-Effective

7.7.3 Secondary Terminal voltage(phase-phase) : 415/110V

7.7.4 Accuracy Class : 1

7.7.5 Output : 5 VA

7.7.6 Winding configuration : Star / Star

7.8 **Miniature Circuit Breaker**

7.8.1 Min. Rating : 20A

7.8.2 Short Time rating : 10 kA

7.8.3 Thermal overload and magnetic short circuit protection provided : [√] Yes [ ] No

7.9 **Selector Switch**

7.9.1 Type of selector switch : [√] Stay put [ ] Wing knob

7.9.2 Lockability : [ ] Provided [√] Not provided

7.10 **Indication Lamps**

7.10.1 Lens Colour

a) On condition : Red

b) OFF condition : Green

7.10.2 Circuit Voltage : 240V

7.11 **Push Buttons**

7.11.1	Voltage Grade	:	500 V
7.11.2	No. of Contacts	:	(2NO + 2NC)

7.12 **Terminals**

7.12.1	Type	:	1100V Grade box clamp, 10 mm² minimum
7.12.2	Material	:	Copper
7.12.3	Whether inter-terminal barrier provided	:	[√] Yes [ ] No

7.13 **Cable Glands**

7.13.1	Provision for all power and control cables considered	:	By vendor for all incoming & outgoing cables
7.13.2	Type	:	Double compression
7.13.3	Material	:	Brass
7.13.4	Nickel Plating provided	:	[√] Yes [ ] No

7.14 **Cable Lugs**

7.14.1	Provision for all power and control terminations considered	:	By vendor for all power & control connections
7.14.2	Type	:	Crimping type/ ring type
7.14.3	Material	:	Tinned copper

7.15 **Timers**

7.15.1 Time Switch

a)	Type	:	As per spec, L4T, Intelligent type synchronous Digital timer
b)	Range	:	00 - 24 Hours
c)	Location	:	All AC LPs incomer

7.15.2 Delay Timer :

a)	No. of Contacts		As per scheme
i.	ON time delay	:	

ii. OFF time delay :

iii. Instantaneous : -

b) Coil Voltage Rating

i. AC timer : 240 V

ii. DC timer : 220 V

c) Time delay range

i. AC timer : 1 – 99 Sec.

ii. DC timer : 24 – 240 Sec.

8.0 **Conduit (Rigid)**

8.1 Rigid Conduit

8.1.1 Duty : Heavy duty type

8.1.2 Application standard : IS:9537 Part I & II

8.1.3 Material : Cold rolled mild steel to IS:226

8.1.4 Sheet thickness (minimum) : 1.6 mm upto 32 mm dia,
2.0mm above 32 mm & upto 50 mm dia

8.1.5 Surface treatment : Hot dip galvanizing inside & outside as per IS:2629

8.1.6 Min. Weight of zinc coating (gm/m^2) : 340 upto 32 mm dia,
460 above 32 mm & upto 50 mm dia

8.1.7 Min. Thickness of zinc coating (microns): 48 upto 32 mm dia, 65 above 32 mm & upto 50 mm dia [By Elcometer]

8.1.8 Standard length approximate : 3 – 5 meters

9.0 **Conduit (Flexible)**

a) Type: GI flexible steel
b) Size: 20 mm
c) Applicable IS: IS 3480
d) Standard length: 25mtrs
e) Thickness of Galvanization: 30 micron
f) Wall Thickness: 2.5mm

10.0 **LABELING**

Requirement of Specification complied : [√] Yes [ ] No

11.0	**PAINTING**		As per spec.	
11.1	Shade (As per IS:5)	:	**Interior**	**Exterior**
	a) LDBs	:		
	b) LPs	:		
	c) Receptacles	:		
	Decorative	:	After award of contract	
	Industrial	:		
	d) Lighting kit box	:		
	e) 24V Supply Module	:		
	f) Emergency lighting Unit	:		
11.2	Finish			
	a) Interior	:	[ ] Matt [√] Semi - glossy	
	b) Exterior	:	[√] Semi - glossy [ ] Full - glossy	
11.3	Paint Thickness(min)	:	50 microns (powder coating)	
12.0	**MAKE**	:	As per sub-vendor list	

13.0 QUANTITY VARIATION (Limited to the value of the Contract)

a) Till the "Engineering" is complete : ± 30 % (As per spec.)

b) Till the completion of work at site : + 10 % (As per spec.)

DATA SHEET- C

1.0 **SYSTEM DESIGN DATA**

1.1 Design Ambient : ^{o}C

1.2 Details of Operating parameters

a) AC Supply

i. Rated voltage : V

ii. Rated frequency : Hz

iii. Voltage variation (Permissible) : %

iv. Frequency variation (Permissible) : %

v. Combined voltage & frequency variation (sum of absolutes permissible) : %

vi. System fault level at rated voltage :

b) DC Supply

i. Rated voltage : V

ii. Voltage variation (Permissible) : %

iii. System fault level at rated voltage :

2.0 **APPLICABLE STANDARDS** : As per Annexure-I

3.0 **LIGHTING CONCEPT**

3.1 Areas

a) Location : [ ] Indoor [ ] Outdoor [ ] Both

b) Street Lighting : [ ] Yes [ ] No

c) Boiler Platforms : [ ] Yes [ ] No

3.2 Types of supplies considered (other than AC Normal)

a) DC Normal : [ ] Yes [ ] No

b) DC Emergency : [ ] Yes [ ] No

c) AC Emergency : [ ] Yes [ ] No

3.3 Diversity Factor considered for sockets :

4.0 **SCOPE OF SYSTEM DESIGN**: **ENGINEERING** [ ] Included in vendor's scope [ ] Excluded from vendor's scope

5.0 **LUMINAIRES, LAMPS & ACCESSORIES**

5.1.0 **LUMINAIRES**

5.1.1 Whether all types of luminaires: as per BOQ offered [ ] Yes [ ] No

5.1.2 If no, Types of luminaires not offered as per BOQ :

5.1.3 List of lamps which can be installed only at specified angle :

5.1.4 Type of false ceiling for recessed fluorescent luminaire :

5.1.5 Degree of protection for drip proof luminaires :

5.1.6 Flame proof luminaires

a) Hazardous area classification :

b) Degree of protection :

c) Mounting type for well glass : [ ] eye-bolt [ ] strap

5.1.7 Non-integral controlgear box

a) Sheet thickness :

b) Degree of protection :

c) Surface treatment : [ ] Painted
[ ] Galvanised

d) If galvanised

i. Wt. of zinc : gms / m^2

ii. Process :

e) If painted

i. Colour to IS :

ii. Minimum paint thickness : microns

5.1.8 Type of lamp holder for incandescent luminaires : [ ] screw type
[ ] Pin type

5.1.9 Tap setting for Ballasts

a) HPSV luminaires :

b) HPMV luminaires :

5.2.0 **LAMPS** :

a) Type of fluorescent lamps : [ ] Cool day light
[ ] White light

b) Type of lamp cap for incandescent lamp : [ ] Screw type
[ ] Pin type

c) Type of HPMV lamp : [ ] Clear
[ ] Fluorescent powder coated

d) Type of lamp cap for HPMV & HPSV :

e) Type of beam for

i. HPMV lamps : [ ] Short beam [ ] Long beam
[ ] Both

ii. HPSV lamps : [ ] Short beam [ ] Long beam [ ] Both

5.3.0 **EMERGENCY LIGHTING SET**

5.3.1 Wattage and No. of incandescent lamp : Watts

5.3.2 Battery voltage: Volts

5.3.3 Type of battery :

5.3.4 AH capacity of battery:

5.3.5 Lumen output of lamp at rated voltage :

5.3.6 Emergency duration of unit :

5.3.7 Weight of unit :

6.0 **DESIGN PARAMETERS OF MAIN EQUIPMENT**

6.1 Lighting Distribution Boards

6.1.1 Sheet thickness : mm

6.1.2 Degree of protection

a) Main panel :

b) Transformer cubicle :

6.1.3 Type of Incomer : [ ] MCCB
[ ] Switch-Fuse

6.1.4 Type of Outgoing Feeders : [ ] Switch-Fuse
[ ] MCB

6.1.5 Bus bar material : [ ] Aluminium [ ] Copper

6.1.6 Cable entry : [ ] Bottom [ ] Top

6.1.7 Whether under voltage relay required in DC LDB : [ ] Yes [ ] No

6.1.8 Range of time delay relay :

6.1.9 Whether hinged door with locking facility provided : [ ] Yes [ ] No

6.1.10 Whether earth busbar provided : [ ] Yes [ ] No

6.1.11 Earth busbar material : [ ] GI [ ] Copper

SYSTEM DESIGN DATA

6.1.12 Fault current and duration : kA

6.1.13 Lighting Transformer

a) kVA Rating(s) : 50 100

b) Type of cooling :

c) Rated current

i. Primary : Amp.

ii. Secondary : Amp.

d) Rated voltage

i. Primary : Volts

ii. Secondary : Volts

e) Rated frequency : Hz

f) No. of phases :

g) Temperature rise above ambient in winding by resistance : ^{o}C

h) Vector Group :

i) Tap changer

i. Type :

ii. Range :

iii. No. of taps :

iv. Voltage of each tap :

j) Type of ventilation arrangement provided for transformer enclosure :

k) Iron loss at 50 Hz and 100% rated voltage : kW

l) Regulation at full load and at 75 ^{o}C and 0.8 :

p.f. lagging

m) Copper loss at rated load and 75 ^{O}C : kW

n) Impedance at rated current, frequency and at 75 ^{O}C :

o) Winding conductor material :

p) Whether transformer is encapsulated : [ ] Yes [ ] No

q) Insulation class :

r) Weight : kg

6.2 Lighting Panel

6.2.1 Application : [ ] Indoor [ ] Outdoor [ ] Both

6.2.2 Sheet thickness : mm

6.2.3 Degree of protection

a) Indoor : IP :

b) Outdoor : IP :

6.2.4 Type of Incomer : [ ] Switch-Fuse
[ ] MCB

6.2.5 MCB type for street lighting panel. : [ ] 1 pole [ ] 3 pole

6.2.6 Busbar material :

6.2.7 Whether hinged door with with locking facility provided : [ ] Yes [ ] No

6.2.8 Whether earthing studs provided : [ ] Yes [ ] No

6.3 Lighting Poles

6.3.1 Type as per IS :

a) PS-1 :

b) PS-2 :

c) PS-3 :

d) PS-4 :

e) PS-5 :

f) PS-6 :

g) PS-7 :

h) PF-1 :

i) PF-2 :

j) PF-3 :

k) PF-4 :

6.3.2 Surface Treatment : [ ] Galvanised
[ ] Painted

6.3.2.1 Galvanisation details (if applicable)

a) Process :

b) Wt. of zinc deposited : gms / m^2

6.3.2.2 Painting details (if applicable)

a) Shade as per IS:5 :

b) Paint thickness : microns

6.4 Lighting Masts

6.4.1 Number of luminaires (max.) on each mast :

6.4.2 Type of design :

6.4.3 Material :

6.4.4 Height (above ground) excluding Lightning Arrester : meters

6.4.5 Galvanization

a) Process :

b) Wt. of zinc deposited : gms / m^2

6.4.6 Weight : Tonnes

6.5 Street Lighting Pole Junction Boxes

6.5.1 Material :

6.5.2 Sheet thickness : mm

6.5.3 Galvanization

a) Process :

b) Wt. of zinc deposited : gms / m^2

6.5.4 Degree of protection : IP :

6.6 Fuse Boxes

6.6.1 Material :

6.6.2 Sheet thickness : mm

6.6.3 Galvanization

a) Process :

b) Wt. of zinc deposited : gms / m^2

6.6.4 Degree of protection : IP :

6.7 Receptacles

6.7.1 Material :

6.7.2 Sheet thickness : mm

6.7.3 Galvanization

a) Process :

b) Wt. of zinc deposited: gms / m^2

6.7.4 Degree of protection : IP :

6.8 24 V Supply Module

6.8.1 Enclosure

a) Material :

b) Sheet thickness :

6.8.2 Transformer

a) Rating : VA

b) Primary voltage : Volts

c) Secondary voltage : Volts

d) Class of insulation :

6.8.3 Lamp

a) Rating : Watts

b) Type :

6.8.4 No. of outgoing sockets :

6.8.5 Whether cord coiling arrangement considered : [ ] Yes [ ] No

6.8.6 Louvers : [ ] Provided [ ] Not provided

7.0 COMPONENT OF LIGHTING SYSTEM EQUIPMENT

7.1 Moulded Case Circuit Breakers (MCCB)

7.1.1 Rated voltage : V

7.1.2 Number of poles :

7.1.3 Rated short circuit duty :

7.1.4 Rated breaking capacity (rms) at 415 V : kA

7.1.5 Rated making current (peak) : kA

7.1.6 Releases provided

a) Overload : [ ] YES [ ] NO
b) Under voltage : [ ] YES [ ] NO

c) Short circuit : [ ] YES [ ] NO

d) Shunt trip : [ ] YES [ ] NO

7.1.7 Auxiliary contacts

a) Numbers : (NO + NC)

b) Rating : Amp

7.2 Switch-Fuse Unit

7.2.1 Utilization category for main contacts : AC -

7.3 Indicating Meters

7.3.1 Ammeter

a) Type :

b) Shape :

c) Size :

d) Accuracy class :

e) Current coil rating : Amps.

f) Angle of deflection : deg.

7.3.2 Voltmeter

a) Type :

b) Shape :

c) Size :

d) Accuracy class :

e) Voltage coil rating : Volts

f) Angle of deflection : deg.

7.4 Power Contactors

7.4.1 Coil voltage (nominal)

a) AC contactors : Volt (AC)

b) DC contactors : Volt (DC)

7.4.2	Current rating of contacts			
	a)	Power	:	Amp
	c)	Control:		Amp
7.5	Under Voltage Relay			
7.5.1	Type		:	[ ] Static [ ] Electromagnetic
7.5.2	Coil Voltage Rating		:	
7.5.3	Means for in-built testing provided		:	[ ] YES [ ] NO
7.6	Current Transformers			
7.6.1	Type		:	
7.6.2	Secondary Rating		:	[ ] 1 Amp. [ ] 5 Amp.
7.6.3	Output		:	VA
7.6.4	Accuracy class		:	
7.7	Voltage Transformers			
7.7.1	Type		:	
7.7.2	System Earthing		:	[ ] Effective [ ] Non-effective
7.7.3	Secondary terminal voltage (phase-phase)		:	Volt
7.7.4	Accuracy class		:	
7.7.5	Output		:	VA
7.7.6	Winding configuration		:	
7.8	Miniature Circuit Breaker			
7.8.1	Min. Rating		:	Amp.
7.8.2	Short time rating		:	kA
7.8.3	Thermal overload and magnetic short circuit protection provided		:	[ ] YES [ ] No

7.9 Selector Switch

7.9.1 Type of selector switch : [ ] Stay put [ ] Wing knob

7.9.2 Lockability : [ ] Provided [ ] Not Provided

7.10 Indication Lamps

7.10.1 Lens colour

a) ON condition :

b) OFF condition :

7.10.2 Circuit voltage :

7.11 Push Buttons

7.11.1 Voltage Grade : Volt

7.11.2 No. of Contacts : (NO + NC)

7.12 Terminals

7.12.1 Type :

7.12.2 Material :

7.12.3 Whether inter-terminal barriers provided : [ ] Yes [ ] No

7.13 Cable Glands

7.13.1 Provision for all power and control cables considered : [ ] Yes [ ] No

7.13.2 Type :

7.13.3 Material :

7.13.4 Nickel plating provided : [ ] Yes [ ] No

7.14 Cable Lugs

7.14.1 Provision for all power and control terminations considered : [ ] Yes [ ] No

7.14.2 Type :

7.14.3 Material :

7.15 Timers

7.15.1 Time Switch

a) Type :

b) Range :

7.15.2 Delay Timer

a) No. of contacts

i. ON time delay : (NO + NC)

ii. OFF time delay : (NO + NC)

iii. Instantaneous : (NO + NC)

b) Coil voltage rating

i. AC timer : volt

ii. DC timer : volt

c) Time delay range

i. AC timer : sec.

ii. DC timer : sec.

8.0 LABELING

Requirement of specification complied with : [ ] Yes [ ] No

9.0 PAINTING

9.1 Shade (as per IS:5)

		Interior	Exterior
a)	LDBs :		
b)	LPs :		
c)	Receptacles :		
d)	Lighting kit box :		
e)	24V Supply Module :		

f) Emergency Lighting Unit :

9.2 Finish

a) Interior : [ ] Matt [ ] Semi-glossy

b) Exterior : [ ] Semi-glossy [ ] Full-glossy

9.3 Paint thickness (min.) : microns

TECHNICAL SPECIFICATION FOR

LIGHTING SYSTEM (SUPPLY)

SPECIFICATION NO. PE-TS-411-558-E001

CONTENTS

1.0 SCOPE

1.1 GENERAL

a) This specification covers the design, manufacture, assembly, testing and inspection at vendor's / sub-vendor's works, packing and despatch to site of lighting system and low voltage power services equipment.

b) The "design" shall broadly cover the selection of components, materials, sizes etc. for the equipment of supply in vendor's scope. Complete responsibility of establishing the correctness of equipment design rests with the vendor.

c) It is not the intent to specify here all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship, and shall be capable of performing the required duties in a manner acceptable to Engineer / purchaser, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgement is not in full accordance herewith.

d) Make of all equipment and components shall be to the approval of purchaser.

1.2 ENGINEERING

a) Specification also covers the aspect of System Design Engineering generally termed as "Engineering". Engineering shall be the purchaser to the successful bidder shall furnish the responsibility of vendor if indicated in Data Sheet A. Engineering inputs.

b) Engineering, if covered in vendor's scope, shall include design of complete lighting system for indoor and outdoor areas. The aspect of engineering covers preparation of electrical distribution and control schemes, quantity estimation, luminaire layout drawings, conduit layout drawings, wiring schemes upto luminaires, cable schedules and all associated design work not specifically mentioned in the specification.

c) Complete engineering shall be as per the guidelines of purchaser and shall be subject to the purchaser's approval.

1.3 Although erection and commissioning is not included in vendor's scope, the vendor shall still not be absolved of his responsibility of establishing the correctness of engineering and equipment at site.

1.4 The requirements given in enclosed drawings, documents and Data Sheet A form part of this specification and shall be fully complied with. In case any discrepancy arises, the requirements of Data Sheet A shall prevail.

1.5 In case of any deviation, the bidder shall indicate the same clause-by-clause in the enclosed "Schedule of Deviations". In the absence of duly filled schedules it will be construed that the bid conforms strictly to the specification.

2.0 CODES & STANDARDS

2.1 Unless specified otherwise, the latest revisions of standards, codes and other applicable statutory rules and regulations specified in Annexure-I are applicable and shall be referred to.

3.0 LIGHTING SYSTEM DESCRIPTION (CONCEPTUAL VIEW)

3.1 All areas of plant (indoor and outdoor) shall be provided with suitable lighting arrangement to meet the functional requirements by use of various types of luminaires so as to achieve the desired quality and level of illumination.

3.2 Lighting system shall also cover the low voltage power services such as power receptacles and single phase feeders.

3.3 Lighting system shall be fed through various power sources such as AC Normal, AC Emergency and DC Normal and DC Emergency supply to achieve the desired reliability.

3.4 Power tapped from various sources shall be distributed through lighting distribution boards and lighting panels upto the various luminaires and power outlet sockets / feeders.

4.0 SYSTEM DESIGN ENGINEERING

Engineering shall be done by the vendor only during the contract engineering stage if the same is covered in his scope. During tender stage, bidder shall make his quotation on the basis of BOQ furnished by the purchaser with the tender document.

4.1 ENGINEERING INPUTS : Complete engineering shall be done by the vendor on the basis of documents listed below. The engineering inputs shall be furnished by purchaser.

4.1.1 Indoor Areas

a) Room dimensions (details as covered in various layout drawings)

b) Lighting System Design Data (LSDD) covering typical values for various types of indoor areas, indicating :

i. Required average illumination level

ii. Reflection factors for walls, ceiling and floor

iii. Maintenance factor

iv. Type of luminaire

v. Mounting height of luminaire

vi. Height of working plane

c) AC Emergency lighting requirements

d) DC lighting requirements

e) Requirement of sockets

f) Requirement of exhaust fans and fan points

4.1.2 Outdoor Areas

a) Area geometry (details as covered in various layout drawings)

b) Lighting System Design Data (LSDD) covering typical values for various types of outdoor areas, indicating :

i. Average illumination level

ii. Type of luminaire

iii. Preferred pole heights / mounting height

iv. AC Emergency lighting requirement

v. DC lighting requirements

c) Requirement of sockets

4.1.3 Other inputs

a) Suggestive location of LDBs

b) Suggestive power distribution scheme (SLDs)

c) Control schemes

d) Single phase feeder details

e) No. of sockets / criteria for computation of no. of sockets / location of sockets etc.

4.2 DESIGN CRITERIA :

4.2.1 General Requirements of Design

4.2.1.1 Lighting system shall be provided to ensure adequate visual performance, safety and amenity and shall be free from excessive glare and flicker from discharge lamps. Particular attention hall be paid to ensure that level of illumination is satisfactory in all respects including viewing of all instruments, alarms, annunciations and indicating lamps.

4.2.1.2 Complete system design shall be done on the basis of inputs provided by the purchaser and in line with the laid down criteria.

4.2.1.3 Requirements of sockets shall be as per the criteria / number of sockets given by the purchaser during detailed engineering stage.

4.2.2 Sources of Power Supply

4.2.2.1 The lighting system shall be provided with the power from the following sources :

a) AC - normal
b) AC - emergency
c) DC - normal
d) DC - emergency

4.2.2.2 AC emergency supply is made available from purchaser's AC emergency Board. This board in turn has two incomers; one from the normal supply source i.e. station supply and other from emergency source i.e. diesel generator supply which is available upon failure of normal supply.

4.2.2.3 Arrangement and distribution of power shall depend upon the functional requirements of areas and therefore supply from all types of power sources shall not be made available to all areas.

4.2.2.4 Power from the purchaser's supply sources shall be brought upto the Lighting Distribution Boards (LDBs) of various types. Each LDB shall in turn feed power to various Lighting Panels (LPs).

4.2.2.5 Power to the AC normal luminaires shall be available through AC normal LDB & LP. Power to the AC emergency luminaires shall be available through AC emergency LDB & AC emergency LP. Power to DC normal luminaires shall be available through DC normal LP, which in turn shall be fed directly from DCDB / Sub-DCDB. However power to the DC emergency luminaires shall be available through DC emergency LDB & LP.

4.2.2.6 Complete power distribution system shall be designed keeping following criteria in view :

a) Simplicity
b) Controlled voltage drop
c) Cost effectiveness

4.2.2.7 Area Classification

The detailed requirements of luminaires depending upon type of power supply source for each area shall be as per the details to be furnished by purchaser during contract engineering. Area classification on the basis of type of luminaires to be provided shall be as under :

a) Area A : AC normal, AC emergency, DC normal and DC emergency luminaires.

b) Area B : AC normal, AC emergency and DC emergency luminaires.

c) Area C : AC Normal and AC emergency luminaires

d) Area D : AC Normal luminaires.

e) Area E : AC Normal luminaires and portable emergency lighting.

4.2.3 Lighting Philosophy

4.2.3.1 In the normal course, for areas A, B and C, all the AC luminaires shall remain switched on through two different sources of supply i.e. AC normal and AC emergency. DC normal luminaires shall also remain switched on for areas A.

4.2.3.2 In case of failure of AC normal supply the following shall apply :

a) Areas A shall remain lit through DC normal luminaires.

b) Areas A & B shall automatically get illuminated from DC emergency luminaires. This supply shall be available till AC emergency power is restored and stabilised.

c) Areas C shall remain temporarily dark till the AC emergency supply is restored from diesel generator set.

d) Areas D shall remain dark till the AC normal supply is restored.

4.2.3.3 As soon as the AC emergency supply is restored, the AC emergency luminaires shall come into operation. DC emergency luminaires shall have time delayed switching off after a specified duration to ensure that the AC emergency supply is stabilised.

4.2.3.4 When the AC normal supply is restored, the following shall apply :

a) DC emergency luminaires shall be switched off immediately, if they are switched on.

b) AC emergency luminaires shall switch off momentarily when AC emergency board incoming supply is changed over from diesel generator to the AC normal supply.

4.2.3.5 Street Lighting / Flood Lighting

Street lights / flood lights will be fed from Street Lighting Panel (SLP). The number of street lights / flood lights shall be grouped in such a way that they will be fed from the nearest SLP available. Street lights shall have provision of automatic switching ON and OFF in any one of the following modes and as per the purchaser's scheme:

a) Manual

b) Automatic through 00 - 24 hrs time switch

c) Automatic through combination of 00 - 24 hrs time switch and a remote sensing device for monitoring external illumination level.

Each SLP shall be provided with a time switch and a remote light sensing device.

4.2.4 Number of Luminaires

4.2.4.1 All calculations shall be done as per the input data covered under "Engineering Inputs".

4.2.4.2 Total AC luminaires

Indoor Areas : Total number of AC luminaires shall be calculated by the Lumen Method for average light intensity.

Outdoor Areas : Total number of AC luminaires for outdoor areas shall be calculated on the basis of point to point method by an established computer program. Optimisation criteria shall form part of street lighting calculations.

4.2.4.3 AC Normal & AC Emergency Luminaires

Area A, B & C : A specified percentage of total AC luminaires shall be considered as AC emergency luminaires. The percentage shall be as specified in Data Sheet A. The remaining luminaires shall be AC normal luminaires.

Area D : All the luminaires shall be considered as AC normal luminaires.

4.2.4.4 DC Normal & DC Emergency Luminaires

Where specified, DC normal luminaires shall be provided for areas A. The vendor shall consider the quantities of DC emergency luminaires as suggested by purchaser for Area A & B types. Unless otherwise indicated, DC luminaires are for the functional purpose only and no design calculations are to be done. Vendor shall ensure that adequate number of DC emergency lights are provided for essential operations of the plant and shall suggest the changes in purchaser's DC lighting stipulations, if required.

4.2.4.5 Independent DC Luminaires

In areas comparatively remote from power house building, emergency illumination, where required will be provided by rechargeable emergency units. Such units will be installed at suitable location without plug and socket and will be permanently connected to normal AC supply. These emergency units will automatically light-up upon failure of normal AC supply.

4.2.5 Layout Considerations

4.2.5.1 General Layout Considerations

a) Layout of equipment such as LDBs and LPs shall be on the basis of following criteria :

   i. Ease of operation

   ii. Maintainability

   iii. Aesthetics

b) Luminaires shall be located to meet the functional requirements of the area. Aesthetics shall form part of layout considerations.

c) Due considerations shall be given to the mounting arrangement depending upon location and type of area.

d) While preparing lighting system layout drawings for air conditioned control rooms/areas having false ceilings, the vendor shall be required to coordinate with the Air Conditioning / Ventilation Duct layout and false ceiling layout drawings to avoid fouling / interference.

4.2.5.2 Conduit System

a) Unless indicated otherwise, conduits shall originate from respective lighting panels and shall continue upto the luminaires for all indoor areas.

b) Conduits shall run in straight runs, parallel to building columns, walls etc. as far as practicable.

c) Unnecessary bends and crossings shall be avoided.

d) In the corrosive environment, conduit installations shall be made with corrosion proof conduits. Such requirements shall be clearly indicated while preparing BOQ.

4.2.5.3 Wiring

a) Each circuit starting from LP shall be taken in a separate conduit.

b) Receptacle wiring conduits shall be distinct from lighting conduits.

c) All wiring shall be of PVC insulated copper conductors. The following conductor sizes shall be applicable :

i. Luminaires 2.5 sq.mm.

ii. 5A plug and socket 2.5 sq.mm.

iii. 5A-15A plug and socket 4.0 sq.mm.

d) Wiring shall be designed for the uniformly distributed spread of luminaires on each phase i.e. R, Y & B. Distribution of luminaires on these phases shall be such that there is generally uniform light intensity in the event of failure of one or two phases.

e) Luminaires located in the offices, stores, laboratories, toilets etc. shall be individually or group controlled.

4.2.5.4 Cabling

a) Cables shall be considered wherever it is not desirable to run the insulated wires due to long runs or for any other valid reason.

b) Cable Schedule shall be prepared for all cable connections.

4.3 ENGINEERING OUTPUTS :

Vendor shall prepare and submit following documents and drawings for purchaser's approval :

a) Lighting calculations for indoor areas covering details such as room dimensions (length, width, height), illumination level, reflection factors (walls, ceiling, floor), maintenance factor, type of luminaire, mounting height of luminaire, room index, coefficient of utilisation, no. of luminaires (AC Normal & AC Emergency), lumen output of each luminaire, reference drawings and remarks.

b) Lighting calculations for outdoor areas covering average illumination level, type of luminaire, chart for illumination level at various points in the area; location (coordinates), number and height of poles; type, number (normal + emergency) and orientation of luminaires etc. Calculated values of average and minimum illumination level as obtained through computer package shall also be furnished. Dot density plots for lux level shall be furnished if available in the computer package.

c) Single line diagrams of power distribution upto Lighting Panels. Separate drawing for complete lighting distribution shall also be prepared by vendor.

d) Control schemes for DC and street lighting.

e) Loads on each phase of LP and LDB with consideration of diversity factor for sockets.

f) Layout drawings for each indoor area indicating location of luminaires, sockets, fan points, exhaust fans, LDBs and LPs. Details of type of luminaires, source of power supply (AC Normal, AC Emergency, DC Normal and DC Emergency). Bill of Material shall also be covered which shall include unit wise requirements of luminaires and other items.

g) Layout drawings for each outdoor area indicating location of poles / towers, orientation of luminaires, sockets and LPs. Details of pole height / mounting height, type of luminaires, source of power supply (AC Normal, AC Emergency, DC Normal and DC Emergency). Bill of Material shall also be covered for various types of luminaires.

h) Conduit layout drawings with wiring and load distribution details as superimposed on the area layout drawings indicated above. Drawings shall include Bill of Material for conduits, wires etc.

i) Wiring and load distribution details for outdoor areas.

j) Master Bill of Material (to be submitted at regular intervals).

5.0 LUMINAIRES, ACCESSORIES AND LAMPS

5.1 GENERAL REQUIREMENTS OF LUMINAIRES

5.1.1 All luminaires and accessories shall be designed for continuous operation and shall be suitable for the system design data given in Data Sheet A.

5.1.2 Luminaires shall be complete with accessories mounted inside the luminaire assembly. Lamps shall be supplied separately as per BOQ.

5.1.3 All luminaires and accessories shall be suitable for operation in the atmospheric conditions prevailing at site.

5.1.4 Power factor for fluorescent lamp luminaires shall be 0.9 or more and that for HPMV / HPSV luminaires shall be 0.85 or more. Power factor correction capacitors shall be provided for this purpose.

5.1.5 Luminaires shall be designed for minimum glare. No bright spots should appear from the lamp or from the reflectors.

5.1.6 All accessories shall be wired upto a terminal block or a separate weather proof metallic terminal box suitable for 2.5 sq. mm. copper wire termination.

5.1.7 All internal wiring shall be of PVC or silicon rubber insulation, capable of withstanding the maximum temperature to which it will be subjected under specified service conditions without deterioration.

5.1.8 All luminaires and accessories including the breathing holes shall be vermin proof.

5.1.9 Surface Treatment:

a) All surfaces after manufacture shall be thoroughly cleaned and degreased. Pre-treatment of surfaces shall be as per the applicable standard. Pretreated surfaces shall be free from rust, sharp edges, scales and burrs.

b) Finish of surfaces shall be non-porous, smooth and unfaded.

5.1.10 All metal parts of the luminaires shall be bonded and connected to the earthing terminal. Earthing terminal shall be suitable for connecting 16 SWG GI wire.

5.1.11 Flood lights shall be provided with base frame / base plate for mounting on structural steel members / wall.

5.1.12 All weather proof luminaires shall have the control gear housed in a weather proof enclosure with necessary gaskets, mounting bracket, locking screws etc.

5.2 LUMINAIRE TYPES

General requirements depending upon type of luminaire are listed below. Specific requirements of each luminaire are indicated in “Luminaire Details” enclosed as Annexure-II.

5.2.1 Channel Mounted Luminaires (Fluorescent Luminaires)

5.2.1.1 Channel mounting luminaires, except the special purpose luminaires, shall have CRCA sheet steel base plate / rail / channel / box / side panels / housing as per “Luminaire Details”. Sheet shall be completely stove enameled unless mentioned vitreous enameled in “Luminaire Details”. Colour of enamel shall be grey on all non-reflecting surfaces and white on reflecting surfaces.

5.2.1.2 Twin fluorescent luminaires shall be wired in lead-lag circuit to minimise stroboscopic effect.

5.2.1.3 Luminaires suitable for surface mounting shall also be suitable for pendant mounting. Knockouts of 20mm ET conduit fixation shall be provided for this purpose.

5.2.1.4 Decorative Fluorescent Luminaires

a) Decorative luminaires shall be provided with one of the following as per "Luminaire Details" :

i. Perspex acrylic diffuser.

ii. High purity, anodised aluminium, mirror optic reflectors with anodised aluminium matt finish transverse fins to control glare.

iii. Opal polystyrene louvers and sheet steel side panels.

iv. Vertical metallic louvers finished in stove enamelled white and with sheet steel side panels.

b) End plates of decorative luminaires shall be of high impact polystyrene or sheet metal finished in black colour.

c) Diffusers and louvers for the fluorescent lamps shall be made of high impact polystyrene sheet and shall have no yellowing property over a prolonged period of use.

d) Recessed type decorative luminaires shall be suitable for mounting with gypsum boards / luxalon / plaster of paris false ceiling of standard size as per Data Sheet A and "Luminaire Details".

5.2.1.5 Industrial Fluorescent Luminaires (General Purpose)

a) Industrial luminaires shall be provided with vitreous enameling, if specified in "Luminaire Details".

b) Additional reflectors, wherever provided, shall be easily removable type.

5.2.1.6 Industrial Fluorescent Luminaires (Special Purpose)

a) Luminaires for chemical vapour (acidic / alkaline) laden environment shall be of cast aluminium controlgear box and end boxes. Controlgear housing shall have detachable, one piece neoprene gasket cover to make it weather proof. Design shall be suitable for chemically charged environment.

b) Luminaires for corrosive and dust laden environment shall be made of tray type sheet steel housing and transparent acrylic visor supported by a galvanised sheet steel frame, fitted to the housing with gasket all around. Cable entry shall be from the side of luminaire. Luminaire shall be totally dust and vapour proof.

c) Luminaires for highly corrosive environment shall have fiberglass reinforced polyester controlgear housing, CRCA sheet steel controlgear tray with a stove enamelled white reflector. A clear acrylic cover of dish shape, secured to canopy by stainless steel toggle and neoprene gasket lining, shall be provided at the bottom.

d) Luminaires for drip proof environment such as street lighting fluorescent luminaire shall have sheet aluminium canopy, a detachable reflector-cum-controlgear housing, clear ribbed acrylic cover held in aluminium frame. Luminaire shall have the degree of protection

IP : 54 unless mentioned otherwise in Data Sheet A. Luminaire shall be suitable for side entry mounting with the pole bracket arm.

5.2.2 Bay Type Luminaires

5.2.2.1 Luminaires shall be designed for following indoor applications:

a) High bay above 8 metres

b) Medium bay 6 - 8 metres

c) Low bay below 6 metres

5.2.2.2 Luminaires shall have top mounted, cast aluminium controlgear housing. Housing shall have cooling fins and canopy for easy access to the components. Canopy shall be hinged at one end and wing screw bolted at the other end.

5.2.2.3 Controlgear shall be connected to the detachable lamp housing at the bottom such that heat dissipation is proper and distributed.

5.2.2.4 Lamp housing-cum-reflector shall be made from spun aluminium, electrochemically brightened and anodised.

5.2.2.5 Lamp housing for the dust laden environment shall be totally enclosed type. A clear toughened glass cover shall be attached to the lamp housing with an aluminium frame and neoprene gasket. Luminaire shall be provided with a safety chain for toughened glass.

5.2.2.6 Mounting arrangement shall consist of MS brackets with an anti-vibration eye-bolt.

5.2.2.7 Side mounted controlgear box shall be provided for low bay luminaires, if mentioned in “Luminaire Details”.

5.2.3 Well Glass Luminaires

5.2.3.1 Well glass luminaires shall be suitable for dust and vapour laden environment.

5.2.3.2 Luminaires shall be provided with a die-cast aluminium canopy and heat resistant well glass, fitted with a ring type gasket.

5.2.3.3 All well glass luminaires shall be provided with vitreous enamelled reflector.

5.2.3.4 Zinc plated MS wire guard shall be provided for protection of well glass.

5.2.3.5 Separate side mounted and top connected controlgear box shall be provided for use with HPMV & HPSV lamps. Separate, non-integral controlgear box is also acceptable.

5.2.3.6 Integral controlgear box, where applicable, shall be of die cast aluminium material with one piece neoprene gasket between the box and its cover to make it dust and vapour proof.

5.2.3.7 Luminaires shall be conduit mounted type for incandescent lamps and surface mounting type for HPMV & HPSV lamps.

5.2.3.8 Flame Proof Well Glass Luminaires

a) Housing material shall be cast aluminium alloy LM6. Housing outer surface shall be provided with cooling fins.

b) Flame proof luminaires shall be provided with heavy toughened well glass cemented in a retaining ring.

c) Zinc-coated / chrome-plated MS chain connected to the main body and glass retaining ring shall be provided.

d) A detachable terminal box at the top shall be provided.

e) Neoprene gaskets, where needed, shall be provided for weather proof construction and indoor and outdoor application.

g) Two cable entries of 20mm ET conduit shall be provided with one flame proof plug.

h) Mounting shall be through eye-bolt or MS galvanised strap as per Data Sheet A.

i) Luminaires shall be suitable for the hazardous areas as classified in Data Sheet A. Design of flame proof luminaire shall be supported by the type test report for flame proofness from a government or government approved independent laboratory.

5.2.4 Street Lighting Luminaires (Other than Fluorescent Luminaire)

5.2.4.1 These luminaires shall be suitable for street lighting and general purpose outdoor area lighting.

5.2.4.2 Luminaire housing shall be one piece cast aluminium alloy to accommodate lamp housing and controlgear in two different compartments for lamp wattage upto 125 Watts. For lamp wattage above 125 Watts, controlgear housing shall be of cast aluminium alloy whereas lamp housing shall be of deep drawn aluminium.

5.2.4.3 Inside finish of the lamp housing shall be stove enamelled white. Optical control shall be provided with two high purity, electro brightened and anodised side reflectors.

5.2.4.4 Clear acrylic bowl fitted with a rubber gasket and easily removable type shall be secured to the lamp housing.

5.2.4.5 Provision shall be made for adjustment of lamp location for proper focussing.

5.2.4.6 Luminaires shall be suitable for mounting with pole bracket arm.

5.2.5 Flood Lighting Luminaires

5.2.5.1 Flood light lamp housing and reflector shall be separate from controlgear box. Requirements of controlgear box are specified elsewhere.

5.2.5.2 Lamp reflectors shall be of high purity spun aluminium attached to the cast aluminium lamp holder housing at the rear. Lamp holder housing shall be provided with cooling fins.

5.2.5.3 Reflector shall be closed from the front by heat resistant toughened glass and synthetic "S" type weather proof gasket.

5.2.5.4 Luminaire shall be provided with special lamp centering and focussing device ensuring good beam control.

5.2.5.5 MS mounting bracket shall allow fixation of the flood light in any position in a horizontal plane and the flood light can be locked in at any set angle in the vertical plane. Cast iron base and / or two protector scales shall also be provided where specified in "Luminaire Details"

5.2.5.6 Design shall permit replacement of lamp from the rear without disturbing the previously set aiming angles. Special guide pins shall also be provided for protecting the lamps from damage while replacing.

5.2.5.7 Halogen Flood Lighting Luminaire

a) Luminaires shall be compact in design with aluminium alloy housing and three piece highly polished and anodised reflector assembly.

b) Toughened glass panel in the front shall be provided with silicon gaskets.

c) Lamp replacement from the front is also acceptable.

5.2.6 Post Top Lanterns

5.2.6.1 Luminaire shall comprise of a spun aluminium canopy, opal acrylic diffuser and a cast aluminium spigot.

5.2.6.2 Controlgear shall be integral type and shall be housed in the spigot.

5.2.6.3 Luminaire shall be supplied without mounting pole.

5.2.7 Bulk Head Luminaires

5.2.7.1 Bulk Head (Flame Proof)

a) Bulk head luminaires shall be used for the locations where explosion or fire hazard exists.

b) Luminaire shall be made of cast iron housing with integral terminal box.

c) Front of the luminaire shall be covered with flat toughened glass cemented into a retaining ring.

d) Lamp replacement shall be from the front.

e) Controlgear box for HPMV lamps shall be integral to the housing.

f) MS fixing straps shall be provided for mounting.

g) Luminaire shall be stove enameled grey outside and white inside.

h) Terminal box shall be provided with 20 mm ET conduit entry.

i) Complete luminaire shall be suitable for the hazardous area as classified in Data Sheet A. Type test certificate for flame proofness test from government or government approved independent laboratory shall be submitted.

5.2.7.2 Bulk Head (Weather Proof)

a) Luminaire shall be suitable for indoor / outdoor applications having weather proof features.

b) The luminaire shall comprise of die cast aluminium alloy body of dish shape.

c) Luminaire shall have a heat resistant prismatic cover held in a weather proof gasket.

d) Luminaire shall be stove enamelled grey outside and white inside.

e) Glass cover shall have a galvanised wire protection.

f) Luminaire shall be provided with locking arrangement with Allen key to prevent pilferage.

g) Luminaire shall be suitable for use with incandescent lamp upto 100W.

h) Provision for 20 mm ET conduit entry shall be provided at the bottom.

5.2.8 Emergency Lighting Luminaires

5.2.8.1 The luminaire shall be automatic, 40W incandescent bulb unit having in-built battery.

5.2.8.2 Battery shall have integral charging unit. Battery rating shall be 4 hours i.e. during AC supply failure emergency lighting shall operate for 4 hours without recharging.

5.2.8.3 Charger shall be suitable for operation as per system design data.

5.2.8.4 Battery shall be maintenance free sealed lead-acid type unless mentioned otherwise in Data Sheet A as Ni-Cd battery.

5.2.8.5 The battery enclosure shall be suitably painted and ventilated for the performance with sealed lead acid battery, as applicable.

5.3 CONTROLGEAR BOX (NON-INTEGRAL TYPE)

5.3.1 Non-integral controlgear boxes shall be of 1.6 mm thick CRCA sheet steel construction unless specified otherwise in Data Sheet A.

5.3.2 Boxes shall have weatherproof construction and shall be provided with one piece neoprene gasket. Unless mentioned otherwise in Data Sheet A, degree of protection shall be IP:55.

5.3.3 Boxes shall be provided with HRC fuse mounted on a removable tray. Boxes shall be provided with all necessary components having a neat layout arrangement such that it is possible to test, inspect or replace any component without difficulty.

5.3.4 Boxes shall be suitable for mounting on structures, walls and columns.

5.3.5 Unless mentioned otherwise in Data Sheet A, boxes shall be galvanised.

5.3.6 Suitable number of terminals shall be provided for looping-in and looping-out of cable connections and also connections to the luminaire(s).

5.3.7 Cable / conduit knock-outs shall be for each loop-in and loop-out connection and also connection to the luminaire(s).

5.4 REFLECTORS

5.4.1 Reflectors shall be made of sheet steel or aluminium as applicable.

5.4.2 The aluminium reflectors shall be made of high purity aluminium sheet. Sheet will be polished, electrochemically brightened and anodised.

5.4.3 Wherever reflectors are separate from housing, they shall be securely attached to the luminaire by means of easily accessible fastening devices such that they are readily removable from the housing for maintenance.

5.5 LAMP HOLDERS

5.5.1 Holders shall be resistant to wear and shall be smooth in operation.

5.5.2 Contacts shall be of durable quality.

5.5.3 Holders shall hold the lamp under condition of shock and vibration.

5.5.4 Lamp holders for fluorescent lamp shall be spring loaded, bi-pin, rotor type with low contact resistance.

5.5.5 Live parts of the holder shall not be exposed when the lamp is inserted or removed in case of fluorescent luminaires.

5.5.6 Lamp holders for HPMV & HPSV lamps shall be of porcelain material.

5.5.7 Holders shall be screw type for HPSV & HPMV lamps. Holders for incandescent lamps shall be screw type, unless mentioned otherwise in Data sheet A.

5.5.8 Lamp holders for incandescent lamps shall be of brass or porcelain.

5.6 STARTER HOLDERS

5.6.1 Starter holders shall be designed and manufactured as per the applicable standard.

5.7 BALLASTS

5.7.1 Fluorescent fixtures, installed in other than control room areas shall have electronic ballasts. For control room, the ballast shall be copper wound, inductive, heavy duty type, filled with

thermosetting insulating moisture repellent polyster and designed for long service life and low power loss.

5.7.2 Ballasts shall be totally enclosed type.

5.7.3 Ballasts shall be easily removable type.

5.7.4 Core shall be made of low loss, electrical grading stampings.

5.7.5 Coils shall be annealed copper wire wound, inductive, heavy duty type.

5.7.6 The core and coil assembly shall be impregnated with suitable insulating material of high thermal stability and integrally encapsulated in thermosetting polyester compound. The compound shall be insulating and moisture resistant filled under pressure or vacuum.

5.7.7 End connections shall be made available in a terminal block, rigidly fixed to the ballast enclosure.

5.7.8 Ballasts shall be free from humming.

5.7.9 Ballast shall be provided separately for each lamp in a multi-lamp luminaire.

5.7.10 Tappings shall be provided to set the voltage within range for HPMV & HPSV luminaires.

5.8 STARTERS

5.8.1 Starters shall be made of aluminium material. Plastic or any other material if used shall be subject to purchaser's approval.

5.8.2 Starters shall have bi-metal electrodes.

5.8.3 Starter shall be replaceable without the use of any tool and without disturbing any accessory or lamp.

5.8.4 Starters shall have high mechanical strength.

5.8.5 Starters shall be provided with radio interference suppressing capacitors.

5.8.6 Starters shall have brass contacts.

5.9 CAPACITORS

5.9.1 Capacitors shall have constant value of capacitance, suitable for operation at supply voltage.

5.9.2 Capacitors shall be hermetically sealed, preferably in a metal enclosure to prevent seepage of impregnant and ingress of moisture.

5.10 LAMPS

5.10.1 Lamps shall be suitable for use in any position.

5.10.2 Lamps shall be capable of withstanding small vibrations without breakage to filaments / electrodes and lead-in wire.

5.10.3 Type of Lamps

a) Fluorescent Lamp

i. They shall be of the “cool daylight” type, unless mentioned otherwise in Data Sheet A.

ii. Anode rings shall be provided to prevent blackening of the ends.

iii. Lamp caps shall be two pin type at each end.

b) Incandescent (GLS) Lamps

i. Incandescent lamps shall be “clear” type.

ii. Lamp caps shall be screw type , unless mentioned otherwise in Data sheet A.

c) Mercury Vapour Lamps

i. Lamps shall have outer envelope with colour corrected fluorescent powder, unless mentioned otherwise in Data Sheet A.

ii. Lamp caps shall be screw type.

d) Sodium Vapour Lamps

i. Lamps shall be ovoid shaped with diffusing powder coating.

ii. Lamps shall be provided with external igniters and rapid restart facility.

iii. Lamp caps shall be screw type.

e) Halogen Lamps

i. Lamps shall be double ended linear type.

ii. Lamps shall be of immediate start type.

iii. Design of lamps shall ensure high performance and high efficiency.

6.0 DESIGN REQUIREMENTS (MAIN EQUIPMENT EXCEPT LUMINAIRES AND LAMPS)

6.1 LIGHTING DISTRIBUTION BOARD (LDB)

6.1.1 General Requirements of LDBs

6.1.1.1 LDBs shall be totally enclosed, modular in construction, indoor type and suitable for electrical system data as specified in Data Sheet A. The LDB shall be free standing type suitable for installation on cable trenches / floor.

6.1.1.2 LDBs shall be constructed from CRCA sheet and structural sections. Sheet thickness for load bearing members shall be 2.0 mm and that for non-load bearing members shall be 1.6 mm, unless specified otherwise in Data Sheet A. The design and construction of LDBs shall ensure adequate rigidity.

6.1.1.3 Vertical cable chambers / alleys of adequate width but not less than 250 mm shall be provided for incoming / outgoing cables of each panel.

6.1.1.4 LDBs shall have only one operational front. Door shall be provided at the front of each module to give full access to all the components.

6.1.1.5 LDBs shall consist of dust and vermin proof cubicles without the use of louvers (except the transformer compartment, where applicable).

6.1.1.6 Good quality synthetic rubber / neoprene gaskets shall be put around the door, cover edges and cutout edges for pushbutton, lamps etc. for protection against dust. The door when closed, shall compress the gasket uniformly.

6.1.1.7 Cutout edges for instruments, relays etc. shall have sufficient overlap surface to minimize the dust entry. The arrangement for the front mounting of switch handles shall render the LDB reasonably dust free such that the normal operations are not affected.

6.1.1.8 Degree of protection for completed LDBs (Distribution Board) shall be IP:52 unless mentioned otherwise in Data Sheet A.

6.1.1.9 The LDBs shall be designed to prevent contact with live parts both within the modules and in the cable alley.

6.1.1.10 The ratings of all components shown in the enclosed drawings are indicative only. The bidder shall be responsible to check and coordinate the MCB characteristic with back up fuses etc. provided. Any change in size / ratings of components required for final arrangement may be complied with and provided by the vendor at no extra cost.

6.1.1.11 All equipment shall be constructed of non-hygroscopic and non-inflammable materials.

6.1.1.12 All components mounted in the LDBs shall be accessible and shall not impede access to wiring or terminals. All faults except busbar fault which may occur within any individual unit shall be confined within that unit only and shall not cause shutdown of any section of the board other than the affected unit itself. Maintenance and inspection shall be possible in any individual unit without affecting other units.

6.1.1.13 Incoming unit shall comprise of either switch-fuse / composite fuse-switch unit or MCCB as per scheme / Data Sheet A. Outgoing units shall be a switch-fuse / composite fuse-switch unit / MCB.

6.1.1.14 The rated continuous current of the equipment and components shall be as given in the schemes. These ratings shall be obtained with the components mounted in their housing as in service without exceeding the permissible temperature rise.

6.1.1.15 Interlock between compartment door and modules shall be provided such that the door cannot be opened without switching off the power supply to the module.

6.1.1.16 Defeat interlock shall be provided for the units comprising of switch or moulded case circuit breaker as a means of isolation device, such that it is possible to open the door with device ON. It shall not be possible to close the door till the interlock has been reinstated.

6.1.1.17 Each LDB shall be fitted with base frame made of angle or channel.

6.1.1.18 All fixing nuts and bolts together with grounding bolts shall be provided.

6.1.1.19 Lifting lugs shall be provided for each shipping section of LDB. Removal of such lugs or hooks shall leave no opening in the LDB.

6.1.2 LDBs with transformers (Additional Features)

6.1.2.1 The lighting distribution board shall be arranged in two adjacent but separate compartments, one compartment for the lighting transformer and the other for the incoming & outgoing feeders etc.

6.1.2.2 The transformer shall be mounted on the base channel and it shall be possible to easily remove the transformer from the cubicle after opening the door. Necessary portable ramp made of mild steel shall be supplied along with each LDB.

6.1.2.3 Independent gasket hinged door with operating handle shall be provided for access to transformer & its taps. Operating handle shall have built-in key locking arrangement.

6.1.2.4 Suitable ventilation arrangement for the transformer compartment to dissipate the heat of the transformer shall be provided. The arrangement shall be in the form of louvers and the same shall be provided with galvanised wire mesh with dust catchers on the inside.

6.1.2.5 The degree of protection for transformer compartment shall be IP:42 unless mentioned otherwise in Data Sheet A.

6.1.2.6 Connections between transformer secondary terminals and the busbars shall be made by using PVC insulated flexible copper cables or busbars.

6.1.2.7 Warning plate shall be provided on transformer enclosure. The inscription of warning plate shall be as given below :

- DO NOT OPEN DOORS WHEN ENERGISED
- KEEP TAPS AT SAME POSITION FOR ALL PHASES

6.1.2.8 Transformer enclosure shall be provided with a danger plate.

6.1.3 Lighting Transformer

6.1.3.1 Lighting transformer, where specified, shall form an integral part of lighting distribution board.

6.1.3.2 Lighting transformer shall be dry type, natural air cooled and suitable for mounting inside the lighting distribution board. Transformer shall be non-encapsulated type, unless specified otherwise in Data Sheet A.

6.1.3.3 Rating of transformer shall be 50 kVA or 100 kVA as per type of LDB.

6.1.3.4 Voltage rating shall be as given in Data Sheet A.

6.1.3.5 Percentage impedance shall be 3% for 50 kVA and 4% for 100 kVA transformers, unless specified otherwise in Data Sheet A.

6.1.3.6 Off circuit tap changers / links shall be provided for +5% in steps of 2.5%.

6.1.3.7 Transformer winding insulation shall be class “F” or better.

6.1.3.8 Transformer shall be of vector group Dyn1.

6.1.3.9 Winding shall be of copper material and maximum winding temperature at full load and under site conditions shall not exceed 120 oC.

6.1.3.10 Transformer shall be suitable for cable connections on the primary side and flexible cable or busbar connection on the secondary side.

6.1.3.11 The secondary neutral of the transformer shall be brought out for getting a grounded 4 wire supply system.

6.1.3.12 The transformer neutral shall be brought outside the LDB for earthing. The neutral bus bar shall be insulated from the LDB enclosure.

6.1.3.13 Transformers shall be provided with the rollers, pulling holes, lifting lugs, jacking positions etc.

6.1.4 Busbars, Connections and Joints

6.1.4.1 Busbars shall be made of aluminium grade E 91E or high conductivity copper (ETC). Busbar material shall generally be aluminium unless mentioned otherwise in Data Sheet A.

6.1.4.2 Busbars shall be supported on non-hygroscopic and non-inflammable insulators of material such as glass reinforced moulded plastic material, epoxy cast resin etc. Separate supports shall be provided for each phase of the busbars. Insulation level of neutral busbar shall be same as that of phase busbars.

6.1.4.3 Busbars shall be contained in a separate vermin-proof compartment within the LDB and shall have bolted sheet steel covers for providing suitable access.

6.1.4.4 Busbar clearances in the air shall be as per applicable standard for 500V, 3 phase system.

6.1.4.5 Temperature for busbars, droppers and connections shall not exceed 90oC for an ambient of 50oC while carrying maximum continuous current.

6.1.4.6 The busbar, busbar connections and supports shall have sufficient strength to withstand thermal and electromechanical stresses produced by the specified short circuit level of the system.

6.1.4.7 Busbars (including neutral busbar) shall be capable of carrying the short-time current specified in Data Sheet A. The duration of short-time current shall be 1 sec unless mentioned otherwise in Data Sheet A. For the specified current and duration, there shall be no damage to the equipment.

6.1.4.8 The neutral bus shall be rated same as phase bus.

6.1.4.9 Main busbars and connections shall be prominently marked and displaced for standard sequence counting from rear to front, top to bottom, or left to right as viewed from the switching device operating mechanism side.

6.1.4.10 Busbars and connections shall be provided with colour coded PVC sleeves. All live parts shall be properly shrouded with insulating material.

6.1.4.11 Earth busbar shall be provided separately. Material of earth busbar shall be GI unless mentioned otherwise in Data Sheet A.

6.1.4.12 Busbar Joints

a) Busbar and tap off joints shall be bolted type.

b) Busbars shall be thoroughly cleaned before jointing. Suitable contact grease shall be applied to remove oxide film just before jointing.

c) For copper busbars, the connecting portion shall be tinned or silver plated.

6.1.5 Wiring and Terminals

6.1.5.1 All internal wiring for connections to remote equipment shall be brought to terminal boards. Spare contacts of devices shall also be wired upto terminal board as per schemes. Wires shall not be jointed or teed-off except at terminal points.

6.1.5.2 Wiring shall be made by 1000 volt grade three / seven strand PVC insulated copper wire having a cross-sectional area of not less that 1.5 sq.mm. All connections from CT leads upto instruments, terminals shall be made by copper wires of minimum 2.5 sq.mm. size.

6.1.5.3 All wiring shall be made with the Colour Codes specified below :

a) 3 phase AC Connections

Phase 1 (R)	Red
Phase 2 (Y)	Yellow
Phase 3 (B)	Blue
Neutral	Black

b) 1 phase AC Connections

Phase	Red / Yellow / Blue (as per associated circuit)
Neutral	Black

c) DC Connections

Positive	White
Negative	Grey

d) Earth Connection Green

6.1.5.4 Where wiring passes from one compartment to another, the aperture shall be 'Bushed' to prevent damage to wires against sheet metal edges. Bushes may comprise of good quality rubber / PVC grommets.

6.1.5.5 Every wire end shall be fitted with numbered ferrules of white or yellow colour having glossy finish with identification number engraved in black. Ferrules shall be made of moisture and oil resisting insulating material. Ferrules shall be of interlocked type or tight fitting type. Ferrules shall be so fitted that they will not get detached, when the wire is removed from the terminal.

6.1.5.6 System of marking of wiring shall be as per applicable standard.

6.1.5.7 All wires used internally shall have crimped on tinned copper lugs for terminations.

6.1.5.8 Terminal boards shall be stud type with insulating barriers of adequate height.

6.1.5.9 Terminal boards shall have separate terminals for incoming and outgoing wires with not more than two wires connected to any one terminal.

6.1.5.10 Terminal boards shall be mounted vertically or in the horizontal rows and properly spaced to have clean wiring arrangement, adequate access for putting ferrules, making terminations etc. It shall be possible to read the ferrule numbers when the wiring is complete. Where terminals may be live when the equipment is isolated from the main supply, these shall be clearly marked near the terminal boards.

6.1.6 Controls

The controls shall be provided as per purchaser's requirements covered in the specification and control schemes.

6.1.7 Switch Fuse Units

Refer clause 7.0 (COMPONENTS OF MAIN EQUIPMENT)

6.1.8 Cable Terminations

6.1.8.1 All cables, either incoming or outgoing to the LDB, shall be terminated in a cable chamber. For each panel, there shall be a cable chamber on the side. The door of cable chamber should

open or be locked with the help of a tool. Unless stated otherwise in Data Sheet A, all cables shall enter from the bottom.

6.1.8.2 Removable undrilled gland plates of sheet steel shall be provided in the cable chamber for entry of cables. Minimum thickness of gland plate shall be 3mm. The gland plate shall be of adequate size for connecting requisite number of cable glands for power and control cables.

6.1.8.3 Heavy duty bolt-on termination tinned copper lugs of compression type shall be used in for power cable termination.

6.1.8.4 For supporting and clamping of cable cores at regular interval in cable alleys, suitable slotted angle upto the respective terminal blocks shall be provided.

6.1.8.5 The supply of tinned copper cable lugs for power cables forms part the supply of equipment.

6.1.9 Earthing

6.1.9.1 An earth busbar of adequate size of galvanised MS shall be provided at the bottom for the entire length of the LDB.

6.1.9.2 Every metal part other than those forming parts of an electrical circuit shall be connected to the earth bus by means of high conductivity copper wire of size not less than 2.5 sq. mm. cross-sectional area.

6.1.9.3 Doors shall have a flexible copper wire for earth connection to fixed unit.

6.1.9.4 Each LDB shall be fitted with two earthing studs located in accessible position on sides for connection of internal earth busbar to the external earthing connection.

6.1.9.5 Earth busbar shall be brought outside LDB for making external connections.

6.1.10 Types of LDBs

The LDBs shall be of following type :

a) LDB-H (n) - AC LDB with 100 kVA transformer

b) LDB-F (n) - AC LDB with 50 kVA transformer

c) LDB-N (n) - AC LDB with no transformer

d) LDB-D (n) - DC LDB

NOTE : (n) indicates number of outgoing feeders.

6.1.10.1 AC LDBs (LDB-H, LDB-F, LDB-N)

Each LDB shall comprise of the following and comply with the enclosed single line diagrams :

a) One lighting transformer (LDB-H & LDB-F).

b) One incomer of TP / TPN switch-fuse unit or MCCB / MCCB with neutral link as per Data Sheet A. It shall be provided on the primary side of transformer for LDB type LDB-H & LDB-F.

c) Set of busbars with 3 phase and neutral.

d) TPN switchfuse units for each outgoing circuit.

e) Three indicating lamps with fuses for indicating bus supply ON.

f) CT operated ammeter with selector switch.

g) VT operated voltmeter with selector switch.

h) Power & control terminals, earth-stud, earth busbar, designation labels, internal wiring, power cable lugs, glands etc. shall be provided to complete the LDB in all respects.

6.1.10.2 DC LDBs (LDB-D)

Each LDB shall comprise of the following and comply with the enclosed single line diagrams :

a) One incomer of two pole switch-fuse unit.

b) Two pole DC contactor on the incoming circuit for changeover to DC in case of AC normal supply failure.

c) One under voltage relay of suitable range, if specified in Data Sheet A.

d) One ON delay timer.

e) One test push button.

f) Set of busbars for positive and negative.

g) Two pole switch-fuse units / MCB for outgoing feeders.

h) Two indicating lamps with fuses for indicating bus supply ON.

i) Power & control terminals, earth-stud, earth busbar, designation labels, internal wiring, power cable lugs, glands etc. shall be provided to complete the LDB in all respects.

6.2 LIGHTING PANELS (LPs)

6.2.1 General Requirements of Lighting Panels

6.2.1.1 LPs shall be totally enclosed, suitable for electrical system data as specified in Data Sheet A. The LP shall be suitable for mounting on wall / column / structure.

6.2.1.2 Panels shall be suitable for indoor / outdoor application as per Data Sheet A and BOQ. Outdoor panels shall have a sloping canopy.

6.2.1.3 LPs shall be constructed from CRCA sheet. Sheet thickness shall be 2.0 mm, unless mentioned otherwise in Data Sheet A. The construction of LPs shall ensure adequate rigidity.

6.2.1.4 All components of the LP shall be fully mounted inside the panel. LPs shall have only one operational front. Door shall be provided to give full access to all the components. Door shall have padlocking arrangement.

6.2.1.5 LPs shall consist of dust and vermin proof cubicles without the use of louvers.

6.2.1.6 Good quality synthetic rubber / neoprene gaskets shall be put around the door. The door when closed, shall compress the gasket uniformly.

6.2.1.7 Unless mentioned otherwise in Data Sheet A, degree of protection for completed LPs shall be IP:52 for indoor LPs and IP:55 for outdoor LPs.

6.2.1.8 The LPs shall be designed to prevent contact with live parts when the front door is open.

6.2.1.9 All busbars (phase, neutral, positive, negative as applicable) within a panel shall be of the same size.

6.2.1.10 All control wiring inside the panels shall be carried out with 1100 V grade, PVC insulated flexible copper wire of 2.5 sq. mm size.

6.2.1.11 The rated continuous current of the equipment and components shall be as given in the single line diagrams. These ratings shall be obtained with the components mounted in their housing as in service without exceeding the permissible temperature rise.

6.2.1.12 Each LP shall be fitted with M.S. mounting brackets.

6.2.1.13 Panel shall be suitable for top / bottom cable / conduit entries. However, outdoor LPs shall have bottom cable / conduit entry. Removable undrilled gland plate of sheet steel shall be provided for entry of cables. Minimum thickness of gland plate shall be 3 mm. The gland plate shall be of adequate size having knock-outs for requisite number cable connections. Gland plate shall be provided with gasket.

6.2.1.14 The lighting panel shall be complete with copper busbars, and shall incorporate switch fuse or MCB on the incoming side, single pole miniature circuit breakers (MCBs) for AC outgoing circuits and double pole MCBs for DC outgoing circuits. Number of outgoing circuits shall be as per BOQ.

6.2.1.15 Each lighting panel shall be fitted with two GI earth studs located in accessible position on the outside of the panel on opposite sides.

6.2.1.16 All metal parts of the panel except current carrying parts shall be bonded together electrically to the earthing stud.

6.2.1.17 Each panel shall be fitted with phase barriers of fireproof insulating material in such a manner that it is not readily possible for personnel to touch the phase busbars. Insulating sheet shall be fitted around the MCBs such that only the surface and toggle of the MCBs are available on the front.

6.2.1.18 The supply of cable lugs for power and control cable connections forms part the supply of equipment.

6.2.1.19 Each panel shall be provided with a circuit directory plate with inscriptions neatly typed and laminated, fitted on the inside of door.

6.2.2 Type of Lighting Panels

a) LP-A (n) - AC Lighting Panel

b) LP-D (n) - DC Lighting Panel

c) LP-F (n) - Fancy Lighting Panel (Decorative)

d) LP-S (n) - Street Lighting Panel

NOTE : (n) indicates number of outgoing circuits.

6.2.3 AC Lighting Panel (LP-A)

6.2.3.1 LPs shall be provided with TPN switch as incomer.

6.2.3.2 Requisite number of single pole MCBs shall be provided for outgoing circuits.

6.2.3.3 Separate neutral shall be available at terminal block for each outgoing circuit.

6.2.3.4 Construction of AC Normal and AC Emergency panels shall be same.

6.2.4 DC Lighting Panels (LP-D)

6.2.4.1 LPs shall be provided with double pole switch as incomer.

6.2.4.2 Requisite number of double pole MCBs shall be provided for outgoing circuits.

6.2.5 Decorative Type Lighting Panels (LP-F)

6.2.5.1 Decorative lighting panels shall be designed for use in areas like administrative building, service building, canteen, residential premises etc.

6.2.5.2 Thickness of sheet steel shall be as per manufacturer's practice.

6.2.5.3 LPs shall be of tone colour with elegant finish.

6.2.5.4 LPs shall be provided with TPN switch as incomer and requisite number of MCBs shall be provided for outgoing circuits.

6.2.5.5 LPs shall be suitable for either surface or flush mounting as per Data Sheet A and BOQ. Flush mounted panels shall have the collared door suitable for matching with the wall.

6.2.5.6 Lighting Panels may be provided with transparent acrylic cover for operation of MCBs, if asked for in Data Sheet A.

6.2.5.7 LPs shall be provided with knockouts on the top, bottom and sides.

6.2.6 Street Lighting Panel (LP-S)

6.2.6.1 Street Lighting Panels shall be provided for feeding power supply to luminaires of street light poles, flood lighting poles, lighting masts etc.

6.2.6.2 Each Street Lighting Panel shall comprise of the following :

a) One TPN door interlocked switch-fuse unit. Interlock defeat feature shall also be provided.

b) Three pole AC Contactor

c) 00 - 24 hrs timer and a photo-electric switch for automatic switching of contactor

d) Three phase & neutral busbars

e) Single pole or three pole MCBs for each outgoing circuit as per Data Sheet A

f) Two lamps for bus supply ON & OFF indications

g) Complete wiring arrangement as per control scheme.

h) Auto-Manual selector switch

i) ON push button

j) OFF push button

k) Photo switch

6.2.6.3 Switching ON and switching OFF shall be through both 00 - 24 hrs timer and light sensor in automatic mode.

6.2.6.4 One number light sensor in weather proof enclosure having IP:55 degree of protection shall be supplied loose along with each SLP.

6.2.6.5 Internal power wiring shall be done with PVC insulated Cu wire of suitable size. All control wiring inside the panel shall be carried out with 1100 V grade, PVC insulated flexible copper wires.

6.3 LIGHTING POLES

6.3.1 Lighting poles as required for street lighting and flood lighting shall be of swaged/stepped tubular steel of swan neck construction as per applicable standard. As an alternative RCC tubular pole construction as per applicable standard can also be quoted.

6.3.2 Unless mentioned otherwise in Data Sheet A, lighting poles shall be painted type provided with following surface treatment:

a) The poles shall be coated with black bituminous paint, conforming to applicable standard, throughout on the inside surface and on the outside surface up to the level which is embedded in ground.

b) Exposed outside surface shall be painted with two coats of red lead oxide primer and followed by two coats of aluminium paint.

6.3.3 Where galvanization of poles is specified;

a) All inside and outside surfaces of the pole and base plate shall be hot dip galvanised as per manufacturer's practice.

b) Base plate shall be galvanised after welding to the pole base.

c) Manufacturer's procedure for galvanisation shall be submitted for purchaser's approval during detailed engineering stage.

6.3.4 Each street lighting pole shall be supplied with necessary pipe-reducer / fixing-bracket for fixing the luminaire. The details of bracket arm are indicated in enclosed drawing.

6.3.5 Each street lighting pole shall be suitably provided with weather proof, galvanised steel junction box and two numbers fixing brackets suiting the diameter of the pole. The requirements of junction box are stipulated elsewhere. The fixing brackets shall be supplied loose.

6.3.6 Street lighting pole shall be provided with wiring hole. The location shall be coordinated with mounting position of street lighting pole JB. The diameter of hole shall be 20 mm. The hole shall be provided with a rubber / PVC grommet.

6.3.7 Flood lighting pole shall be provided with painted MS plate and shall be suitable for the number of flood lighting luminaires and controlgear boxes as per enclosed drawings.

6.3.8 Provision for earthing shall be provided for flood / street lighting poles at a height 1 metre above the ground.

6.3.9 Types of Lighting Poles

Exact type and designation of lighting pole is as given in Data Sheet A. Basic types are as follows :

a) PS1 - Street Lighting Pole for one luminaire with 1200mm bracket arm.

b) PS2 - Street Lighting Pole for one luminaire with 1800mm bracket arm.

c) PS3 - Street Lighting Pole for one luminaire with 2500mm bracket arm.

d) PS4 - Street Lighting Pole for two luminaires with 1800mm bracket arm each.

e) PS5 - Street Lighting Pole for two luminaires with 2500mm bracket arm each.

f) PS6 - Street Lighting Pole for four luminaires with 1800mm bracket arm each.

g) PS7 - Street Lighting Pole for four luminaires with 2500mm bracket arm each.

h) PF1 - Flood Lighting Pole for one luminaire.

i) PF2 - Flood Lighting Pole for two luminaires.

j) PF3 - Flood Lighting Pole for three luminaires.

k) PF4 - Flood Lighting Pole for four luminaires.

6.4 LIGHTING MASTS

6.4.1 The lighting mast (tower) shall be of steel sections having lattice structure construction with ladder, cage and top platform.

6.4.2 Lighting mast design shall be suitable for following :

a) Height of the lighting mast as per type.

b) Maximum number of luminaires as per Data Sheet A.

c) Additional load of 500 kg towards the weight of maintenance crew.

6.4.3 Permissible design parameters should be according to relevant standard. The deflection under the maximum wind pressure of 150 kg/sq.m shall not exceed 1 in 360.

6.4.4 All steel sections, members and hardware used shall be hot dip galvanised as per applicable standard.

6.4.5 The mast shall be provided with a platform at the top, a steel cage ladder connecting to the ground and a midway landing. Height of the platform provided on the top of the mast shall be 2.0 metre and mid-way landing platform height shall be minimum 1.0 metre.

6.4.6 The span of rung shall not be less than 300mm and spacing between two adjacent rungs shall not be more than 300mm. Diameter of cage for ladder shall not be less than 1000 mm. Ladder shall be supported to give adequate rigidity.

6.4.7 Necessary mounting facilities for mounting of luminaires and controlgear boxes shall be provided at top platform. This shall include provision of holes in the fixing bracket for movable fixing plate. Adequate number of movable plates affixed to the bracket shall also be provided. Size of movable plates and the position of holes shall match with the luminaire fixing arrangement.

6.4.8 Mast shall be provided with 600mm long air termination for the lightning protection. Suitable arrangement for connection of down comer (not in the scope of vendor) shall be provided. Provision of earth connection of GI strip shall also be kept at an height of one metre from the ground.

6.4.9 Provision shall be made for supporting cables, down conductors etc. at regular intervals on lighting tower. Hot dip galvanised brackets of required size shall be provided for the same.

6.4.10 Height of lighting tower shall be the height of tower above the ground and upto the top of the top platform. Other members such as foundation members and lightning arrester shall not be considered for defining the height of tower.

6.4.11 Types of Lighting Masts

a) LM25 - Lighting Mast with 25 m height

b) LM28 - Lighting Mast with 28 m height

c) LM30 - Lighting Mast with 30 m height

d) LM32 - Lighting Mast with 32 m height

c) LM35 - Lighting Mast with 35 m height

6.5 JUNCTION BOXES

6.5.1 Junction boxes with terminals shall be supplied for branching and terminating lighting wires/cables whenever required, as specified.

6.5.2 Construction Features

The junction boxes shall be fabricated out of MS sheet of thickness not less than 2.0mm and shall be of rectangular shape. The cover shall be hinged or bolted with captive nuts and bolts and shall be provided with neoprene gasket lining all over.

The junction boxes shall be provided with suitable knock outs/ gland plates for conduit/ cable connection. The conduit connection shall be properly sealed. The junction boxes meant for cable connection shall be complete with removable gland plates, glands and cable lugs, as required. The junction boxes shall be provided with two earthing terminals suitable for GI earthing wires.

The junction boxes shall be weather proof type conforming to IP-55 of IS:2147. Junction boxes for street light poles and lighting/lightning masts shall be provided with hinged doors and allen keys with bolts as locking arrangement.

The boxes and cover shall be hot dip galvanised. Junction boxes for corrosive areas like DM Plant, water treatment plant etc. shall have additional epoxy/acrylic coating of thickness not less than 50microns on outer surface.

The junction boxes shall be suitable for mounting on wall, columns, lighting poles, mast structures etc. The brackets, bolts, nuts, screws and any other erection accessories required for erection shall be included in the erection price. Circuit number, number of street lighting panel and pole/mast at site by the contractor after their installation.

6.5.3 Terminals

Multiway terminal blocks of approved type and make complete with galvanised screws, nuts, washers and marking strips shall be furnished for terminating the lighting wires.

All the terminals blocks shall be of 650V grade one piece construction with insulating barriers. These terminals shall be made of copper alloy and shall be stud type. Each terminal provided on junction box shall be suitable for terminating two numbers of aluminium conductors of the size as specified without any damage to the conductors or looseness.

6.5.4 The junction boxes shall be of following types:

Type of junction boxes:

Type	Description
JB-F	Provided with four (4) way stud type terminals for terminating upto 2Nos. 10 mm2 stranded aluminium conductors on each terminal, suitable for outdoor installations.
JB-FE	Same as above but with an additional epoxy coating of 50micron thickness.
JB-S	Provided with four (4) way stud type terminals, each terminal suitable for terminating upto two nos. of 16mm2 stranded aluminium conductors & with one no.6A HRC fuse and link.
JB-M	Provided with four (4) way stud type terminals, each terminal suitable for terminating upto two nos. of incoming 35mm2 stranded aluminium conductors, with three nos. 25A HRC fuses, one link, and one number 32A TPN switch, and four way stud type terminals each suitable for terminating 16sq.mm. Al conductor outgoing cable.
JB-M1	6way stud type terminal block for three phases and three neutrals of adequate size to receive 4C-16mm2 incomer cables and three nos. 2Cx2.5mm^2 Cu conductor outgoing cables.
JB-SW1	Provided with four (4) way stud type terminals each terminal suitable for terminating to 10mm2 stranded aluminium conductor.
JB-SW2	Similar to the JB-SW1 but provided with ten (10) way terminals.
JB-SW3	Similar to JB-SW1 but provided with eighteen (18) way terminals.

6.6 FUSE BOXES

6.6.1 Boxes shall be suitable for accommodating fuses, neutral links and termination of cables on each side.

6.6.2 Boxes shall be of rectangular shape and fabricated out of sheet steel, hot dip galvanised and of weather proof construction.

6.6.3 Sheet steel thickness shall be 1.6 mm, unless mentioned otherwise in Data Sheet A.

6.6.4 Unless specified otherwise in Data Sheet A, degree of protection of fuse boxes shall be IP:55.

6.6.5 Galvanisation shall be done corresponding to the sheet thickness and as per the applicable standard.

6.6.6 Boxes shall be provided with a hinged lockable door with neoprene gasket lining all over. Lock shall be operable with an allen key.

6.6.7 Terminals shall be stud type suitable for ring type lugs. The size of cable shall be intimated during detailed engineering.

6.6.8 Boxes shall be provided with suitable knock outs for conduit / cable connections.

6.6.9 Two earthing terminals suitable for GI earthing wire shall be provided for each box.

6.6.10 Boxes shall be suitable for mounting on walls, structural members etc. Suitable welded fixing brackets shall be provided for this purpose.

6.6.11 Fuse boxes shall be provided with a danger plate for the rated line to line voltage.

6.6.12 Types of Fuse Boxes

a) FB - 1 Fuse Box with 1 fuse and 1 link

b) FB - 2 Fuse Box with 2 fuses and 2 links

c) FB - 3 Fuse Box with 3 fuses and 3 links

d) FB - 4 Fuse Box with 3 fuses and 1 link

6.7 RECEPTACLES

6.7.1 Receptacle unit shall consist of socket outlet with associated switch and plug. The socket outlet and switch shall be flush mounted on a box which shall be suitable for mounting on wall or steel structures.

6.7.2 Receptacle boxes shall be fabricated from CRCA sheets or made of heavy duty cast aluminium alloy as per Data Sheet A. Thickness of sheet steel shall be 1.6 mm, unless mentioned otherwise in Data Sheet A.

6.7.3 Steel boxes shall be hot dip galvanised as per the requirements of applicable standard corresponding to the sheet thickness.

6.7.4 The boxes shall have conduit knock-outs and shall be suitable for cable entry of the size to be specified by purchaser during detailed engineering.

6.7.5 The boxes shall be provided with neoprene rubber gaskets to make them moisture and dust proof.

6.7.6 Suitable loop-in and loop-out terminals shall be provided inside the box. Terminals for incoming and outgoing shall be suitable for the size of conductor of cables.

6.7.7 The receptacle units shall be of the following types:

i) Type RA: It shall have the following:

a) 20A, 250V, 1-phase, 2 pole, 3-pin (third pin scrapping earth) porcelain, metal clad socket with a metallic cover tied to it, similar to `Crompton Greaves' type AS20 or equivalent.

b) Rotary, heavy duty 20A switch conforming to applicable standard.

c) Shrouded, die-cast aluminium plug similar to `Crompton Greaves' type AS20 or equivalent. Combined interlocked weather proof industrial unit.

d) Mechanical interlock shall be provided as follows :

i) Switch can be put ON only when plug is fully engaged.

ii) Plug can be withdrawn only when switch is in OFF position.

iii) Cover can be opened only when switch is in OFF position.

e) The arrangement should ensure that water does not enter tyhe plug when socket is ON.

f) Loop-in loop-out terminals shall be provided inside the box suitable for 10 mm2 Al conductor.

ii) Type RB: It shall have the following:

a) Combination of 5A & 15A, 240V, 1-phase, 2 pole, 3-pin, third pin grounded socket with integral piano key type 15A switch, flush mounted on decorative backelite (6 mm thick)/ perspex (3 mm thick) sheet as cover of the boxes.

b) Loop-in loop-out terminals similar to type RA shall be provided. These will be located in office areas.

iii) Type RC: It shall have the following:

a) 63A, 415V, 3-phase-neutral earth, metal clad socket with cover, similar to `Crompton Greaves' type CS63.

b) Rotary, heavy duty 63A switch conforming to applicable standard.

c) Shrouded, die-cast aluminium plug similar to `Crompton Greaves' type CP63

d) It shall be combined, interlocked weather proof industrial unit.

e) Mechanical interlock shall be same as that are applicable for RA type receptacles

f) The receptacle boxes shall be suitable for entry and exit of 3.5CX70 mm2 Al conductor PVC cable and loop-in loop-out terminals for the same shall be provided such that not more than one core is terminated at one terminal. Removable, undrilled cable gland

plate shall be provided. Tinned copper lugs and double compression cable glands shall also be supplied by the bidder.

6.8 CEILING FAN & REGULATORS

6.8.1 The bidder shall supply the following ceiling fans complete with suspension rod, canopy and accessories and regulators:

i) 1200 mm sweep
ii) 1400 mm sweep

6.8.2 The fan motor shall be totally enclosed. The motor winding shall be of copper wire provided with double or reinforced class-E insulation.

6.8.3 The fan shall have three (3) well balanced blades. Precaution shall be taken in the manufacture of fan as well as regulators to ensure reasonable degree of silence at all speeds.

6.8.4 The regulator shall be conventional/electronic type with stepped/smooth (stepless) control of approved make.

6.8.5 The ceiling fans shall generally conform to relevant IS.

6.9 LIGHTING CONTROL SWITCH-BOXES

6.9.1 The switch-boxes shall be of bent steel construction, fabricated of 1.6 mm thick MS steel, with 6 mm thick decorative bakelite or 3 mm thick perspex sheet cover. The boxes shall be hot-dip galvanised.

6.9.2 The switch-boxes shall be suitable for surface mounting as well as flush mounting in brick walls. They shall be flush mounted in the walls in the office areas where false ceiling is provided.

6.9.3 Switch-boxes shall have conduit knock-out on two sides. Adequate provision shall be made for ventilation of these boxes. Conduit knock-out sizes shall be as per conduit layout drgs.

6.9.4 Switches shall be of piano-key type having quick-make, quick-break mechanism, provided with position marking, suitable for mounting on insulating plate. The switches shall be suitable for 1-phase, 240V, 50 Hz supply. They shall conform to relevant standards. The switches shall be supplied loose and shall be fixed at site according to requirement.

6.9.5 All components housed in the switch-boxes shall be wired to an outgoing junction box by 1.5 mm2 Cu wire. The junction box shall have adequate nos. of terminals.

6.9.6 The size of switch-boxes shall be adequately chosen to accommodate the no. of switches and fan regulator boxes specified below. Fan regulators shall be supplied separately.

i) Type SWB1 - Switch board with 1 no. 5A switch & JB type SW1.

ii) Type SWB2 - 3 nos. 5A switches and 1 no. fan regulator with JB type SW2.

iii) Type SWB3 - 7 nos. 5A switches and 3 nos. fan regulator with JB type SW3.

7.0 COMPONENTS OF MAIN EQUIPMENT (OTHER THAN LUMINAIRES)

7.1 MOULDED CASE CIRCUIT BREAKERS

7.1.1 Moulded case circuit breakers (MCCBs) shall be provided when called for in Data Sheet A for use in lieu of switch fuse for LDB incomer. MCCB shall meet the requirements stipulated in Data Sheet A.

7.1.2 MCCBs in AC circuits shall be of triple pole construction arranged for simultaneous three pole manual closing and opening and for automatic tripping at short circuit and overload. Neutral link shall be provided for LDBs without transformers.

7.1.3 Operating mechanism shall be quick make, quick break and trip free type.

7.1.4 The ON, OFF & TRIP positions of the MCCB shall be clearly indicated so as to be visible to the operator when mounted as in service. Operating handle shall be provided on front of the LDB.

7.1.5 MCCBs shall be capable of withstanding the thermal stresses caused by overloads and short circuits. The maximum tripping time under short circuit shall not exceed 20 milli seconds.

7.1.6 MCCB terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.

7.1.7 Under voltage release and other releases shall be provided as specified in Data Sheet A / BOM / schemes.

7.2 SWITCH-FUSE UNITS

7.2.1 These units shall preferably comprise of switches having integral fuses, called composite units. Alternatively, combination units of separate switch and fuse may also be acceptable.

7.2.2 These units shall be provided for general purpose i.e. incoming or outgoing units.

7.2.3 The units shall be of the air break air insulated type and designed to ensure safety to operating personnel.

7.2.4 Composite units shall have integral fuses i.e. fuse carrier with fuse link (fuse link forming the moving contact). The design shall ensure that the moving contact is not live when switch is open i.e. in OFF position, so as to facilitate removal of fuse.

7.2.5 The switch shall be capable making and carrying the system prospective fault current, but limited in magnitude and duration by the cut off characteristics of the largest HRC fuse link that may be fitted to that unit.

7.2.6 The fixed contact shall be so shrouded that maintenance of the unit can be carried out in safety with the busbars live.

7.2.7 Where one isolating switch is used as the incoming device, the incoming side fixed contacts shall be shrouded to ensure that maintenance can be carried out with the remote fuse and switch closed.

7.2.8 Composite switch-fuse or the combination of switch and fuse shall meet the requirements of its components as follows:

7.2.9 Isolating Switch

a) Switches shall be air-break, quick make, quick break heavy duty type conforming to applicable standard.

b) All switches shall have visible ON / OFF position indication and shall be padlockable in any (ON / OFF) position.

c) Switches shall be door interlocked such that it shall not be possible to gain access to inside the unit unless the isolating switch is in OFF position.

d) The switches shall be suitable for independent manual operation.

e) The switch contacts shall be of silver alloy or silver plated copper and springs of non-corrosive material.

f) Inter-phase barriers shall be provided to prevent possibilities of phase to phase fault in the switch. The switch shall also be shrouded from all sides to prevent access to live parts on the switch after opening the unit door. The barriers and shrouding shall extend upto the height of switch to fully enclose both side terminals of the device. The arrangement shall permit easy maintenance.

7.2.10 High Rupturing Capacity (HRC) Fuses

a) The fuse serving as the short-circuit protective device in isolating fuse-switch units shall be of HRC cartridge, current limiting and plug-in non-deteriorating type.

b) The fuse carriers shall be easily withdrawable for replacement of fuse. Insulated fuse pullers shall be provided where fuses are not mounted in insulating carriers to remove and replace fuses in live conditions.

c) Fuses shall preferably be fitted with a device to indicate operation (i.e. when the fuse has blown).

d) Live terminals of fuse bases shall be shrouded to prevent contact with personnel where fuse links are not mounted in carriers and are directly plugged into the fuse base. Inter-phase barriers extending throughout the length of the fuse base shall be provided to prevent inter-phase short circuit. They shall be shrouded from all sides to prevent accidental contact.

e) Fuse carriers and bases shall be of good quality moulded insulating material. Porcelain fuse bases and carriers will not be accepted.

f) The rating and characteristics of fuse links shall be chosen appropriately for short circuit protection of circuits down stream.

7.3 INDICATING METERS

7.3.1 Meters shall be panel mounted, flush type and suitable for rear terminal connection.

7.3.2 Meters and instruments shall be enclosed in dust proof, moisture resistant black finished cases and shall be suitable for tropical use. Instruments shall be suitable for operation from the secondary windings of CTs and VTs.

7.3.3 All instruments shall be calibrated to enable direct reading of primary quantities. Instruments shall be adjusted and calibrated at manufacturer's works and shall have means of calibration, checking and zero adjustment at site.

7.3.4 Instruments pointer shall have 90^0 movement. All the divisions and the quantity to be measured shall be clearly marked. Instruments shall conform to applicable standard and shall have accuracy class 1.5 or better having black numerals and lettering on white anti-parallax dial with knife edge pointer. Indicating instruments shall be of moving iron type for AC and moving coil type for DC circuits.

7.3.5 Ammeter, voltmeter etc. shall be of 96mm x 96mm (minimum) size.

7.3.6 Instruments having metallic cases shall be fitted with earthing terminals.

7.4 CONTACTORS

7.4.1 Contactors shall be of the air break type fitted with arc shields.

7.4.2 The operating coil shall be suitable for satisfactory operation in the range of 85% - 110% of nominal voltage specified under the Data Sheet A. The coil shall be tropicalized having insulation not less than class 'E'.

7.4.3 Electrically independent auxiliary contacts not less than 2NO + 2NC for interlocking and indication shall be fitted to individual power contactor.

7.4.4 All springs shall be made out of a corrosion proof material.

7.5 RELAYS

7.5.1 Relays shall be provided on the various circuits as per schemes. Relays shall be flush mounted on front of the board. Relay case shall be painted with dull black or egg shell black enamel and with back connected terminals. Metal cases and frames of relay shall be earthed.

7.5.2 All relays shall be of withdrawable type with built-in testing facilities, with provision for inspection, maintenance and replacement. Where built-in test facility is not provided for a particular relay, separate suitable test block shall be provided on the board for this purpose.

7.5.3 Relay performance shall not alter due to mechanical shock or vibration or external magnetic field which may be present at the place of mounting.

7.5.4 Each relay shall not have less than two independent pairs of contacts.

7.6 CURRENT TRANSFORMERS

7.6.1 CTs shall be air insulated having insulation class E or better, cast resin type and shall be capable to withstand the thermal and mechanical stresses resulting from maximum short circuit.

7.6.2 The short time current duration for CTs shall be one second.

7.6.3 CT primary current shall not be less than the full load thermal rating of the associated circuit. CT secondary shall have 5Amp rating unless specified otherwise in Data Sheet A. Polarity shall be marked in a suitable manner. The ratings shall be adequate to cater for the burden of connected instruments.

7.6.4 Measuring CTs shall have accuracy class 1.0 and instrument security factor less than 5.

7.6.5 CTs shall be of bar primary / wound primary / ring type capable of carrying the rated primary current.

7.7 VOLTAGE TRANSFORMER

7.7.1 Voltage transformers (VT) shall be dry, cast resin type comprising of single phase or three phase units. They shall have their primary windings protected by current limiting fuses with interrupting capacity corresponding to that of the lighting board / panel.

7.7.2 VT secondary windings shall be earthed in LDB / LP through link, which can be removed for insulation testing.

7.7.3 Three phase voltage transformers shall have 110 V secondary voltage unless mentioned otherwise in Data Sheet A. Single phase VTs shall have voltage rating of :

(Nominal System Voltage / $\sqrt{3}$) V / (110 / $\sqrt{3}$) V

So that secondary voltage shall be 110 volts phase to phase when the secondary winding is star connected. The accuracy class of VTs shall be 1.0. VTs shall have an output rating adequate to cater to the burden connected to them.

7.8 MINIATURE CIRCUIT BREAKERS

7.8.1 The use of miniature circuit breakers (MCBs) combining thermal overload and magnetic short circuit protection shall be application for the outgoing circuits of Lighting Panels.

7.8.2 MCBs shall have suitable rating but not less than 20A, 9kA.

7.8.3 MCBs shall be suitable for housing in the lighting panel and for connection of copper link bus bar at the incoming and copper lugs at the outgoing ends.

7.8.4 The terminals of MCB and ON / OFF positions shall be clearly and indelibly marked.

7.9 SELECTOR SWITCHES

7.9.1 The rating and other features of the switches shall be suitable for the application. The number of positions and the number of contacts required for each switch shall be as indicated in the schemes enclosed.

7.9.2 Selector switches shall be stay put type, provided with properly designated escutcheon plates clearly marked to show operating position.

7.9.3 Terminals carrying potential above 120 Volts shall be shrouded to prevent accidental contact with personnel.

7.9.4 Ammeter selector switches shall have make before break contacts.

7.9.5 The switches shall be suitable for semi-flush mounting with the front plate and operating handle projecting out. All connection to the switches shall be from the back.

7.9.6 The arrangement for front mounting of these devices shall be such as to make them reasonably dust free so as not to interfere with normal operation.

7.10 INDICATION LAMPS

7.10.1 Indication lamps shall be complete with lens covers and holders.

7.10.2 Each lamp shall be fitted with a durable resistance integrally wired in series with the lamp. Alternatively, lamps with built in transformers are acceptable.

7.10.3 The lamp cover (lens) shall be translucent of appropriate colour.

7.10.4 Bulbs and covers shall be interchangeable, easily replaceable from the front without the need for any special means.

7.10.5 Terminals having potential above 120V shall be shrouded to prevent contact with personnel.

7.11 PUSH BUTTONS

7.11.1 Push button shall be heavy duty, flush mounted suitable for the application.

7.11.2 Push button shall be provided with integral escutcheon plates marked with its function identified as per schemes.

7.11.3 Colour shall be appropriate to the function.

7.11.4 Minimum number of contacts shall be 1 NO + 1 NC or as per the requirements of control scheme.

7.12 TERMINALS

7.12.1 Terminals shall be stud type of copper material.

7.12.2 Terminals shall be provided with transparent cover(s).

7.12.3 Separate terminals shall be available for each termination of loop-in and loop-out power connections.

7.12.4 Terminals shall be suitable for ring type copper cable lugs of size depending upon the circuit rating.

7.13 CABLE GLANDS

7.13.1 Whether specifically mentioned or not, cable glands of suitable sizes shall be supplied along with each equipment for power and control cables.

7.13.2 Cable glands shall be single compression type of brass material.

7.13.3 Cable glands shall be nickel plated, unless specified otherwise in Data Sheet A.

7.13.4 Rubber components used in the gland shall be of neoprene.

7.13.5 Name / trade name of manufacturer, type no. and applicable range of outer diameter of cable shall be engraved / indelibly printed on the cable gland.

7.14 CABLE LUGS

7.14.1 All equipment shall be supplied with the power and control cable lugs of suitable size, whether specifically mentioned or not.

7.14.2 Cable lugs shall be of tinned copper.

7.14.3 Name / trade name and size of lug shall be engraved/ indelibly printed on each cable lug.

7.15 TIMERS

7.15.1 Time Switch

a) Time switch shall be suitable for automatic switching ON and OFF of street lighting / flood lighting circuits.

b) Time switch have 00 - 24 hrs clock base.

c) Time switch shall indicate actual time and shall permit accurate time setting.

d) Time switch shall be rugged, independent of normal fluctuations of voltage / frequency and free from maintenance.

e) Contact rating, clock accuracy, rated voltage rating and frequency rating of timer shall be suitable to its application.

f) Time switch shall be provided with Ni-Cd battery.

g) Time switch shall be suitable for mounting inside the panel.

7.15.2 On Delay Timer

a) On delay timer shall be required for continuation of DC supply for a limited duration when the AC Emergency supply has been restored and DG set is under stabilisation.

b) Timer shall be fully static and suitable for operation on normal frequency and system voltage.

c) Timer shall have high setting accuracy, high repeat accuracy, low reset time and low power consumption.

d) Timer shall have the time setting range of 24 - 240 seconds, unless mentioned otherwise in Data Sheet A.

e) Timer shall be suitable for mounting inside the panel.

8.0 LABELING

8.1 Labels to identify all the Main assemblies, Sub-assemblies and components of the LDBs and LPs shall be provided.

8.2 Name and rating plate / marking shall be provided as required by relevant standard applicable to each component / assembly to be identified.

8.3 Labels shall be of two colour, three layer plastic material with matt or semi matt finish or of the anodised aluminium sheet.

8.4 All labels other than “Danger” or “Warning” labels shall have black lettering on a white background. Danger labels shall be as per applicable standard and shall not be affixed on to removable parts.

8.5 All labels shall be securely fixed on to the equipment by means of self tapping screws or other approved means.

8.6 Stick-on type labels of good quality and permanent mounting shall be acceptable for internally mounted components only.

8.7 A list of all such items to be labeled and text and type of labels to be provided is given below :

a) BOARD DESIGNATION (MAIN EQUIPMENT LABEL)

i. Inscription : Designation & LDB number for LDBs.
Designation and LP number for LPs.

ii. Location : Top centre in the front of the LDB.
Top centre in the front of the LP.

iii. Material : 3 Layer plastic material, fixation by self tapping, non-rusting screws, black inscription on white back ground.

b) OUTGOING - FEEDER DESIGNATION

i. Inscription : Module number, LP number / purpose.

ii. Material : Black engraving on white anodised aluminium plate of thickness 1.6 mm or more. Plate to be secured with screws.

c) COMPONENT DESIGNATION

i. Inscription : Letter symbol / Legend as assigned in schemes.

ii. Location : Near or on the component

iii. Material : Stick-on type

8.8 CIRCUIT DIAGRAM / DIRECTORY PLATE

8.8.1 A diagram is to be prepared for fixing to the inside cover of every lighting panel giving details of the points controlled by each circuit.

8.8.2 The circuit list shall be typed or printed stating the location of the equipment served, rating of the protective unit and the circuit loadings.

8.8.3 The list shall be mounted on the inside of the cover door and shall be protected by an acrylic sheet cover to be easily removable to permit circuit modifications.

9.0 SURFACE TREATMENT

9.1 All metal parts and the surfaces (exterior & interior) of equipment, unless stated otherwise in case of reflectors, shall be degreased by dipping in hot alkaline solution and rubbed with wire brush to remove oil & scale from them & then rinsed in water.

Alternatively, they may be shot / sand blasted.

9.2 Parts shall be pickled by dipping in hydrochloric acid tank to remove the rust from the surfaces formed during storage of sheets & then rinsed to remove traces of the acid. The cleaning and pretreatment of all metal parts shall be as per applicable standard.

9.3 The surfaces to be painted shall then be prepared by phosphatizing to protect them from further rusting & to create a good bond with the paint. The pretreatment shall conform to the applicable standard.

9.4 All parts shall then be subjected to a coat of red oxide primer paint.

9.5 All inside and outside surfaces of panel shall be spray painted with synthetic enamel of the shade as per Data Sheet A.

9.6 Paint thickness shall be minimum 80 microns unless specified otherwise in Data Sheet A.

9.7 Electrostatic or powder painting shall be acceptable subject to purchaser's approval.

9.8 Wherever possible, finished parts shall be coated with peelable compound by spraying method to protect the finished product from scratches, grease, dirty and oily spots during handling and transportation.

10.0 PACKING

10.1 Packing procedure shall conform to the General Technical Conditions (Volume IIC).

10.2 Specification for the sea worthy packing, if enclosed, for the export jobs shall form part of the specification.

11.0 GUARANTEED PERFORMANCE REQUIREMENTS

11.1 The vendor shall guarantee satisfactory performance of the equipment supplied under all conditions and requirement as laid down by this specification.

11.2 For the general requirements of performance guarantees refer to other parts of the specification.

12.0 INSPECTION & TESTING

12.1 Inspection and testing of Lighting equipment shall be performed as per BHEL standard Quality Plans. Bidder shall sign and stamp the Quality Plans for conforming compliance. The equipment which are not covered in the Quality Plan shall be tested as per the QP to be submitted by bidder. Purchaser's comments shall be incorporated and final QPs shall be submitted for purchaser's approval during contract engineering stage. Modifications in the QP shall be incorporated without any cost implication to the purchaser.

12.2 All the components and completely assembled equipment shall be tested as per the latest edition of standards indicated in Annexure-I.

12.3 All the specified type and routine tests shall be carried out to verify the rating and performance of the equipment. Where valid type test certificates in evidence of equipment performance claimed are available & approved by purchaser, the requirements for conducting type tests may be waived. The general arrangement of object under test shall be to purchaser's approval.

12.4 Functional testing shall be carried out for Lighting Distrbution Boards.

12.5 All manufacturing processes viz. machining, sheet forming, electroplating, wire routing, cleating & crimping, assembly, surface preparation shall conform to good manufacturing practices.

12.6 Inspection for dimensional & visual checks especially of the following, with respect to contract drawings, documents & standards shall be conducted:

a) General sturdiness & rigidity of equipment.

b) Surface finishing.

c) Gasketting.

d) Inter-changeability.

e) Constructional features viz. location, accessibility & marking of components, segregation, accessibility to live parts (shrouding) etc.

f) Completeness of scope.

12.7 Safety interlocking verification shall be done.

12.8 Each lighting transformer shall be routine tested and one transformer of each rating shall be type tested in accordance with relevant standard in case type test certificates of similar transformers are not available / not acceptable to the purchaser.

12.9 Equipment shall be liable for rejection if tolerances on the values of dimensions, power consumption, impedances, temperature rise etc. exceed the specified values by purchaser and / or standards.

13.0 QUANTITY VARIATION

13.1 Quantities of various items are indicated in BOQ as part of Section C, Volume IIB for the purpose of bidding.

13.2 Purchaser reserves the right to delete / add any of the equipment from the vendor's scope of supply. Unit prices quoted shall be considered for this purpose.

13.3 Unless stated otherwise in Data Sheet A, the unit rates quoted by the bidder for various equipment shall be firm for a variation of quantities limited to as follows :

a) +30% of the total order value till the finalisation of engineering details and Master BOQ.

b) +10% of total order value till the completion of works at site.

14.0 SPARES

14.1 A list of commissioning spares and O&M spares' quantities for a duration specified in Data Sheet A shall be filled up in the applicable schedule / format and submitted by bidder along with offer.

14.2 The bidder shall indicate any additional start-up and O&M spares and their recommended quantities, which may be required as per vendor's usual practice. However, the acceptance of the same shall not be binding on purchaser.

15.0 TOOLS AND TACKLE

15.1 Tools & tackle which are essential to facilitate assembly, adjustments, erection, maintenance & dismantling of equipment shall be provided as part of equipment supplied.

15.2 The above tools shall be supplied along with the initial consignment of equipment so as to be available prior to erection but may not be used for erection purposes.

15.3 Vendor shall also submit a list of recommended tools and tackle. Acceptance of these tools and tackle shall not be a binding on the purchaser.

15.4 Schedule of tools & tackle shall be filled up by bidder.

16.0 DOCUMENTATION

16.1 Purchaser's documents as part of tender

Purchaser's single line diagrams, schematic drawings, documents etc. being enclosed in the specification are listed in Data Sheet A.

Specification of sea-worthy packing forms part of the specification for export jobs.

16.2 Documents to be submitted by the Bidder along with the bid.

a) Complete technical literature on luminaires, accessories and lamps.

b) Quality Plans enclosed with the tender with bidder's seal and signature of acceptance on each sheet.

c) Quality Plan for additional items.

d) Catalogues / technical leaflets of all major components.

e) Deviations from the technical specification, if any, brought out in the enclosed "Schedule of Deviations" (Volume III).

f) Unpriced Price Schedules enclosed in Vol.III.

g) Schedule of quantities of commissioning spares.

h) Schedule of quantities of O&M spares.

16.3 Documents to be submitted by the vendor immediately after award of contract (Along with Data Sheet B).

a) General arrangement drawings for all types of LDBs with following details :

i. Dimensions of each panel and overall dimensions.

ii. Arrangement of panels / modules.
iii. Floor mounting details and cutout details.

iv. Single Line Diagram.

v. Rating of components.

vi. Bill of quantities.

b) General arrangement drawing of Lighting Transformer.

c) Bar chart of activities of manufacture, testing, inspection and despatch.

16.4 Documents to be submitted during detailed engineering of contract

16.4.1 Engineering documents (refer clause 4.3) to be generated by the vendor, if applicable.

a) Lighting calculations for indoor areas.

b) Lighting calculations for outdoor areas.

c) SLD of power distribution upto LPs.

d) Control schemes for DC and street lighting

e) Power load on each LP & LDB

f) Layout drawings for indoor areas

g) Layout drawings for outdoor areas.

h) Conduit layout drawings.

i) Wiring and load distribution details for outdoor areas.

j) Master Bill of Material.

16.4.2 Other documents :

a) Final Quality Plans

b) Polar curves, zonal flux diagram and CoU charts of luminaires.

c) Complete design calculations for arriving at number of luminaires.

d) Fixing / mounting details of luminaires and other items.

e) General arrangement drawings of following :

i. Luminaires

ii. Controlgear boxes
iii. LPs

iv. Lighting Poles

v. Lighting Masts
vi. Street Lighting Pole JBs

vii. Fuse Boxes

viii. Receptacles

ix. 24 V Supply module

f) Field Quality Plan as per General Technical Conditions.

g) Rating and diagram plate drawing for lighting transformer.

h) Structural design calculations for lighting tower.

i) Foundation design calculations for lighting tower.

j) Control Scheme for fluorescent, HPMV and HPSV luminaires.

k) Schematic drawings for LDBs / LPs.

l) Type test certificates.

m) Catalogues / leaflets

16.4.3 Operation and maintenance (O&M) manual :

16.4.3.1 The document shall comprise of installation, operating and maintenance instructions for various items / components. The O&M manual shall include the following :

a) Write ups / instructions / procedures for

i. Storage at site.

ii. Unpacking.

iii. Handling at site.

iv. Erection.

v. Pre-commissioning / commissioning tests.

vi. Operating procedures.

vii. Maintenance procedures.

viii. Precautions to be taken during operation and maintenance work.
ix. Trouble shooting charts covering problems, cause and solution.

b) Approved Technical Data Sheets.

c) Characteristic curves of HRC fuses, MCCBs, MCBs etc.

d) Technical leaflet of various items / components.

e) Copies of the type, acceptance and routine test certificates in bound volume.

f) Details of all components liable to be replaced during the life of the equipment.

g) List of maintenance tools required.

h) List of testing equipment required.

16.4.3.2 Draft O & M manual shall be submitted for approval

16.4.3.3 Final O&M shall be submitted in bound volume.

16.5 AS BUILT DRAWINGS

16.5.1 In case Engineering is the scope of vendor, the preparation of As Built Drawings shall be the scope of vendor.

16.5.2 The As Built Drawings shall be prepared on the basis of marked up copies received from the erection contractor.

16.5.3 Entire work of As Built Drawings shall be to the satisfaction of purchaser. Requisite number of prints and RTFs shall be submitted by vendor.

16.6 Number of copies of documents to be submitted by vendor shall be as per section-C of specification.

ANNEXURE-I

LIST OF APPLICABLE STANDARDS

ILLUMINATION

1.	Code of practice for interior illumination	[ ] IS 3646
2.	Code of practice for industrial lighting	[ ] IS 6665
3.	Code of practice for design of electrical street lighting installations	[ ] IS 1944

LUMINAIRES

4.	General and safety requirement for electric lighting fittings	[ ] IS 1944
5.	Luminaires	[ ] IS 10322
6.	Industrial lighting fittings with metal reflector	[ ] IS 1777
7.	Industrial lighting fittings with plastic reflectors	[ ] IS 3287
8.	Decorative lighting outfits	[ ] IS 5077
9	Water proof electric lighting fittings	[ ] IS 3528
10.	Water tight electric lighting fittings	[ ] IS 3553
11.	Dust proof electric lighting fittings	[ ] IS 4012
12.	Dust tight electric lighting fittings	[ ] IS 4013
13.	Flame proof electric lighting fittings well glass & bulk head types	[ ] IS 2206
14.	Electric lighting fittings for division 2 areas	[ ] IS 8224

LAMPS

15.	Electric lamps, tungsten filament general service	[ ] IS 418
16.	Tubular fluorescent lamps for general lighting service	[ ] IS 2418

17.	High pressure mercury vapour lamps	[ ] IS 9900
18.	High pressure sodium vapour lamps	[ ] IS 9974

LUMINAIRE COMPONENTS

19.	Ballast for fluorescent lamps for switch start circuits	[ ] IS 1534
20	Ballast for high pressure mercury vapour lamps	[ ] IS 6616
21.	Capacitors for electric discharge lamps (fluorescent and MV)	[ ] IS 1569
22.	Bi-pin lamp holders for tubular fluorescent lamps	[ ] IS 3223
23.	Methods of measurement of lamp cap temp. rise	[ ] IS 8913
24.	Starters for fluorescent lamps	[ ] IS 2215
25.	Holders for starters for tubular fluorescent lamps	[ ] IS 3324
26.	Cast acrylic sheets for use in luminaires	[ ] IS 7569

ASSEMBLED EQUIPMENT AND COMPONENTS

27.	General requirements for swgr. and control gear for voltage not exceeding 1000 V AC or 1200 V DC	[ ] IS 4237
28.	Code of practice for selection, installation & maintenance of switchgear & control gear	[ ] IS 10118
29.	Flame proof enclosures for electrical apparatus	[ ] IS 2148
30.	Classification of hazardous areas for electrical installations	[ ] IS 5572
31.	Degree of protection provided by enclosures for LV switchgear & control gear	[ ] IS 2147
32.	Dry type transformers	[ ] IS 11171

33.	Air break switches, disconnector etc. and fuse combinations units	[ ] IS 4064
34.	Miniature air break circuit breaker for voltages not exceeding 1000 V	[ ] IS 8828
35.	Low voltage Fuses	[ ] IS 9224
36.	Contactors for voltags not exceeding 1000 V AC or 1200V DC	[ ] IS 2959
37.	Indicator lamps (visual)	[ ] IS 1901

POLES, SOCKETS AND OTHER MISCELLANEOUS

38.	Tubular steel poles for over head power lines	[ ] IS 2713
39.	Three pin plugs and sockets	[ ] IS 1293
40.	Switch socket outlets (non-interlocking)	[ ] IS 4615
41.	Interlocking switch socket outlet	[ ] IS 4160
42.	Structural steel (Standard quality)	[ ] IS 226
43.	Danger notice plates	[ ] IS 2551
44.	Boxes for enclosure of electric accessories steel & cast iron boxes	[ ] IS 5133
45.	Code of practice for general construction in steel	[ ] IS 800
46.	Wrought aluminium and aluminium alloy bars, rods, tubes and sections for electrical purposes	[ ] IS 5082
47.	Code of practice for phosphating of iron and steel	[ ] IS 6005
48.	Colour for ready mixed paints & enamels	[ ] IS 5
49.	Recommended practice for hot dip galvanising of iron & steel	[ ] IS 2629
50.	Method of testing uniformity of coating on zinc coated articles	[ ] IS 2603

ANNEXURE-II

LUMINAIRE DETAILS

LUMINAIRE CODING SCHEME

1.0 Code Structure

A A NN (no. x W) — Number of lamps x Wattage of each lamp
Classified Serial Number (Numeric)
Luminaire type (Alpha)
Lamp type (Alpha)

2.0 Lamp types

a) F - Fluorescent
b) M - Mercury Vapour
c) S - Sodium Vapour
d) T - Tungsten
e) H - Halogen

3.0 Luminaire types

a) C - Channel Mounted (Fluorescent)
b) B - Bay Mounted
c) W - Well Glass
d) S - Street Lighting
e) F - Flood Lighting
f) H - Bulk Head
g) P - Post Top Lantern
h) E - Emergency Lighting
i) X - Others

4.0 Serial Numbers

a) 01 - 20 General Purpose (Industrial)
b) 21 - 40 Decorative
c) 41 - 50 Vapour Proof
d) 51 - 60 Dust Proof
e) 61 - 70 Drip Proof
f) 81 - 90 Corrosion Proof
g) 91 - 99 Flame Proof

NOTES :

1. Flood lighting luminaires to have non-integral control gearbox.

2. All other luminaires shall have integral control gearbox, unless specifically mentioned otherwise in enclosed sheets.

3. For more details of each luminaire, refer specification.

1.0 **Fluorescent Lamp Luminaires**

1.1 FC01 1 x 40 Fluorescent, industrial box type base without any cover.

1.2 FC02 2 x 40 Fluorescent, industrial box type base without any cover.

1.3 FC03 1 x 40 Fluorescent, industrial box type base and stove enamelled side reflectors.

1.4 FC04 2 x 40 Fluorescent, industrial box type base and stove enamelled side reflectors.

1.5 FC05 1 x 40 Fluorescent, industrial box type base and vitreous enamelled side reflectors.

1.6 FC06 2 x 40 Fluorescent, industrial box type base and vitreous enamelled side reflectors.

1.6a FC07 1 x 18 W Fluorescent, industrial box type base and vitreous enamelled side reflectors operating on 220V DC input supply.

1.7 FC21 1 x 40 Fluorescent, decorative with 3 side perspex acrylic diffuser.

1.8 FC22 2 x 40 Fluorescent, decorative with 3 side perspex acrylic diffuser.

1.9 FC23 1 x 40 Fluorescent, decorative, recessed type with perspex acrylic diffuser.

1.10 FC24 2 x 40 Fluorescent, decorative, recessed type with perspex acrylic diffuser.

1.11 FC25 1 x 40 Fluorescent, decorative, recessed type with mirror optic reflector.

1.12 FC26 2 x 40 Fluorescent, decorative, recessed type with mirror optic reflector.

1.13 FC27 2 x 40 Fluorescent, decorative with opal polystyrene louvers.

1.14 FC28 2 x 40 Fluorescent, decorative, recessed type with opal polystyrene louvers.

1.15 FC29 2 x 40 Fluorescent, decorative with vertical metallic louvers.

1.16 FC30 4 x 14 Fluorescent, decorative, recessed type, 600 x 600 size with perspex acrylic diffuser.

1.17 FC31 4 x 20 Fluorescent, decorative, recessed type, 600 x 600 size with opal polystyrene louvers.

1.18 FC32 2 x 20 Fluorescent, decorative, surface mounted with mirror optic reflector.

1.18a FC33 1 x 18 W Fluorescent, decorative, recessed type with mirror optic reflector operating on 220V DC input supply.

1.18b FC34 1 x 18W Fluorescent, dust proof, totally enclosed type with sheet steel housing operating on 220V DC input supply

1.19 FC41 2 x 40 Fluorescent, vapour proof with end boxes and controlgear box of cast Al.

1.20 FC51 2 x 40 Fluorescent, dust proof, totally enclosed type with sheet steel housing.

1.21 FC61 1 x 40 Fluorescent, street light with sheet aluminium canopy and ribbed acrylic cover.

1.22 FC62 2 x 40 Fluorescent, street light with sheet aluminium canopy and ribbed acrylic cover.

1.23 FC81 2 x 40 Fluorescent, corrosion proof, totally enclosed type with sheet aluminium housing.

2.0 **High Pressure Mercury Vapour (HPMV) Lamp Luminaire**

2.1	MB01	1 x 250	Mercury, high bay, industrial type.
2.2	MB02	1 x 400	Mercury, high bay, industrial type.
2.3	MB03	1 x 1000	Mercury, high bay, industrial type.
2.4	MB04	1 x 250	Mercury, high bay, totally enclosed industrial type.
2.5	MB05	1 x 400	Mercury, high bay, totally enclosed industrial type.
2.6	MB06	1 x 250	Mercury, high bay with non-integral controlgear box.
2.7	MB07	1 x 400	Mercury, high bay with non-integral controlgear box.
2.8	MB11	1 x 250	Mercury, medium bay, industrial type.
2.9	MB12	1 x 400	Mercury, medium bay, industrial type.
2.10	MB13	1 x 250	Mercury, medium bay, totally enclosed industrial type.
2.11	MB14	1 x 400	Mercury, medium bay, totally enclosed industrial type.
2.12	MB17	1 x 80	Mercury, low bay, industrial type.
2.13	MB18	1 x 125	Mercury, low bay, industrial type.
2.14	MB19	1 x 80	Mercury, low bay, totally enclosed industrial type.
2.15	MB20	1 x 125	Mercury, low bay, totally enclosed industrial type.
2.16	MW41	1 x 80	Mercury, well glass, vapour proof with vitreous enamelled reflector.
2.17	MW42	1 x 125	Mercury, well glass, vapour proof with vitreous enamelled reflector.
2.18	MW51	1 x 80	Mercury, well glass, dust proof with vitreous enamelled reflector.
2.19	MW52	1 x 125	Mercury, well glass, dust proof with vitreous enamelled reflector.
2.20	MW91	1 x 80	Mercury, well glass, flame proof with vitreous enamelled reflector and cast aluminium housing.

2.21	MW92	1 x 125	Mercury, well glass, flame proof with vitreous enamelled reflector and cast aluminium housing.
2.22	MW93	1 x 80	Mercury, well glass, flame proof with vitreous enamelled reflector and cast iron housing.
2.23	MW94	1 x 125	Mercury, well glass, flame proof with vitreous enamelled reflector and cast iron housing.
2.24	MW95	1 x 80	Mercury, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast iron housing for Div.-2 areas.
2.25	MW96	1 x 125	Mercury, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast iron housing for Div. 2 areas.
2.25a	MW98	1 x 125	Mercury, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast iron housing for Div. 2, Group-IIC areas.
2.26	MS61	1 x 125	Mercury, street light with one piece cast aluminium body.
2.27	MS62	1 x 250	Mercury, street light with two piece cast aluminium body.
2.28	MS63	1 x 400	Mercury, street light with two piece cast aluminium body.
2.29	MF61	1 x 250	Mercury, flood light, general purpose.
2.30	MF62	1 x 400	Mercury, flood light, heavy duty type.
2.31	MF63	2 x 400	Mercury, flood light, heavy duty type.
2.32	MP21	1 x 80	Mercury, post top lantern
2.33	MP22	1 x 125	Mercury, post top lantern

3.0 **High Pressure Sodium Vapour (HPSV) Lamp Luminaire**

3.1	SB01	1 x 150	Sodium, high bay, industrial type.
3.2	SB02	1 x 250	Sodium, high bay, industrial type.
3.3	SB03	1 x 400	Sodium, high bay, industrial type.
3.4	SB04	1 x 150	Sodium, high bay, totally enclosed industrial type.
3.5	SB05	1 x 250	Sodium, high bay, totally enclosed industrial type.
3.6	SB06	1 x 400	Sodium, high bay, totally enclosed industrial type.
3.7	SB07	1 x 150	Sodium, high bay with non-integral controlgear box.
3.8	SB08	1 x 250	Sodium, high bay with non-integral controlgear box.

3.9	SB09	1 x 400	Sodium, high bay with non-integral controlgear box.
3.10	SB11	1 x 150	Sodium, medium bay, industrial type.
3.11	SB12	1 x 250	Sodium, medium bay, industrial type.
3.12	SB13	1 x 150	Sodium, medium bay, totally enclosed industrial type.
3.13	SB14	1 x 250	Sodium, medium bay, totally enclosed industrial type.
3.14	SB17	1 x 70	Sodium, low bay, industrial type.
3.15	SB18	1 x 150	Sodium, low bay, industrial type.
3.16	SB19	1 x 70	Sodium, low bay, totally enclosed industrial type.
3.17	SB20	1 x 150	Sodium, low bay, totally enclosed industrial type.
3.18	SW41	1 x 70	Sodium, well glass, vapour proof with vitreous enamelled reflector.
3.19	SW42	1 x 150	Sodium, well glass, vapour proof with vitreous enamelled reflector.
3.20	SW51	1 x 70	Sodium, well glass, dust proof with vitreous enamelled reflector.
3.21	SW52	1 x 150	Sodium, well glass, dust proof with vitreous enamelled reflector.
3.22	SW91	1 x 70	Sodium, well glass, flame proof with vitreous enamelled reflector and cast aluminium housing.
3.23	SW92	1 x 150	Sodium, well glass, flame proof with vitreous enamelled reflector and cast aluminium housing.
3.24	SW93	1 x 70	Sodium, well glass, flame proof with vitreous enamelled reflector and cast iron housing.
3.25	SW94	1 x 150	Sodium, well glass, flame proof with vitreous enamelled reflector and cast iron housing.
3.26	SW95	1 x 70	Sodium, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast iron housing for Div. 2 areas.
3.27	SW96	1 x 150	Sodium, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast iron housing for Div. 2 areas.
3.28	SS61	1 x 70	Sodium, street light with one piece cast aluminium body.
3.29	SS62	1 x 150	Sodium, street light with one piece cast aluminium body.
3.30	SS63	1 x 250	Sodium, street light with two piece cast aluminium body.
3.31	SS64	1 x 400	Sodium, street light with two piece cast aluminium body.

3.32	SF61	1 x 250	Sodium, flood light, general purpose.
3.33	SF62	1 x 400	Sodium, flood light, general purpose.
3.34	SF63	1 x 250	Sodium, flood light, heavy duty type.
3.35	SF64	1 x 400	Sodium, flood light, heavy duty type.
3.36	SF65	2 x 250	Sodium, flood light, heavy duty type.
3.37	SF66	2 x 400	Sodium, flood light, heavy duty type.
3.38	SP21	1 x 70	Sodium, post top lantern.

4.0 **Tungsten Lamp Luminaires**

4.1	TW41	1 x 100	Tungsten, well glass, vapour proof with vitreous enamelled reflector.
4.2	TW42	1 x 200	Tungsten, well glass, vapour proof with vitreous enamelled reflector.
4.3	TW51	1 x 100	Tungsten, well glass, dust proof with vitreous enamelled reflector.
4.4	TW52	1 x 200	Tungsten, well glass, dust proof with vitreous enamelled reflector.
4.5	TW91	1 x 100	Tungsten, well glass, flame proof with vitreous enamelled reflector.
4.6	TW92	1 x 200	Tungsten, well glass, flame proof with vitreous enamelled reflector.
4.7	TW95	1 x 100	Tungsten, well glass, increased safety (Div. 2) with vitreous enamelled reflector.
4.8	TW96	1 x 200	Tungsten, well glass, increased safety (Div. 2) with vitreous enamelled reflector.
4.9	TB21	1 x 60	Tungsten, bulk head, weather proof.
4.10	TB22	1 x 100	Tungsten, bulk head, weather proof.
4.11	TB91	1 x 100	Tungsten, bulk head, flame proof.
4.12	TB92	1 x 200	Tungsten, bulk head, flame proof.
4.13	TP21	1 x 200	Tungsten, post top lantern.
4.14	TE02	1 x 20	Tungsten, portable emergency unit with rechargeable battery.
4.15	TE02	1 x 40	Tungsten, portable emergency unit with rechargeable battery.
4.16	TX01	1 x 60	Dispersive vitreous enamelled reflector.

4.17	TX02	1 x 100	Dispersive vitreous enamelled reflector.
4.18	TX03	1 x 75	Decorative recessed mounting luminaire suitable for comptalux lamp.
4.19	TX04	1 x 100	Decorative recessed mounting luminaire suitable for comptalux lamp.
4.20	TX05	2 x 100	Double obstruction aviation light of cast Al. alloy with red glass.
5.0	**Halogen**		
5.1	HF61	1 x 300	Halogen, flood light, drip proof.
5.2	HF62	1 x 500	Halogen, flood light, drip proof.
5.3	HF63	1 x 750	Halogen, flood light, drip proof.
5.4	HF64	1 x 1000	Halogen, flood light, drip proof.

TECHNICAL SPECIFICATION FOR

LIGHTING SYSTEM (CONDUIT)

SPECIFICATION NO. PE-TS-411-558-E002

CONTENTS

1.0 GENERAL

1.1 This specification covers the manufacture, inspection & testing at vendor's works and delivery to site of conduits, pipes and their fittings for electrical installation.

2.0 CODES AND STANDARDS

2.1 The material, constructional features and various processes involved in manufacture shall comply with currently applicable Indian Standards.

2.2 The following Indian Standards shall be applicable, in general. However if Data Sheet A specifies conformance to other international standards, the equivalent IEC/BS/other standards shall be considered.

a) IS:9537 (All Parts) Conduits for electrical installation.

b) IS:3480 Flexible steel conduits for electrical wiring.

c) IS:6946 Flexible non-metallic conduits for electrical installation.

d) IS:1239 Mild steel tubes, tubulars and other wrought steel fittings (for size above 63mm dia of rigid conduits).

e) IS:2667 Fittings for rigid steel conduits for electrical wiring.

f) IS:3837 Accessories for rigid steel conduits for electrical wiring.

g) IS:3419 Fittings for rigid non-metallic conduits.

h) IS:6005 Code of practice for phostating iron & steel.

i) IS:2629 Recommended practice for hot dip galvanizing on iron and steel.

j) IS:4759 Specification for hot dip zinc coatings on structural steel and allied products.

k) IS:6745 Methods for determination of mass of zinc coating on zinc coated iron and steel articles.

3.0 DESIGN REQUIREMENTS AND CONSTRUCTIONAL FEATURES

The conduit and conduit accessories shall include conduit plugs & caps, gaskets and box cover etc in addition to any specific requirement given in Data Sheet A. The diameter of conduits and accessories shall be uniform throughout the length.

3.1 Rigid Conduits and Fittings

3.1.1 Rigid conduits shall generally conform to the requirements of IS:9537 (Part I & Part II). However conduits above 63mm diameter shall conform to the requirements of IS:1239. Unless specified otherwise in Data Sheet A, all conduits and pipes shall be of medium duty.

3.1.2 The rigid conduits shall be hot dip galvanized inside and outside. Weight of zinc shall be as per IS:4759. Conduits shall be thoroughly cleaned and pretreated, conforming to IS:6005.

3.1.3 Conduits shall be supplied in approximate length as specified below

a) Rigid Conduits 3 - 4 metres
b) Flexible Conduits 10 - 30 metres

3.1.4 Each end of conduit length shall be threaded. The ends of conduits shall be sealed with protective caps to prevent damage to threaded portions and entrance of moisture and foreign material.

3.1.5 The inside surface of all conduits shall be smooth and suitable for pulling insulated cables and wires without damage.

3.1.6 Conduit fittings shall be made out of tube or cast to the shape as to match with corresponding conduit sizes and meet their purpose without any special adjustment.

3.1.7 All fittings shall be screwed type and hot dip galvanized inside and outside.

3.2 Flexible Metallic Conduits and Fittings

3.2.1 Flexible metallic conduits shall generally conform to the requirements of IS:3480.

3.2.2 Flexible conduits shall be made of strip steel, which shall be of cold rolled mild steel. The strip shall be of uniform width and thickness throughout.

3.2.3 The strip shall be electro galvanized to a minimum thickness of 25 microns as specified in IS:3480. The surface of the strip shall be thoroughly cleaned before application of protective coating. Pretreatment, before galvanization, shall conform to IS:6005.

3.2.4 The strip for making flexible conduit shall be wound tightly and so overlapped in subsequent helicals that no openings are seen in normal position.

3.2.5 Flexible conduits shall be lead coated for application in high temperature zones, if specifically mentioned in Data Sheet A.

3.2.6 The conduit shall have uniform diameter throughout its length. The internal surface of all conduits shall be smooth and suitable for pulling insulated cables and wires without damage.

3.3 PVC Conduits

3.3.1 PVC conduits shall generally conform to the requirements of IS:9537(Part I & Part III).

4.0 INSPECTION

4.1 The following stages of manufacture shall be stage inspected by Purchaser or his duly authorized representative.

4.1.1 Inspection of manufacturing processes such as shearing, punching, bending, welding, galvanizing etc.

4.1.2 Inspection of packing material and procedure.

4.1.3 Inspection of finished product.

4.2 The inspection will be carried out as per agreed quality plan.

5.0 TESTING

5.1 Rigid Conduits

a) Acceptance Tests: As per IS: 9537 Part 1 & 2 upto 63mm OD and IS:1239 above 63mm OD.

i) Dimension checks
ii) Bending test (below 32mm OD)
iii) Compression test

b) Special Tests (as acceptance test) as applicable to galvanizing.

5.2 Flexible Steel Conduits

a) Acceptance Tests: As per IS: 3480.

i) Dimension checks
ii) Linear breaking test
iii) Test for flexibility
iv) Bend fracture test
v) Crushing test

b) Special Tests (as acceptance test) as applicable to galvanizing.

5.3 PVC Conduits

a) Type Tests: As per IS: 9537 (Part 1 & 3).

i) Dimension checks
ii) Bending test
iii) Compression test
iv) Impact test
v) Collapse test
vi) Resistance test
vii) Resistance to burning
viii) Electrical Characteristics

b) Acceptance tests: As per IS: 9537 (Part 1 & 3).

i) Dimension checks
ii) Bending test
iii) Compression test
iv) Collapse test
v) Resistance to burning
vi) Electrical characteristics

5.4 Sampling for the tests shall be done as per applicable standards mentioned above.

5.5 The testing shall be carried out as per agreed quality plan.

6.0 PACKING

6.1 The material shall be packed as per manufacturer's standard. Packing procedure shall be to the purchaser's approval.

7.0 DRAWING, DATA AND DOCUMENTS REQUIRED

7.1 The following information shall be furnished within two weeks of award of contract, for purchaser's approval.

a) Data Sheet-B

b) Final quality plan

8.0 TECHNICAL DETAILS OF CONDUITS

Refer Annexure-1 as "TECHNICAL DETAILS OF CONDUITS ".

ANNEXURE-1
TECHNICAL DETAILS OF CONDUITS

1.0 APPLICABLE STANDARDS : IS

2.0 RIGID STEEL CONDUITS & STEEL PIPES

a) Material : Cold rolled mild steel to IS:226

b) Applicable standard

i) Upto 63mm OD : IS:9537 Part I & II

ii) Above 63mm OD : IS:1239

c) Surface treatment : Hot dip galvanizing inside & outside as per IS:2629

d) Min. Weight of zinc coating (gm/m^2) : 340 upto 32 mm dia
460 above 32 mm & upto 50 mm dia

e) Duty : Heavy duty type

f) Fittings : Screw type as per IS:2667

2.1 Sheet thickness (minimum) : 1.6 mm upto 32 mm dia
2.0mm above 32 mm & upto 50 mm dia

2.2 Min. Thickness of zinc coating (microns) [By Elcometer] : 48 upto 32 mm dia
65 above 32 mm & upto 50 mm dia

2.3 Standard length approximate : 3 - 5 meters

3.0 FLEXIBLE CONDUITS:

a) Material : Strip steel cold rolled and annealed

b) Standard applicable : IS: 3480

c) Surface treatment : Electro galvanized as per IS: 3480

d) Whether lead coated : YES

e) Minimum thickness : 25 microns of zinc coating

4.0 PVC CONDUITS

a) Material : PVC

b) Applicable standard : IS: 9537 (Part I & III)

5.0 SALIENT PARAMETERS OF CONDUIT ACCESSORIES

5.1 LOCKNUTS

Size of Conduit	Thickness	Width Across Flat (mm)
20 mm	5 mm	27
25 mm	5mm	33
32 mm	5 mm	41
40 mm	5 mm	50

5.2 SADDLES

Size of Conduit	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)	F(mm)	G(mm)
20mm	53	20	-	22	4	15.5	40
25mm	60	25	-	22	4	18	46
32mm	68	32	-	18	5	17.5	55
40mm	65	40	-	18	5	20	67

5.3 COUPLER (ELECTRO GALVANISED)

Nominal Size of Coupler	L(min).(mm)
20 mm	35
25mm	43
32mm	43
40mm	43

5.3 CIRCULAR BOXES (Refer IS)

DIMENSIONS OF SMALL CIRCULAR BOXES

Size of Conduit	B(mm)	C(mm)	D(mm)	E(mm)	F(mm)	G(mm)	H(mm)	I(Cixmm)
20mm	25	-	18	16.5	25	60	50	3mm
25mm	30	-	19	18	28	60	50	3mm
32mm	38	-	14	13	35	75	60	2.5
40mm	45	-	19	18	44	75	64	2.5

5.4 NORMAL BEND

Size of Conduit	Straight Length (mm)	Radius (mm)
20mm	30	60
25mm	50	69.5
32mm	60	90
40mm	60	130

5.5 INSPECTION BENDS

The main criteria is for the threaded portion which has to be taken same as that of a normal bend.

Conduit Size	Threaded Portion (mm)
20mm	15.0
25mm	19.0
32mm	19.0
40mm	19.0

TECHNICAL SPECIFICATION FOR

LIGHTING SYSTEM (INSTALLATION)

SPECIFICATION NO. PE-TS-411-558-E003

CONTENTS

1.0 SCOPE OF WORK

The scope of installation work of the complete lighting and low voltage power services equipment shall be as follows:

1.1 Receipt at site, unloading, handling, unpacking, storing and preservation of all lighting equipment specified under technical specification (Supply) of Section-D and all other materials required for completion of this package

1.2 Erection, testing and commissioning of complete lighting and low voltage power services for the power station.

1.3 The contractor's scope shall also be deemed to include all such other equipment/materials and services required for the completeness of the job, but not listed above, as applicable and shall be quoted for accordingly.

1.4 Supply & erection of consumable like conduit accessories & fittings, conduit boxes, saddles, clamps, flexible conduit, junction boxes, fixing hardwares, anchors, wedges, nuts & bolts, concrete inserts, materials required for mounting the fixtures, consumable and other incidental materials required to complete the installation testing & commissioning of complete lighting system for successful operation, & to the satisfaction of purchaser/ customer. Supply scope of these items shall form part of the installation rates quoted for the item.

Minor civil works Plumbing/Grouting/Foundation required to complete the lighting installation are covered under the scope of this contract and form part of the item installation cost and are not payable separately.

1.5 Power cables from lighting distribution boards LDBs to lighting panels (LPs), LDBs to street lighting panel, street lighting panels to poles and control cables from LDBs to remote street lighting control panel will be supplied by purchaser as free issue item to contractor, Laying & termination of these cables are to be done by the bidder.

1.6 Supply & Erection of supporting structural steel i.e. angles, channels etc. are to be quoted on tonnage basis. During contract stage contractors has to furnish total requirement for structural steel.

1.7 All tools & tackles, ladders, testing equipment etc. required for erection, testing & commissioning of complete lighting system are to be arranged by the contractors.

1.8 The entire work shall be carried out in accordance with specified installation instruction, manufacturer's recommendations, purchaser's approved drawings and/or as directed by the purchaser. Manufacturer' drawings and instructions shall be correctly followed in handling setting, testing and commissioning of all equipment and care shall be taken in handling to avoid distortion to structures, marring of finished surface, damage to delicate instruments etc. The equipment shall be installed in a neat work-manship like manner.

1.9 The erection work shall conform to latest applicable Indian standards, codes and practices, Electricity rules, fire insurance regulations and safety regulations of the locality where the equipment will be installed. All apparatus, wiring and connections shall be designed so as to minimise risk of fire or any damage which will be caused in the event of fire. Contractor to furnish the installation drawings of all equipment for purchaser's approval.

2.0 CODES AND STANDARDS

The design, Manufacture and performance of equipment shall comply with all currently applicable regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be constructed to relieve the bidder of these responsibilities.

2.1 Unless otherwise specified, equipment offered shall conform to latest applicable Indian and IEC standards. Equipment complying with any other authoritative standards such as British, U.S.A, VDE etc. may also be considered provided these standards ensure performance equivalent to or superior to Indian Standards. In such cases the Bidder shall clearly indicate the standard adopted and furnish a copy of the latest English version of the standard along with the tender. Should there be any dispute of design standard, the most stringent one shall be followed. The relevant Indian Standards are:

Lighting Wires

IS: 694	PVC insulated cables for working voltages upto and including 1100V.
IS: 3961	Recommended current ratings for PVC insulation light out put cables.
IS: 5331	PVC insulation and sheath of electric cables
IS: 8130	Conductors for insulated electric cables and flexible cards.
IS: 10810	Methods of tests for cables.

Conduits & Accessories and Junction Boxes

IS: 1653	Rigid steel conduits for electrical wiring.
IS: 3480	Flexible steel conduit for electrical wiring.
IS: 2667	Fittings for rigid steel conduits for electrical wiring.
IS: 3837	Accessories for rigid steel conduits for electrical wiring.
IS: 4649	Adaptors for flexible steel conduits.
IS: 5077	Decorative Lighting outfits.
IS: 5133	Steel and Cast Iron Boxes. (Part-I)
IS: 5133	Boxes made of Insulating materials (part-II)
IS: 2629	hot dip galvanising of iron & Steel.
IS: 9537	Specification for conduits for Electricals installation. (part-I & II)

Electrical Installation Practices & Miscellaneous

IS: 5	Colour for ready mixed paints 2 enamels.
IS: 1293	3 Pin, Plug & Socket Outlets.
IS: 226	Structural steel (standard quality).
IS: 2509	Rigid non metallic conduits for electric wire.
IS: 371	Ceiling roses
IS: 3854	Switches for domestic and similar purposes.
IS : 5216	Guide for safety procedures and practices in electrical work.
IS: 1913	General and safety requirements for electric lighting fittings.
IS: 3419	Fittings for rigid non metallic conduit.
IS: 732	Code of practice for Electrical Wiring installation (System Voltage not exceeding 650V).
IS: 3646	Code of practice for interior illumination part I, II & III.
IS: 1944	Code of practice for lighting of public thorough forces.
IS: 3106	Code of practice for selection of installation and maintenance of fuses. (Voltage not exceeding 650V).
IS: 4615	Switch socket out let (Non-locking).
IS: 5571	Guide for selection of electrical equipment for hazardous areas.
IS: 5572	Classification of hazardous areas electrical installation.
IS: 800	Code of practice for use of structural steel in general building construction.
IS: 2633	Method of testing uniformity of coating in zinc plated articles.
IS: 6005	Code of practice for phosphating of form & steel.
IS: 3043	Code of practice for earthing.

INDIAN ELECTRICITY ACT AND RULES

IS: 6665	Code of practice for industrial lighting.
IS: 458	Specification for concrete pipes.

Fire Insurance Regulations

Rule no. 35, 48, 49, 50, 61 & 64 of Indian Electricity Rule with amendment-3 rules 1986 Regulations laid down by the chief Electrical Inspector of the State.

3.0 GUIDELINES FOR LIGHTING SYSTEM ERECTION WORK.

3.1 The contractor shall work in co-ordination with civil, air-conditioning, ventilation & switchgear vendors. Where holes or openings in walls and floors are required for routing the conduits, the contractor shall provide the same. Cut-outs in false ceiling shall be provided by false ceiling contractor.

3.2 The contractor shall be responsible if any parts of lighting fixtures, LDBs, LPs are lost or damaged and lamps are broken during installation. All damage and thefts shall be made good by the contractor till the installation is handed over to the customer.

3.3 The contractor shall note that for any change in the location of lighting panels, lighting fixtures, switch boxes/receptacles, no extra charges will be paid so long as the modifications are indicated to the contractor before commencement of the work on that particular equipment or circuit.

3.4 The contractor shall have a separate cleaning gang to clean all equipment under erection as well as the work area and the project site at regular intervals to the satisfaction of Engineer-in-charge. In case this is not done, the purchaser will have the right to carry out the cleaning operation and any expenditure incurred in this regard will be to the contractor account.

3.5 Except as specifically approved by the Engineer-in-Charge, installation of exposed conduits, mounting of lighting fixtures, etc. shall be taken up only after other services such as piping, air ducting, cable tray/bus duct hangers, structural bracing's etc. in a particular area have been installed

3.6 After installation of lighting fixtures/receptacles, panel number and circuit number shall be painted on them at a suitable place

3.7 Lighting Fixtures and Accessories.

3.7.1 Lighting fixtures of appropriate type as per the lighting layout drawings shall be installed by the contractor. The type of mounting. arrangement of fixtures shall be selected from the typical arrangements shown in enclosed fixture mounting details drawings in section-E. The type of mounting will generally be indicated on the layout drawings. The exact mounting will, however, be decided at site depending upon the actual space/other facilities available at site.

3.7.2 The contractor shall submit for purchaser's approval the drawings showing the detailed mounting arrangements of various types of fixtures prior to installation.

3.7.3 Wooden plugs in walls and ceilings for fixing of lighting fixtures and accessories are not acceptable. A suitable fool-proof method (preferably using nylon rawl plug) of fixing these shall be offered and this be subject to the purchaser approval.

3.7.4 The bracket for mounting the lighting fixtures on boiler platforms shall be fabricated at site using 40 mm GI conduit with a reducing socket to suit the fixture and clamped to the hand rails. However, the clamping of these conduits at points of large vibrations should be avoided. The fixing shall be strong enough to withstand vibrations and wind velocity. If a roof (or other platform over the platform is available, the fixture will be pendant mounted (supported to the structural members of the platform above).

3.7.5 Flood lights shall be mounted on steel base facing the tentative direction shown on drawings. Bolts shall be tightened with spring washers. Terminals connection to the flood lights shall be through flexible conduits.

3.7.6 In the rooms where false ceilings are provided, the lighting fixtures shall be supported separately by false ceiling grid of roof over false ceiling if it is of steel structural or form ceiling and not by the false ceiling board. The arrangement shall be to the approval of purchaser. The erection rate of lighting fixtures shall include the supply of steel brackets, supporting, anchoring material, hardware and also steel brackets/hangers for bridging the gap above false ceilings, etc., required for installation of lighting fixtures as shown in the approved fixture mounting arrangement drawings.

3.7.7 A four (4) way terminal junction box type F shall be provided near each lighting fixture, for loop-in, loop-out and off connection of lighting wires or as required.

3.7.8 To distinguish emergency AC fixtures form normal AC fixtures, red painted circular mark of 1 cm dia. shall be provided on emergency fixtures.

3.7.9 The self contained emergency lighting fixtures shall be installed in required areas. Mounting brackets are to be provided by the contractor.

3.8 Lighting distribution board and Lighting Panels.

3.8.1 Lighting DB's consisting of lighting transformer etc, shall be mounted on floor and LP's shall be mounted on the walls/columns/steel structures at the locations indicated in the drawings.

3.8.2 Suitable Space provision for LDB mounting on floor would be made by the purchaser. The contractor will supply necessary foundation bolts and do the grouting to fix up the LDBs.

3.8.3 LPs shall be installed by fastening to studs of not less than 12 mm dia. which will be suitably grouted/welded to the wall/column by the contractor. All the required accessories including studs for the erection of the panel shall be supplied by the contractor. If Mounting channels are required for, LPs the same will be provided by contractor.

3.8.4 Unless specifically noted otherwise on the drawings the height of the centre line of lighting panels from the floor shall be 1200 mm.

3.9 Lighting control Switch Boxes & Receptacle Boxes.

3.9.1 The locations of switch/receptacle boxes will be approximately as shown in the drawings. The exact location shall be finalised by the contractor in consultation with the engineer-in-Chief.

3.9.2 All switch/receptacle boxes in offices and control room shall be flush mounted in the wall. In other areas they shall be mounted on wall or column.

3.9.3 Unless Otherwise noted on the drawings the mounting height of switch/receptacle boxes shall be as follows.

i. Lighting Control switch boxes - 1500 mm.
ii. Receptacle boxes 500 mm for indoor and 900 mm for outdoor locations.

3.10 Conduits and Accessories

3.10.1 All lighting wires shall be run inside the conduit. Size of conduit shall be selected as per the table given below.

Size of Wire	Max. number of wires in	
	20mm conduit	25mm conduit
1.5 sq. mm.	4	
2.5 sq. mm.	4	6

3.10.2 Conduit shall run along wall, floor, ceiling, on steel structures, embedded in wall, floor, for ceiling, in accordance with relevant layout drawings. The contractor shall closely co-ordinate his work with the civil contractor. Exposed conduits shall be run in straight lines parallel to building columns, beams and walls. Unnecessary bends and crossings shall be avoided to present a neat appearance. In the office area as specified conduits shall be embedded along the entire run. It is the responsibility of the lighting contractor to co-ordinate with the civil contractor of these buildings. Conduits supports shall be provided at an interval of 750 mm for horizontal runs and 1000 mm vertical runs

3.10.3 Conduit shall be clamped on to approved type spacer plates or brackets by saddles or U-bolts. The spacer plates or brackets in turn, shall be securely fixed to the building steel by welding and to concrete or brick work by grouting or by nylon rawl plugs.

3.10.4 Embedded conduits shall be securely fixed in position to preclude any movement. In fixing embedded conduit, if welding or brazing is used, extreme care should be taken to avoid any injury to the inner surface of the conduit.

3.10.5 Spacing of embedded conduits shall be such as to permit flow of concrete between them and in no case shall be less then 40mm.

3.10.6 Where conduits are along cable trays provided by purchaser, they shall be clamped to supporting steel at an interval of 600 mm.

3.10.7 For direct embedding in soil, the conduits shall be coated with an asphaltbase compound. Concrete pier or anchor shall be provided where necessary to support the conduit rigidly and to hold it in place.

3.10.8 Conduits shall be installed in such a way as to ensure against trouble from trapped condensation.

3.10.9 The contractor shall made available at site, dies for threading various conduits. Running threads shall be avoided as far as practicable. Where it is unavoidable, check nut shall be used. All field thread ends shall be reamed after threading and anti-corrosive paint applied.

3.10.10 Conduits shall be kept, wherever possible, at least 300 mm away from hot pipes, heating devices etc.

3.10.11 Slip joints shall be provided when conduits cross structural expansion joints or where long run of exposed conduits are installed, so that temperature change will cause no distortion due to expansion or contraction of conduit run

3.10.12 For long conduit runs junction/pull boxes shall be provided at suitable intervals (not exceeding 10 m) to facilitate wiring.

3.10.13 Conduits shall be securely terminated at LPs/junction boxes or lighting fixtures by proper fastening with a lock put on inside and outside. The number of conduits terminating at LP's shall not exceed the permissible number considering the glanding area of lighting panel. Conduit termination's shall be made water & vermin proof.

3.10.14 Conduits lengths shall be jointed by acrewed couplers. Conduit shall be cleanly cut. The cut ends shall be within three (3) degrees of square with the conduit axis. Cut ends shall be reamed and all burrs and sharp edges removed.

3.10.15 Conduits lengths shall be jointed connection and shall be made thoroughly water-tight and rust-proof by application of a thread compound which will not insulate the joints. White lead will be uses for embedded conduit and red lead for exposed conduit.

3.10.16 Water treatment plant chlorination plant lighting installations shall be made with epoxy coated steel conduits and accessories.

3.10.17 Field bends shall have a minimum radius of four (4) times the conduit diameter. All bends shall be free of kinks, indentations or flattened surfaces. Heat shall not be applied in making any conduct bend. Separate bends may be sued for this purpose.

3.10.18 The entire metallic conduit system, whether embedded or exposed, shall be electrically continuous and thoroughly grounded where slip joints used, suitable bending shall be provided around the joint to ensure a continuous ground circuit.

3.10.19 Conduits and fittings shall be properly protected during construction period against mechanical injury. Conduit ends shall be plugged or capped to prevent entry of foreign material.

3.10.20 After installation, the conduits shall be thoroughly cleaned by compressed air before pulling in the wire.

3.10.21 Lighting fixtures shall not be suspended directly from the junction box in the main conduit run.

3.11 Lighting wires

3.11.1 Lighting wires from lighting panels to junction boxes and junction boxes to lighting fixtures, switch boxes and receptacle boxes shall run in conduits (Rigid/flexible).

3.11.2 All wires in a conduit shall be drawn simultaneously. No subsequent drawing is permissible.

3.11.3 Wires shall not be pulled through more than two equivalent 90 deg. bends in a single conduit run. Wherever required, suitable conduit junction boxes/pull boxes shall be provide. All types of wiring, concealed or unconcealed shall be capable of easy inspection.

3.11.4 Receptacles and lighting circuits shall be fed from different circuits. The switch controlling these circuits shall be on the live side (phase wire) of the circuits.

3.11.5 A.C. normal, A.C. emergency and D.C. emergency system wiring shall run throughout in separate conduits.

3.11.6 Wiring shall be spliced only at junction boxes. Maximum two wires shall be connected at each terminal.

3.11.7 In vertical run of wires in conduit the wires shall be suitably supported by means of wooden/hard rubber plugs at each pull/junction box.

3.11.8 All lighting wires shall be crimped using suitable type of solderless, crimping, tinned fork type copper lugs. Cost of the lugs shall be included in the erection price of wire.

3.12 Junction Boxes

3.12.1 Junction boxes having volume upto 1600 cubic centimetre may be installed without any support other than that resulting from connecting conduits where two or more rigid metallic conduits enter and accurately position the box. Boxes shall be installed so that they are levelled, properly aligned and present a pleasing appearance. Boxes with volumes greater that 1600 cubic cm. or for other reasons not rigidly held, shall be adequately supported. The contractor shall perform all drilling, cutting, welding, shimming and bolting required for attachment to supports.

3.12.2 Necessary holes for conduit/cable entry shall be done during installation depending on the requirement. The holes shall be drilled/punched neatly and shall be dust/vermin proof after installation of the conduit.

3.12.3 All welds, bolts holes, conduit entry holes etc,. made during installation as mentioned above shall be wire brushed and touched up with metal primer (lead oxide and zinc chromate in synthetic medium

3.13 Street Lighting/Flood Lighting Poles

3.13.1. The lighting poles and lighting Tower shall be erected by the contractor at locations shown in the street lighting layout to be prepared by contractor and shall be got approved from the purchaser. The erection work shall include making of foundations (with supply of all materials). Installation of necessary wiring/ cabling, junction/ switch box and mounting of assembled fittings The cable from junction box at the bottom of pole upto the lighting fixture shall be supplied by the contractor. All the above erection work shall be done by contractor for lighting masks including making of foundations. 50mm GI pipe shall be provided for cable protection from trench to junction box by the contractor for loop-in-loop-out cables.

3.13.2 The lighting poles shall be painted with two coats of aluminium paint after completion of installation or as specified by purchaser.

3.13.3 The flood light fixtures shall be mounted on galvanised M.S. base making use of shop drilled holes or by suitable clamps. No cutting or drilling of galvanised structure is permitted.

3.13.4 Each lighting poles and lighting/lightning mast junction box shall be earthed by 25X3 mm GS flat bonded to one (1) 20 mm dia MS earth electrode of 3 meter length driven vertically in the ground. The flat and electrode shall be supplied by the bidder and price of these shall be included in the erection price of individual pole/mast. 14 SWG GI wire shall be taken from fixture to JB.

The bidder shall submit the foundation drgs of poles/masts for purchaser's approval.

3.14 Earthing of Lighting system

3.14.1 All junction boxes, receptacles, switch boxes, lighting fixtures, conduit etc. shall be earthed in compliance with the provision of I.E. rules and applicable Indian Standard amended upto date.

3.14.2 A continuous earth conductor of 14 SWG G.I. wire shall be run all along each conduit run and bonded at every 600 mm by not less than two turns of the same size of wires. This conductor shall be connected to the earth bus of lighting panel from which the conduits originate. All junction boxes, receptacles, lighting fixtures etc. shall be connected to this 14 SWG GI earth conductor. All lighting panels and LDBs shall be earthed by GI flats to the purchasers earthing bus. The supply of GI flat and erection shall be in contractor's scope and rates of the same shall be included in the erection rates of the respective LDB/LP.

3.15 Ceiling Fans and Regulators (If Appilicable)

3.15.1 The contractor shall install the ceiling fans and regulators at the locations shown in the relevant drawings. The exact location will however, be decided at site in consultation with engineer-in-charge.

3.15.2 The fan regulators shall be flush mounted on the lighting control switch boxes provided in that area.

3.15.3 Hook alongwith rubber bush shall be supplied and grouted by contractor in ceiling for mounting the fan. All necessary material and hard wares for installation shall be supplied by contractor.

3.16 Foundation & Civil Works

3.16.1 Equipment foundations, for street lighting Poles/Flood Lighting Poles,lighting mast, street lighting panel and other panels mounting foundation and other civil work including supply of cement, steel and other materials as per relevant drawings and specification clauses shall be provided by the contractor. Cost of foundation works , including supply of necessary material is to be quoted as part of E & C rates for these items.

3.16.2 All foundation drawings shall be subject to the purchaser's approval. However, it shall be the responsibility of the contractor to check these foundations before commencement of erection to ensure their suitability.

3.16.3 Al final adjustment of foundation levels, chipping and dressing of foundation surfaces, setting and grouting of anchor bolts, sills, inserts and fastening devices shall be carried out by the contractor including minor modification of civil work as may be required for erection.

3.16.4 Any cutting of masonry/concrete work, which is necessary, shall be done by the contractor at his own cost and shall be made good to match the original work. The contractor shall obtain approval of the purchaser before proceeding with any cutting of masonry/concrete work.

3.16.5 The contractor shall perform all excavation and backfilling as required for ground connections and casting foundations.

3.16.6 Excavation shall be performed upto the required depth. Such measures shall be taken as may be necessary for protection of the wall.

3.16.7 The contractor shall make use of his own arrangements for pumping out any water that may be accumulated in the excavation.

3.16.8 All excavation shall be backfilled to the original level with good consolidation.

3.17 Cabling work:

3.17.1 The owner will supply necessary cables required for the system as per the specification & the bidder shall have to lay & terminate the same. This shall include all clamping, fixing, drilling, cutting, glanding, luging, connecting to terminal blocks, grounding etc. as required to complete the job. Cost of all consumable materials required for cable laying & cable termination shall be included in the erection rate to be quoted by the bidder.

3.17.2 Bidder shall supply all necessary glands & lugs required for cable termination carried out by him. Size of glands & lugs shall be as per the size of the cables selected during detailed engg.

3.17.3 Cable glands shall be double compression type & made of tin plated heavy duty brass casting and machine finished. Glands shall be of robust construction capable of clamping cable & cable armour firmly without injury to the cable. Thickness of tin coating shall not be less than 10 microns. All washers and hardwares shall be made of brass & tinned. Rubber components used in the glands shall be made of neoprene of tested quality.

3.17.4 Cable lugs shall be tinned copper, solderless crimping type, conforming to IS:8309 suitable for Al or Cu conductors. Crimping of terminals shall be done by using corrosion inhibitory compound.

3.17.5 All cable entry points shall be sealed & made vermin & dust proof. Unused opening shall be effectively closed.

3.17.6 Cables shall be laid in owner's trays wherever available. In areas, where owners trays are not available, cable shall be clamped to the structures or laid in conduit or buried depending on the area.

3.17.7 Each cable shall be tagged with the cable no. as per cable schedule. The tag shall be of rectangular shape & attached to the cable by not less than two turns of 20 SWG GI wire. Cable tag shall be provided at each end of the cable before entering the equipment enclosure, on both sides of wall or floor crossing and every 30 meter of cable runs.

3.17.8 Minimum bending radius for the cables shall not be less than 12D, where D is the overall dia of the cable.

3.18 Steel Fabrication

3.18.1 The steel structures supplied and fabricated by the contractor shall be made from standard quality steel sections/flats/plates. The steel fabricated structures shall be free from defects, cleaned of rust, grease, oil etc,. and sharp edges shall be removed.

3.18.2 The welds shall be wire brushed or cleaned otherwise. The holes shall be touched up with metal primer.

3.18.3 All steel fabrications shall be painted with two coats of metal primer (lead oxide and zinc chromate in synthetic medium) followed by two coats of aluminium paint. The welds to galvanised steel shall be touched up with galvanised weld rod applied in accordance with manufacturer's instruction.

3.19 Cutting & wastage allowances:

3.19.1 Contractor shall carefully plan cutting schedule of each cable drum, conduit, lighting wires, GI wires such that wastage's are minimised and any resultant short length can be used where appropriate route length are available. The following wastage's allowances are permissible for various materials.

3.19.2 Power cables, and control cables, Cutting & wastage's allowance shall be computed on the length actually measured, used & accepted. Break up of above 3% wastage allowances are given below :

a) 1% unaccountable wastage.
b) 2% accountable wastage.

Note: Usable length to be returned to purchaser. Minimum wastage length is to be decided in consultant with site engineers.

3.19.3 The contractor shall take-back the unused installation materials which has not been entered in the measurement records by the purchaser after completion of job.

3.20 Quantity measurement:

3.20.1 For all payment purpose, measurement shall be made on physical measurements. Physical measurements shall be made by the contractor in the presence of the site engineer/purchaser.

3.20.2 The measurement of cable laying shall be made on the basis of length actually laid from lug to lug including that of loops provided.

3.20.3 In the measurement of conduits, the accessories will not be include GI wire / GI strip.

3.20.4 The E & C cost of of lighting wires and earthing wires shall be included in the E & C cost of conduits. No separate cost of erection of lighting wires and earthing wires shall be paid.

3.20.5 The accountable wastage to be returned to purchaser's store in good condition and as directed by site engineer.

3.20.6 Any wastage granted by the vendor in excess of the allowable percentage shall be charged at the panel rates decided by the site engineer whose decision shall be final and binding on the vendor.

3.21 Contractor to make a protocol in consultation with site engineer and customer's representative for erection, testing & commissioning of all lighting equipment.

4.0 TESTING & INSPECTION AT CONTRACTOR'S WORKS

4.1 Standard quality plan (QP) for lighting equipment is enclosed. Bidder to confirm compliance to this QP by signing every page of it.

4.2 All accessories shall be subject to routine and type tests in accordance with requirement of appropriate IS in the presence of purchaser's representative.

4.3 Samples selected by the purchaser of all galvanising material shall be subjected to galvanising tests. All fittings, fabrications, hardwares etc. as specified shall be inspected & tested in accordance with IS recommendation. Type test certificates from National Test House or from reputed agency shall be considered.

4.4 Field quality plan for quality checks to be observed at site during erection, testing & commissioning shall also be furnished by contractor alongwith offers as per standard format.

4.5 Testing and commissioning

4.5.1 On completion of erection work, the contractor shall request the site engineer for inspection and test.

4.5.2 The site engineer shall arrange for joint inspection of the installation by purchaser's and customers representative for completeness and correctness of the work. Any defect pointed out during such inspection shall be promptly rectified by the contractor.

4.5.3 The installation shall be then tested and commissioned in presence of the site Engineer & customer's representative

4.5.4 The contractor shall provide all men, material and equipment required to carry out the tests.

4.5.5 All rectification's, repairs or adjustment work found necessary during inspection, testing and commissioning shall be carried out by the contractor without nay extra cost. The handing over of the lighting installation shall be effected only after the receipt of written instruction from the site engineers/ customer.

4.5.6 The testing shall be done in accordance with the applicable Indian standards and codes of practice. The following tests shall be specifically carried out for all lighting installation.

i. Insulation resistance
ii. Testing of earth continuity path
iii Polarity test of single phase switches.

4.5.7 The lighting circuits shall be tested in the following manner.

i. All switches ON and consuming devices in circuit, both poles connected together, to obtain resistance to earth.

ii. Insulation resistance between poles with lamps and other consuming devices removed and switches ON

5.0 DRAWINGS/ DOCUMENTS

REFER VARIOUS CLAUSES OF ELSEWHERE

6.0 PRICES

6.1 The contractor shall quote his prices for supply, erection, testing & commissioning of complete lighting system as per format attached with the specification.

6.2 Unit price quoted for erection, testing & commissioning of items listed under B O M shall be deemed to have been included the prices for erection material as described in clause 1.4 of this specification and other relevant clauses of this specification for various lighting equipment.

6.3 The unit rates of supply & installation (E & C) for all equipment and service quoted by the bidder shall be firm for a variation of quantities limited to

a. ±30% of total order value till finalisation of engineering details & BOQ.

b. +10% of the total order value in addition to (a) above, till the completion of job.

6.4 Purchaser reserves the right to right to delete/add any equipment or services from the bidders scope, and for price adjustment in such cases, unit prices quoted by the bidder will be considered.

6.5 The bidder shall furnish unpriced price schedule of all equipment and services inclusive of E & C and recommended spares alongwith the technical bid.

		QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-558-00-Q-001, REV-02			SPECIFICATION : TITLE			
		SHEET 1 OF 4	SYSTEM			ITEM :ILLUMINATION			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	LUMINAIRES & LAMPS	1. ACCEPTANCE TEST										
		a) VISUAL	MA	VISUAL	IS 10322 (PART5 SEC1)	IS 10322 / BHEL SPE	IS 10322 /BHEL SPE	TEST CERT	3/2	1	-	AFTER SUCCESSFUL COMPLETION OF 1a, 1b & 1c FURTHER TESTING OF 1d) TO BE DINE BY PAPER INSERTION METHOD.
		b) IR (Dry)	CR	ELECTRICAL	IS 10322	-DO-	-DO-	-DO-	3/2	1	-	
		c) HIGH VOLTAGE	CR	ELECTRICAL	-DO-	-DO-	-DO-	-DO-	3/2	1	-	
		d) DUST PROOF	CR	ELECTRICAL	-DO-	-DO-	-DO-	-DO-	3/2	1	-	
		e) PHOTOMETRIC	CR	ELECTRICAL	*	-DO-	-DO-	-DO-	3/2	1	-	*: ONE NO. LUMINAIRE OF EACH TYPE TO BE WITNESSED BY BHEL. MAIN VENDOR TO WITNESS AS PER IS-10322
		2. ROUTINE TEST										
		a) VISUAL	MA	VISUAL	100%	IS 10322 / BHEL SPE	IS 10322 /BHEL SPE	TEST CERT	3/2	-	1	TYPE TESTS CLEARANCE FROM BHEL/CUSTOMER
		b) IR (Dry)	CR	ELECTRICAL	-DO-	-DO-	-DO-	-DO-	3/2	-	1	
		c) HIGH VOLTAGE	CR	ELECTRICAL	`	-DO-	-DO-	-DO-	3/2	-	1	
2.0	LIGHTING PANELS AND LIGHTING DISTRIBUTION BOARDS	1.DIMENSIONS	MA	MEASUREMENT	SAMPLE	BHEL DRG.	BHEL DRG.	INSPT. REPORT	3	2,1	-	COMPONENTS TO BE OF APPROVED MAKE
		2.PAINT SHADE/ THICKNESS	MA	VISUAL/ MEASUREMENT	-DO-	BHEL SPEC/DRG	BHEL SPEC/DRG	INSPT. REPORT	3	2,1	-	
		3.DEGREE OF PROTECTION (INCLUDING EXPLOSION PROOF IF ANY)	MA	TESTS	1/SIZE	BHEL SPEC/ RELEVANT IS	BHEL SPEC/ RELEVANT IS	TEST CERT	-	-	2,1	
		4.PERFORMANCE TESTS	MA	ELECT.	100%	BHEL SPEC.	BHEL SPEC.	INSPT. REPORT	3	2,1	-	
		5.HV/IR/HV	MA	ELECT	100%	2.5KV AC FOR 1 MINUTE	2.5KV AC FOR 1 MINUTE	INSPT. REPORT	3	2,1	-	
	BHEL		**PARTICULARS**		**BIDDER/VENDOR**							
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

	QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-558-00-Q-001, REV-02			SPECIFICATION : TITLE			
	SHEET 2 OF 4		SYSTEM			ITEM :ILLUMINATION			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
		6.TEMP.RISE TEST (FOR COM-PLETE ASSEMBLED LDB)	MA	ELECT	1/RATING	BHEL SPEC.	BHEL SPEC.	-DO-	3	2	1	
3.0	LIGHTING TRANSFORMER	1. ROUTINE TEST										
		a) TYPE / RATING	CR	VISUAL	100%	IS 11171 / BHEL SPE	IS 11171 / BHEL SP	INSPT. REPORT	3	2,1	-	
		b) WIND. RESISTANC	CR	TEST	100%	IS 11171 / BHEL SPE	IS 11171 / BHEL SP	INSPT. REPORT	3	2,1	-	
		c) V. RATIO /VECTOR	CR	TEST	100%	IS 11171 / BHEL SPE	IS 11171 / BHEL SP	INSPT. REPORT	3	2,1	-	
		d) Z VOLT/ Z SCKT	CR	TEST	100%	IS 11171 / BHEL SPE	IS 11171 / BHEL SP	INSPT. REPORT	3	2,1	-	
		e) LOAD LOSS/ CURREN	CR	TEST	100%	IS 11171 / BHEL SPE	IS 11171 / BHEL SP	INSPT. REPORT	3	2,1	-	
		f) NO LOAD LOSS	CR	TEST	100%	IS 11171 / BHEL SPE	IS 11171 / BHEL SP	INSPT. REPORT	3	2,1	-	
		g) SOURCE WITHSTAND	CR	TEST	100%	IS 11171 / BHEL SPE	IS 11171 / BHEL SP	INSPT. REPORT	3	2,1	-	
		h) INDUCED O/V	CR	TEST	100%	IS 11171 / BHEL SPE	IS 11171 / BHEL SP	INSPT. REPORT	3	2,1	-	
		2. TYPE TEST	MA	TEST	1/RATING	IS 11171 / BHEL SPE	IS 11171 / BHEL SP	TEST REPORT	3	2	1	TYPE TESTS CLEARANCE FROM BHEL/CUSTOMER
4.0	CONDUITS	1.MATERIAL	MA	VISUAL,MECH, & CHEMICAL	AS PER SPEC./ IS 9537	IS:9537	IS:9537	INSPT. REPORT	3	2	1	
		2.DIMENSIONS	MA	MEASUREMENT	AS PER SPEC./ IS 9537	IS:9537	IS:9537	INSPT. REPORT	3	2	1	FOR SAME MANUFACTURER, 1st LOT WILL BE WITNESSED BY BHEL, SUBSEQUENT LOT CAN BE CLEARED BASED ON TEST WITNESSED BY MAIN VENDOR.
		3. MECH. PROPERTIES										
		a) BENDING TEST	CR	TEST	IS 9537-II	IS-9537	IS-9537	INSPT. REPORT	3	2,1	-	
		b) COMPRESSION	CR	TEST	IS 9537-II	IS-9537	IS-9537	INSPT. REPORT	3	2,1	-	
		c) BEND	CR	TEST	SPEC.	SPEC.	SPEC.	INSPT. REPORT	3	2,1	-	
		4. GALVANISATION TEST										
		a) ZINC COATING	CR	TEST	IS 9537-II	IS-2633	IS-2633	INSPT. REPORT	3	2,1	-	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

		QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-558-00-Q-001, REV-02			SPECIFICATION : TITLE			
		SHEET 3 OF 4	SYSTEM			ITEM :ILLUMINATION			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
		b) MASS OF ZINC COAT.	CR	TEST	IS 9537-II	IS-6745/4759/SPEC	IS-6745/4759/SPEC	INSPT. REPORT	3	2,1	-	
		c) COATING THICKNESS	CR	TEST	IS 9537-II	IS-9537/ SPEC	IS-9537/ SPEC	INSPT. REPORT	3	2,1	-	BY ELCOMETER
		d) EPOXY THICKNESS	MA	VISUAL/PHYSICAL	IS 9537-II	50 MICRONS	50 MICRONS	INSPT. REPORT	3	2,1	-	
5.0	ELECTRIC POLES											
5.1	MATERIAL	1.CHEMICAL COMP.	MA	CHEM. ANALYSIS	SAMPLE	IS-2713 IS:228 & IS:1894	IS-2713 IS:228 & IS:1894	-DO-	3/2	-	2,1	
		2.PHYSICAL PROP.	MA	PHY.TESTS	-DO-	-DO-	-DO-	-DO-	3/2	-	2,1	
5.2	FINAL INSPECTION	1.WORKMANSHIP AND FINISH	MA	VISUAL & MEAS	SAMPLES	BHEL DRG./ IS:2713	BHEL DRG./ IS:2713	-DO-	3/2	2,1	-	FOR DEFLECTION & DROP TEST, TC VERIFICATION BY BHEL
		2.DIMENSIONS	MA	-DO-	-DO-	-DO-	-DO-	-DO-	3/2	2,1	-	
		3.WEIGHT	MA	-DO-	-DO-	-DO-	-DO-	-DO-	3/2	2,1	-	
		4.TESTS AS PER IS-2713	MA	-DO-	-DO-	IS-2713	IS-2713	-DO-	3/2	2,1	-	
6.0	JUNCTION BOXES & RECEPTACLES	1.DIMENSIONS	MA	MEASUREMENT	100%	BHEL DRG.	BHEL DRG.	INSP. REPORT	3	-	2	COMPONENTS TO BE OF APPROVED MAKE
		2.PAINT SHADE/ THICKNESS	MA	VISUAL/MEAS.	SAMPLE	BHEL SPEC/DRG	BHEL SPEC/DRG	-DO-	3	-	2	
		3.HV/IR/HV	MA	ELECT.TESTS	100%	2KV AC FOR 1 MINUTE	2KV AC FOR 1 MINUTE	-DO-	3	-	2	
		4.DEGREE OF PROTECTION	MA	TEST	1/SIZE	IS:2147	IS:2147	TEST CERT.	3	-	2,1	
		5.SPECIAL TESTS IF ANY,EXPLOSION PROOF ETC.	MA	TEST	1/SIZE	IS:2148	IS:2148	TEST CERT.	3	-	2,1	
		6. OPERATION CHECK	MA	TEST	SAMPLE	BHEL DRG	BHEL DRG	INSP. REPORT	3	-	2	
		7. MECHANICAL INTERLOCK	MA	TEST	SAMPLE	BHEL DRG	BHEL DRG	INSP. REPORT	3	-	2	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

		QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-558-00-Q-001, REV-02			SPECIFICATION : TITLE			
		SHEET 4 OF 4	SYSTEM			ITEM :ILLUMINATION			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10	10	10	11
7.0	PVC WIRES	1.SURFACE DEFECTS	MA	VISUAL	SAMPLE	BHEL SPEC. IS:694 IS:1554	BHEL SPEC. IS:694 IS:1554	INSPN. REPORT & TEST REPORT FROM MANUFACTURER	3/2	2	1	TO BE PROCURED FROM BIS APPROVED SOURCE
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-DO-	-DO-	-DO-	3/2	2	1	
		3.TYPE TESTS	CR	ELEC.TESTS	ONE/TYPE & SIZE	BHEL SPEC. IS:694 IS:1554	BHEL SPEC. IS:694 IS:1554	TEST CERT.	3	2	1	
		4.ACCEPTANCE TESTS	MA	-DO-	SAMPLING	-DO-	-DO-	-DO-	3	2	1	
		5.ROUTINE TESTS	MA	-DO-	100%	-DO-	-DO-	-DO-	3	-	2,1	
		6.FRLS PROPS.	CR	FRLS TESTS	SAMPLES	BHEL SPEC	BHEL SPEC	-DO-	3	2	1	
		NOTES:										
		1. IN CASE TYPE TEST CERTIFICATE FOR DEGREE OF PROTECTION/EXPLOSION PROOFNESS FROM INDEPENDENT LAB. IS NOT AVAILABLE, THE ITEM SHALL BE TESTED AT AN INDEPENDENT LAB.										
		2. ITEMS LIKE CEILING FANS, EMERGENCY LIGHTING UNIT, FLEXIBLE CONDUIT, EARTHING WIRE & FLATS, 24V SUPPLY MODULE, LADDERS, HUME PIPE, SWITCHBOXES, EXIT SIGNS, STRUCTURAL STEEL ETC. WILL BE CLEARED BASED ON COC (CERTIFICATE OF COMPLIANCE).										

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL