GUJARAT ENERGY TRANSMISSION CORPORATION LTD.

Sardar Patel Vidyut Bhavan, Race Course,
Vadodara: 390 007

TECHNICAL SPECIFICATION

FOR

ILLUMINATION

GETCO/ENGG/TECH. SPECI. – ILLUMINATION/R9 Dt.25.07.2022

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TECHNICAL SPECIFACTIONS FOR ILLUMINATION

1.0 LIGHTING SYSTEM

1.1 The scope of work comprises of design, engineering, testing, supply, installation, testing and commissioning of various lighting fixtures complete with lamps, supports and accessories, ceiling fans complete with regulators & accessories, lighting panels/structures/canopy, lighting poles complete with distribution boxes, galvanized rigid steel conduits, lighting wires, , G.I. Earth wire or 2.5 mm Cu-stranded wire for earthing, receptacles, switchboards, switches, junction boxes, pull out boxes complete with accessories, lighting transformer etc.

1.2 LIGHTING SYSTEM DESCRIPTION

The lighting system shall comprise of the following:

1.2.1 AC Normal Lighting

*All the lights connected to the AC lighting system for **outdoor areas** will be connected to the Main Lighting Distribution Boards (MLDB) through ACP 2, ACP 3 & ACP 4. Supply of MLDB shall be fed from LT panel Board (LTPB) through Lighting Transformer in case of 400 KV and 220 KV substations only.*
*All the lights connected to the AC lighting system for **indoor areas** will be connected to the LT panel Board (LTPB) through ACP-1(Normal).*

1.2.2 AC Emergency Lighting

A.C. emergency lighting is provided for Control Room building, Fire Fighting pump house, DG Set building & Switchyard. AC lighting load shall be connected to this system using ACP-1 (Emergency lighting) which is normally 'ON'. ACP-1 (Emergency lighting) is to be fed from Diesel Generator during the emergency. 30% of lighting fixtures shall be connected on AC emergency lighting.

1.2.3 D.C. Emergency lighting

A few DC emergency lighting fixtures operated on the DC system will be provided in the strategic locations including staircase, corridors, electrical rooms, Battery charger room, LT switchgear room in control room building and GIS Building, so that the operating personnel can safely find their way even during emergency of a total AC failure. These lights will be normally 'OFF' and will be switched 'ON' manually as and when required.

1.2.4 **Portable Fixtures**

1.2.4.1 The portable fixtures shall have a built in 12V battery rated for six hours, battery chargers and solid-state inverters. These shall be of approved make.

1.2.4.2 The portable fixtures shall be of a single unit, completely tropicalised and suitable for prolonged use with no maintenance.

1.2.4.3 The portable fixtures shall be supplied and necessary supporting brackets of galvanized steel suitable for wall/column mounting shall also be supplied.

1.2.4.4 The portable fixture shall come up automatically in the event of failure of normal supply.

Portable Fixtures shall be provided as per **Ann.4** of Tender Document.

1.3 The ***average*** lux levels to be maintained in the different areas shall be as per following:

Sr .No.	Area	Lux
i)	Control Room	300
ii)	GIS Room	200
iii)	PLCC Room/LCC Room	300
iv)	Offices & Reception/Workshop	300
v)	Test Room/Lab.	300
vi)	Cable Galary/Floor	70
vii)	Cloak/Store Room/Stairs	100
viii)	Battery Room	100
ix)	Computer Room	300
x)	Entrance lobby	150
xi)	Corridor & landing	70
xii)	Conference Room	300
xiii)	AC Plant/DG Set Building/LV Room	150
xiv)	Fire Fighting Pump House	150
xv)	*Switchyard - at equipment level*	*50*
	Switchyard - at ground level.	*20*
xvii)	Street/Approach Road/Parking	20

The lux levels indicated above are the average lux levels. Further the minimum lux level to average lux level ratio should not be less than **0.3 (i.e. Emin/Eav>0.3).**

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For achieving the specified lux levels in the switchyard, the contractor can provide luminaries of 1x400 /1 x250 / 1x 150 W or 2x400/ 2x250/2x150 W flood light OR LED fixtures as per requirement.

Bidder shall submit detailed calculation for reaching the above Lux levels. Contractor shall confirm the Lux levels at different locations by measurement.

In addition to the normal lighting provided in the switchyard area to maintain the desired lux levels, few high beam fixtures on swivel support shall be provided in strategic locations near equipments which shall be kept normally OFF and these shall be switched ON in case of maintenance work. In F.F. pump house also fixtures on swivel support mounted on wall shall be provided.

1.4 **Control Room Wiring**

In control room wiring shall be carried out as per Industrial standards i.e. Industrial Wiring with 1.5 Sq.mm PVC FR insulated copper conductor cable housed in recessed/surface steel conduit confirming standard IS - 9537. Principles of good lightings and practices should be followed as per IS-3646 Pt I & II with provision of clamps saddles etc accessories and black painting as required complete erected with flushed wall ceiling and shock proof accessories of Anchor or approved brand mounted in 16G steel board with approved 3 mm thick white PVC/Hylum/backlite fire proof sheet cover.

Wire shall be used as per Industrial standard with1.5 sq.mm. for 5A plug and 2.5 sq.mm. for 15A plug.

In case of ***concealed wiring***, it shall be as per BS 7671 or NEC guide lines.

1.5 The following specific areas are included in the scope of lighting:

(i) Complete switchyard Area.

(ii) Entire Control Room building, GIS room, LCC room, Corridor

(iii) All the staff quarters, parking places

(iv) DG set room, Fire fighting pump house/Store Room

(v) Street lighting inside switchyard and colony fencing.

(vi) Any other area intimated to vendor during detail engineering.

1.6 The detailed drawings showing the lighting layout of these areas shall be prepared by the Contractor and submitted for approval. The above layout drawings will include disposition and location of lighting fixtures, receptacles, switchboards, ceiling fan points, etc. The conduit layout for substation buildings, cable schedule for substation yard etc. for wiring of these equipments shall also be prepared by the Contractor.

1.7 Each cable and conduit run shall be tagged with number that appears in the cable and conduit schedules. Cables and conduits shall be tagged at their entrance and/or exit from any piece of equipment, junction or pull box, floor opening etc.

1.8 The tag shall be made up of aluminium with the number punched on it and securely attached to the cable by not less than two turns of G.I. wire. Cable tags shall be rectangular in shape for power cables and circular shape for control cables.

1.9 Location of cables laid directly under ground shall be indicated clearly by cable marker made of galvanized iron plate embedded in concrete block.

1.10 The location of under ground cable joints if any shall be clearly indicated with cable marker with an additional inscription "cable joint".

1.11 The marker, which is a concrete block, shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change of direction. It shall also be located on both sides of the road or drain crossing.

2.0 DESCRIPTION OF ITEMS

The Contractor shall supply and install the following equipment and accessories in accordance with the specification.

2.0.1 Lighting Transformer:

Supply, erection, testing and commissioning of 100 KVA or above (in case the capacity of transformer required is higher than 100 KVA as per approved calculations), 415/415 V, 3 Phase 50 Hz Dry type natural air cooled lighting transformers. The technical parameters of these lighting transformers are as following:

Type of transformer	: Dry type natural air cooled
Rating	: 100 KVA
Voltage ratio	: 415/415 V
No. of Phases	: Three
Frequency	: 50 Hz
Winding connection	: Dyn-11
Class of Insulation	: ‘B’ Class

Impedance : 4% ± 10%
No. of taps & steps : 5, ± 5% in steps of 2.5%
Ref. standard : IS: 2026

The enclosure for the above transformer shall have degree of protection not less than IP-42. The rating of lighting transformer should be suitable for lighting load. The contractor shall submit the supporting calculation for the rating of lighting transformer.

2.1 LIGHTING PANELS

2.1.1.A 415V AC lighting panel with 415V, 63A, 3 phase 4 wire bus and one no. 63A, TP, MCB with neutral unit as incomer, the details are as follows.

SR. NO.	TYPE	DESCRIPTION	DETAILS OF OUTGOING FEEDERS	DETAILS OF INCOMING FEEDER & GENERAL REQUIREMENT
1	AC Panel-1	Indoor	8 nos.-20A Single pole MCB	1) 63 Amp,4 Pole ELCB -1 No. 2) 63 Amp, TPN switch for ELCB bypass arrangement-1 No. 3) 63 Amp, 3 Phase, TPN Contactor 230V AC Supply -1 No. 4) CU/AL Alloy Busbar-25x6 mm,100Amp-4 No. supporting on insulator. Busbar withstand fault level is 9 KA for 1 Sec. & Confirming IS:5082. 5) Phase Indicating Lamp 22.5mm, dia 230V AC LED type (R, Y, B, ON, OFF)- 5 No. 6) 20A HRC Fuse Base with 2 A Fuse Link-4 No. 7) Push Button with NC Contact, RED-STOP-1 No. 8) Push Button with NO Contact, GREEN-START-1 No
2	AC Panel-2	Outdoor	24 nos.-10A Single pole MCB & 1 no. 36A Triple pole MCB with Neutral & suitable timer & contactor for automatic switching	
3	AC Panel-3	Outdoor	12 nos.-10A Single pole MCB & 1 no. 36A Triple pole MCB with Neutral & suitable timer & contactor for automatic switching	
4	AC Panel-4	Outdoor street lighting panel	4 nos.-20A Triple pole MCB with Neutral with suitable timer and contactor for automatic switching	

2.1.1.B 415V AC lighting panel with 415V, 125A, 3 phase 4 wire bus and one no. 125A, TP, MCB with neutral unit as incomer, the details are as follows. These panels are without lighting transformers.

SR. NO.	*TYPE*	*DESCRIPTION*	*DETAILS OF OUTGOING FEEDERS*
1	*MLDB*	*Outdoor*	*8 nos.- 63A Triple Pole MCB, Voltmeter with selector Switch, Current Transformer, Digital KWH Meter*

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2.1.1. C 220V or 110 V DC lighting panel with 220 V or 110V, 32A, DP, MCB as incomer, the details are as follows.

SR. NO.	TYPE	DESCRIPTION	DETAILS OF OUTGOING FEEDERS	DETAILS OF INCOMING FEEDER & GENERAL REQUIREMENT
1	DC Panel-1	Indoor	4 nos.- 10A Double pole MCB	1) 32 Amp Double pole ,MCB -1 No 2) Indicating Lamp 220/110V DC ,RED (Incomer ON).-1 No. 3) 20A HRC Fuse Base with 2 A Fuse Link- 2 No. 4) CU/AL Alloy Busbar-25x6 mm,100Amp-2 No. supporting on insulator.Busbar withstand fault level is 4kA for 1 Sec. & Confirming IS:5082.

Note: -

1. The numbers of outgoing feeders indicated above are the minimum.
2. Above Panels shall confirm IS-8623 & MCB confirm IS:8828
3. Name plate, Caution plate, Number Plate & Labels are to be provide.
4. The Panel shall have Removable gland plate at bottom side having suitable size gland for incoming and outgoing cable connection. Terminal connector are proper size connection by Ring type lug for incoming and outgoing cable.
5. Enclosure shall be provided outer door having handle, Pad locking and inner door having slot for operating knobs of MCB's.
6. Panel Enclosure shall have both side 2 No. 12 mm earthing stud suitable for outside connection 50x6 G.S. Flat & inside connection with Copper/AL Earth bus size 25x3 mm. Door shall have earthed with 2.5 sqmm flexible copper wire.
7. Following type test report shall be submitted from NABL accredited laboratory as per IS:8623 during detailed engineering,
    1) Verification of temperature-rise limits.
    2) Verification of the dielectric properties.
    3) Verification of mechanical operation.
    4) Verification of the degree of protection (IP5X) clearly stipulating the Gasket Size, Type, profile & drawing etc.
    5) Short-ckt test.

2.1.2 The panels shall conform to IS-8623.

The Outdoor and Street Lighting panels ACP-2, ACP-3 & ACP-4 shall be provided with a timer device having twenty-four hours hand set dial with a facility for setting ON & OFF times. There will be a provision of selecting either the manual control or the automatic control.

2.2 **Constructional Features**

2.2.1 Panels shall be sheet steel enclosed and shall be dust, weather and vermin proof. Sheet steel used shall be of thickness not less than 2.00 mm (cold rolled) or 2.5 mm (hot rolled) smoothly finished, leveled and free from flaws. Stiffeners shall be provided wherever necessary.

2.2.2 All outdoor panels and panels located in damp atmosphere shall have degree of protection not less than IP-55 as per IS:13947 / (Part-I). All indoor panels shall have degree of protection not less than IP-52 as per IS:13947 (Part-I).

2.2.3 The panels shall be of single front construction, front hinged and front connected, suitable for either floor mounting on channels, sills or on walls/columns by suitable M.S. brackets.

2.2.4 Panels shall have a dead front assembly provided with hinged door(s) with padlocking arrangement with single key supplied in duplicate.

2.2.5 All doors, removable covers and plates shall be gasketed all around with neoprene gaskets.

2.2 6 The panels shall be suitable for cable/conduit entry from the top and bottom. Suitable removable cable gland-plate shall be provided on the top and bottom of panels. Necessary number of double compression cable gland shall be supplied, fitted on to this gland plate. The glands shall be screwed on top and made of tinned brass.

2.2.7 The panels shall be so constructed as to permit free access to connection of terminals and easy replacement of parts.

2.2.8 Each panel shall have a caution notice fixed on it.

2.2.9 Each panel shall be provided with a circuit directory plate (of anodized aluminium with the inscriptions indelibly etched on the plate) which is fitted on the inside of the door.

2.2.10 Each lighting panel shall be provided with one no. ‘ON’ indicating lamp for each phase along with fuses.

2.3 **Main Bus Bars**

2.3.1 Bus bars shall be of aluminium alloy conforming to IS:5082 and shall have adequate cross-section to carry the rated continuous and withstand short circuit currents. Maximum operating temperature of the bus bars shall not exceed 85 deg. C. The bus bars shall be able to withstand a fault level of 9 kA for 1 sec. for AC panels and 4 KA for 1 sec. for DC panels.

2.4 **Switch-Fuse Units**

2.4.1 Switches shall be hand operated, air break, heavy duty, quick make, quick break type conforming to IS:13947.

2.4.2 The rating of switch shall be so chosen as to get complete protection under all normal/abnormal conditions such as full load, overload, short circuit etc.

2.4.3 All fuses shall be plug in HRC cartridge link type. The fuses shall be of Class 3 type (20 kA prospective breaking current) for AC circuits and class 1 (16 kA prospective current) for DC circuit. Fuses shall be provided with visible operation indicator to show that they have operated. All accessible live connections shall be adequately shrouded, and it shall be possible to change fuses with the circuit alive, without danger of contact with live metal.

2.5 **Miniature Circuit Breaker (MCB)**

a) The miniature circuit breakers shall be suitable for manual closing, opening, automatic tripping under overload and short circuit. The MCBs shall also be trip free.
b) Single pole as well as three pole versions shall be furnished as required in the Schedule of Lighting Panels.
c) The MCBs and panel incomer fuse together shall be rated for full fault level. In case the MCB rating is less than the specified fault level the bidder shall co-ordinate these breaker characteristics with the back up fuse in incomer switch fuse unit in such a way that if fault current is higher than breaker rating, the fuse should blow earlier than the breaker. If the fault current is less than MCB breaking capacity, MCB shall operate first and not the incomer fuse.
d) The MCBs shall be suitable for housing in the lighting panels and shall be suitable for connection with stranded copper wire connection at both the incoming and outgoing side by copper lugs or for bus bar connection on the incoming side.
e) The termination marking of the MCBs and the ‘open’ ‘close’ and ‘trip’ conditions shall be clearly and indelibly marked.
f) The tender shall check and co-ordinate the ratings of MCBs with respect to starting characteristics of discharge lamps. The vendor has to furnish overload and short circuit curve of MCB as well as starting characteristics curves of lamps for Owner’s approval.
g) The MCB shall conform to IS:8828.

2.6 **Contactors**

Contactors shall be of the full voltage, direct-on line air break, single throw, electro-magnetic type. They shall be provided with at least 2-’NC’

and 2'NO' auxiliary contacts. Contactor shall be provided with the three element, positive acting, ambient temperature compensated time lagged, hand reset type thermal overload relay with adjustable settings to suit the rated current. Hand reset button shall be flush with the front of the cabinet and suitable for resetting with starter compartment door closed. The Contactor shall be suitable for switching on Tungsten filament lamp also. The bidder shall check the adequacy of the Contactors rating wire with respect to lighting load.

2.7 **Push Buttons**

All push buttons shall be of push to actuate type having 2 'NO' and 2 'NC' self reset contacts. They shall be provided with integral escutcheon plates engraved with their functions. Push buttons shall be of reputed make.

2.8 **Labels**

a) The lighting panels shall be provided on the front with panel designation labels on a 3 mm thick plastic plate of approved type. The letter shall be black engraved on white back ground.

b) All incoming and outgoing circuits shall be provided with labels. Labels shall be made of non-rusting metal or 3 ply lamicold. Labels shall have white letters on black or dark blue background.

2.9 **Earthing Terminals**

2.9.1 Panels shall be provided with two separate and distinct earthing terminals suitable to receive the earthing conductors of size 50x6 G.S. Flat.

2.10 **Lighting Fixtures, Receptacles and Accessories**

2.10.1 **General**

All lighting fixtures and accessories shall be designed for continuous operation under atmospheric conditions existing at site, without reduction in the life or without any deterioration of materials, internal wiring.

2.10.2 **Temperature Rise**

All lighting fixtures and accessories shall be designed to have a low temperature rise according to the relevant Indian Standards. The design ambient temperature shall be taken as 50 deg. C.

2.10.3 **Supply Voltage**

2.10.3.1 Lighting fixtures and accessories meant for 240V A.C. operation shall be suitable for operation on 240V A.C. 50Hz, supply voltage variation of ± 10%, frequency variation of ± 5% and combined voltage and frequency variation of ± 10%.

2.10.3.2 Lighting fixture and accessories meant for *110 V/ 220V DC* operation shall be suitable for operation on *110 V / 220V DC* with *variation of ± 10%.*

2.10.4 **Lighting Fixtures**

The lighting fixtures shall be Philips or Bajaj or Crompton Greaves or Oshram make. The different types of lighting fixtures are as indicated elsewhere in this Section.

2.10.4.1 All fixtures shall be designed for minimum glare. The finish of the fixtures shall be such that no bright spots are produced either by direct light source or by reflection.

2.10.4.2 All lighting fixtures shall be complete with fluorescent tubes/incandescent lamps/mercury vapour/sodium vapour lamps as specified and shall be suitably wired up.

2.10.4.3 All fluorescent lamp fixture shall be complete with all accessories like ballasts, power factor improvement capacitors, lamps, starters, holders etc.

2.10.4.4. High beam fixtures shall be suitable for pendant mounting and flood lights shall have suitable base plate / frame for mounting on steel structural member. Hook mounted high beam fixtures are not acceptable.

2.10.4.5 Each lighting fixture shall be provided with an earthing terminal suitable for connection to 16 SWG GI earthing conductors /Cu Stranded wire of proper size.

2.10.4 6. All light reflecting surfaces shall have optimum light reflecting co-efficient such as to ensure the overall light output as specified by the manufacturer.

2.10.4.7 Height of fixtures should be such that it is easy to replace the lamps with normal ladder/stool. In case the ceiling height is very high, the fixtures may be placed on the walls for ground lighting.

2.10.4.8 Type and Description of lamps.

Type	**Description**
SC	150 W SON-T Tubular Sodium Vapour lamp in street lighting luminary. A special optical reflector clear acrylic cover, a single piece die

	cast aluminium housing made out of LM6 and corrosion resistance proof. Similar to Philips Cat *No. SRX-51/150 and Bajaj Cat No. BGEST 150 SV / Crompton Greaves. Cat No. SSG2315IH*
SFI	Weather proof integral Floor Lighting with housing made of corrosion resistant die cast aluminium painted black. Grey powder coated outside suitable for 150W SON-T lamp complete with all accessories and suitable for termination with conduits / flexible Cat. No. F69045 (C) Similar to Philips Cat. No. SNT 100 / Bajaj Cat. No. BGEMF-150W SV Crompton Greaves Cat No. FAD 11151 H.
SF2	1 / 2 X 400 or 1 / 2 x 250W HP Sodium vapour lamps in high Flood lighting fixture suitable for outdoor mounting with aluminium enclosure : similar to *Philips Cat. No. SWF 330/1X400 or RVP302/2x400W or SWF 330/1X250 / Bajaj Cat. No. BJFL 400SV TS or BJENF 22 or BJFL 250 SV TS / Crompton Greaves Cat No. FAI40IH or FHD1424 or FAI1125IH*.
FC	2x36W fluorescent lamp in corrosion proof fixture consisting of a canopy made of fibre glass reinforced polyester (FRP) with gasket a gear tray made of sheet steel and a reeded acrylic cover fixed by toggle clips, Type: Crompton Greaves Cat. No. IPFC-1124 HSB.
FI	Enclosed type high bay, luminaries having 250 watt metal halide fixtures Type: Philips Make HPK 225/HPI 250W NBGL
FF	2x36W fluorescent lamp with mirror optics in recessed mounting type decorative fluorescent fitting consisting of white stove enameled sheet steel housing with accessories and reflector of aluminium sheet steel duty electro-chemically brightened and anodized fitted with aluminium lamellae painted white. Similar to Philips Cat. No. TBS- 285/236 and Bajaj Cat. No. BJLM-236/ Crompton Greaves Cat. No. CRFA 24 HSB.
FL	2x36W fluorescent lamps in decorative lighting fixture with widespread mirror optics suitable for pendent mounting with twin tube complete with all accessories: Type: Crompton Greaves Cat No. CSBW 1124HSB or equivalent
IF	100 W Low Bay Luminary , Type: Crompton Greaves Cat No. IBH1110BC or equivalent and Down Light Luminary Type: Crompton Greaves

	Cat No. DDLV 10BC or equivalent
IB	9W CFL lamp in Bulkhead fixtures with Cast Aluminium alloy body, suitable for column, wall, and ceiling mounting finished stove enameled silver grey outside white inside, to be supplied complete (prisat front glass, wire guard, tropicalised, gasket and E.S. Porcelain, lamp holder taped 3/4" E.I. for conduit entry) similar to Philips Cat. No. FXC 101/Bajaj Cat. No. BJBE-19/ Crompton Greaves.
PF	1x11 W CFL Lamp emergency light with Battery operated portable fixture with built in chargeable batteries and battery charger suitable for a lighting period of six hours similar to ALPHA DELUX OF M/s DELTA FLASH LITE / MICRO LITE OF M/s MICRO
EEO1	Energy efficient luminaries suitable for switchyard lighting (flood lighting) with suitable combination of 14W/24W Tube, Voltage range 130V to 300V or better, p.f>0.95, operating temp. 50 deg. C with spike protection circuit, 2yrs warranty with reputed make side holders & cap & mirror optic reflectors, whether proof body, suitable housed for easy maintenance, Aluminium housing with hamper ton silver colour, deepdown thickness min. 20 guage, water proofing gasket, acrylic top cover, SS clamps min 8 nos., CRCA 55 mm dia pipe with double locking bolt or structure mounted
EEO2	Energy efficient luminaries suitable for street light with suitable combination of 14W/24W Tube, Voltage range 130V to 300V or better, p.f>0.95, operating temp. 50 deg. C with spike protection circuit, 2yrs warranty with reputed make side holders & cap & mirror optic reflectors, whether proof body, suitable housed for easy maintenance, Aluminium housing with power coated/stoved enameled paint, one piece molded metal body. 3mm thick first quality transparent molded acrylic top cover with suitable clamps & fittings, water proofing gasket, SS clamps min 8 nos., CRCA pipe with double locking bolt.
EEI	Energy efficient luminaries suitable for indoor house lighting with suitable combination of 24W/36W Tube, Voltage range 130V to 300V or better, pf>0.95, operating temp. 50 deg. C with

	spike protection circuit, 2yrs warranty with reputed make side holders & cap & mirror optic reflectors, whether proof body, suitable housed for easy maintenance, Aluminium housing with hamper ton silver colour, deep down thickness min. 20 gauge, fitting arrangement for ceiling mounting. Type: Crompton Greaves Cat. No. CRFQ 11236/P5 OR Equivalent
I-LED1	***2x2, luminaries with high efficiency and low power consumption*** ***PHILLIPS-QUADRA LED*** ***BCS705 20xLXML/NW PSU-E-220-240V*** ***BBS705 20xLXML/NW PSU-E-220-240V*** ***BBS 805 2xLLM1800/840PSU-E 220-240V*** ***INSTA PRISMA 45W/OMEGA 45W***
I-LED2	***19W, Recessed type LED luminaries with high efficiency and low power consumption*** ***Phillips: LUX SPACE BBS480 1XDLED-4000 PSU-E 220-240V WH*** ***Insta Power: INSTA DL12W-6SH***
I-LED3	***Decorative recessed mounted LED luminaire made up of CRCA powder*** ***coated body suitable for 600X600mm False ceiling.*** ***CGL Make: LCTLR-36-FO-LDL***
I-LED4	***LED Highbay luminaire comprises of heat sink, clear glass, gear tray with accessories & canopy*** ***CGL Make: LHBBx-270-CDL OR LHBBx-360-CDL***
I-LED5	***LED suitable to outdoor switch yard lighting***
S-LED	***LED Street lighting luminaries*** ***Phillips: BETA Power BRP320 x24LEDHP/CW PSUGR*** ***Insta Power: VERSAT-2-48***

LED LUMINAIRES:

Indicative models of LED luminaries are indicated as above. The offered luminaries shall have minimum 50 lumens/watt capacity(ie ratio of total output lumens & input power) including driver. The quantity of these luminaries shall be decided on the basis of design criteria specified and lux level required at various rooms/locations. The bidder shall submit complete type test certificates & photometry reports of offered luminaries duly certified/conducted at accredited laboratory for owner's acceptance. The luminaries / drivers should generally comply with following relevant standards.

1) CISPR – 15/ EN 55015 (for RFI / EMI)

2) IEC 61347 – 2 – 13 (for safety)

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3) IEC 62384 (for performance of control gear)
4) IEC 61547 (for EMC immunity requirements)
5) IEC 61000- 3 -2 (for harmonics)

2.10.4.10 Design calculations regarding no. of fixtures, lux level achieved etc should be approved before execution.

2.10.5 **RECEPTACLES**

a) All receptacles shall be of cast steel/aluminium, heavy duty type, suitable for fixing on wall/column and complete with individual switch.

b) In general the receptacles to be installed are of the following types:

i) **Type RO**-15A, 240V, 2 pole, 3 pin type with third pin grounded, metal clad with gasket having cable gland entry suitable for 2Cx6 sq.mm. PVC FR cable and a metallic cover tied to it with a metallic chain and suitable for installation in moist location and or outdoor. Receptacles shall be housed in an enclosure made out of 2 mm thick Gl sheet with hinged doors with padlocking arrangements. Door shall be lined with good quality gasketing. This shall conform to IP-55.

ii) **Type R1 -** Combination of 5A and 15A, 240V, 3 pin type with third pin grounded, suitable for flush mounting. The switch shall be of piano key type and shall be flush mounted.

iii) **Type RP** - 63A, 415V, 3 phase, 4 pin interlocked plug and switch with earthing contacts. Other requirements shall be same as type RO. The receptacle shall be suitable for 3.5C x 35/3.5Cx70 sq.mm. aluminium conductor cable entry and shall also be suitable for loop-in and loop out connection of cables of identical size. Receptacle shall be suitable for outdoor application. Receptacles shall be housed in a box made out of 2mm thick G.I. sheet, with hinged door with padlocking arrangement. Door shall be lined with good quality gasketing. This shall conform to IP-55.

2.10.6 **ACCESSORIES**

2.10.6.1 **Reflectors**

The reflectors shall be manufactured from sheet steel or aluminium as applicable of not less than 22 SWG thickness. They shall be securely fixed to the captive type.

2.10.6.2 **Lamp holders and Starter Holders**

(a) Lamp holders/starter holders for fluorescent tubes shall be of the spring loaded, low contact resistance, bi-pin rotor type, resistant to wear and suitable for operation at the specified temperature, without deterioration in insulation value, contact resistance or retention of the lamp/starter. They shall hold the lamp/starter in position under normal condition of shock and vibration.

(b) Lamp holders/starter for incandenscent lamps, CFL/Energy Efficient Lamps and HPMV/HPSV/MH lamps shall be of screwed type, manufactured in accordance with relevant standard and designed to give long and satisfactory service.

2.10.6.3 **Ballasts (If Required)**

a) The Ballasts shall be designed, manufactured and supplied in accordance with relevant standard and function satisfactorily under site condition specified. The ballasts shall be designed to have a long service life and low power loss.

b) Ballasts shall be mounted using self locking anti-vibration fixing and shall be easy to remove without dismantling the fixtures. They shall be totally enclosed units.

c) The ballasts shall be of the inductive, heavy duty type, filled with thermosetting insulating moisture repellent polyester compound filled under pressure or vacuum. The ballast wiring shall be of copper wire. They shall be free from hum. Ballasts which produce humming sound shall be replaced free of cost by the Contractor. Ballasts for high pressure mercury vapour/HPSV/MH lamps shall be provided with suitable tappings to set the voltage within the range specified. End connections and taps shall be brought out in a suitable terminal block, rigidly fixed to the ballast enclosure.

d) Separate ballast for each lamp shall be provided in case of multi-lamp fixtures.

2.10.6.4 **Starters (Required if any)**

Starters shall have bimetal electrodes and high mechanical strength. Starters shall be replaceable without disturbing the reflector or lamps and without the use of any tool. Starters shall have brass contacts and radio interference suppressing capacitor.

2.10.6.5 **Capacitors (Required if any)**

a) The capacitors shall have a constant value of capacitance and shall be connected across the supply of individual lamp circuits.

b) The capacitors shall be suitable for operation at supply voltage as specified and shall have a value of capacitance so as to correct the power factors of its corresponding lamp circuit to the extent of 0.98 lag.

c) The capacitors shall be hermetically sealed in a metal enclosure.

2.10.6.6 **Lamps**

2.10.6.6.1 General Lighting Services (GLS) or CFL-(as per schedule) lamps shall be provided with screwed caps and shall be of 'clear' type unless otherwise specified.

2.10.6.6.2 The fluorescent lamps shall be 'Day-light-colour' type unless otherwise specified and shall also be provided with features to avoid blackening of lamps ends. The Bidder should clearly state these features in the bid.

2.10.6.6.3 Metal Helide Lamps, sodium vapour lamps or energy efficient luminaries (as per schedule) shall be colour corrected type, with screwed caps.

2.10.6.6.4 The Bidder shall furnish typical wiring diagram for Fluorescent, MH, energy efficient luminaries & HPSV fitting including all accessories. The diagram shall include technical details of accessories i.e. starters, chokes, capacitors etc.

2.10.6.6.5 Flexible conduits if required, for any fixture shall be deemed to be included in Contractor’s scope.

2.10.6.7 **Occupancy Sensor and Light level sensor**

2.10.6.7.1 Sufficient number of occupancy and light level sensors shall be provided. No occupancy sensor and light level sensors are envisaged for ACDB room, DCDB room, Lobby, Corridor. Each light level sensor shall be provided to measure and regulate lighting. The light level sensor shall be used to achieve bank switching. Each occupancy sensor shall be used for indoor use with time delay programmable in the minimum range of 1 sec. to 2 Hour to control the illumination in the area.

2.11 **SWITCH AND SWITCHBOARD**

(a) All switch boards/boxes shall be of bent steel construction, fabricated of 16 SWG sheet with 6 mm thick bakelite or 3 mm thick Perspex sheet cover to ensure the fire proofing.

(b) Switch board/boxes located in office/building areas shall be fire proof.

(c) Switch boards/boxes shall have conduit knock outs on all the sides. Adequate provision shall be made for ventilation of these boxes.

(d) Flush type receptacles provided shall be so located that only the plug project outside.

(e) Switches shall be of piano key type having quick make and quick-break mechanism complete with position indicator and shall conform to relevant Indian Standard.

(f) All the components housed in the switchboard shall be wired to an outgoing terminal block by 2.5 mm^2 stranded copper wire The terminal block shall be of adequately rated

(g) The exact number of switches including regulator for fans and layout of the same in the switchboard shall be to suit the requirement during installation.

2.12 JUNCTION BOXES

2.12.1 The junction boxes shall be suitable for mounting on walls, columns, lighting poles, structures etc.

2.12.2 Junction boxes shall be of square/rectangular type of 1.6 mm sheet steel with minimum 6 mm thick pressure die cast aluminium material LM-6 or FRP / SMC press molded junction box and shall have bolted cover with good quality gasket lining.

2.12.3 The junction box and cover shall be hot dip galvanized in case of steel sheet.

2.12.4 The junction boxes shall be complete with conduit knockouts/threaded nuts and provided with terminal strips .The junction boxes shall be suitable for termination of conduit/glands of dia 20 mm, 25 mm, 32 mm, 40 mm on all sides. The junction boxes shall be provided with 4 way terminals suitable for two numbers 10 sq. mm. wire & for street lighting/switchyard lighting suitable for 2 numbers 4C x 16 Sq.mm Al. cable.

2.12.5 The junction boxes shall have the following indelible markings

(i) Circuit Nos. on the top.

(ii) Circuit Nos. with ferrules (inside) as per drawings.

(iii) DANGER sign in case of 415 volt junction box.

2.12.6 The junction boxes shall be weather proof type with gaskets conforming to IP-55 as per IS:13947 (Part-I). The conduit connections shall also be properly sealed to prevent entry of water.

2.12.7 Junction box of suitable size comprising of sub-circuit distribution MCBs and switches, connectors etc shall be supplied and erected at the place decided in consultation with Engineer In charge. The drawing for the Junction box shall be approved before procurement.

2.13 LIGHTING POLES

2.13.1 The Contractor shall supply, store and install the following types of steel tubular lighting poles required for street lighting.

a) Type 1 Street Lighting Pole

b) Type 2 Post top lantern pole

2.13.2 **a) Type 1:**

Street light poles shall be swaged type, galvanized tubular steel pole, confirming to the requirements and tested as per methods specified in IS 4736 & IS 2629, including foundation, fabrication, cutting and street light pole with single arm confirming to latest relevant IS made of steel tube of following size as per attached drawing.

Overall length - 7.0.mtr. (Excluding swaged joint)

Effective length of section: -

Bottom - 4.0 mtr long - 114.3 mm outer diameter & 3.61 mm thick.

Middle - 1.50 mtr long + 0.3mtr. swaged joint - 88.9 mm outer diameter & 3.25 mm thick.

Top - 1.50 mtr long + 0.23mtr. swaged joint 76.1 mm outer diameter & 3.25 mm thick.

Base Plate: MS base plate having size of 240X240X16mm welded to bottom of the pole.

The complete civil work for erection of the street lighting poles shall be included in the scope of work.

b) Type 2:

Post Top Lantern poles shall be galvanized tubular steel pole, confirming to the requirements and tested as per methods specified in IS 4736 & IS 2629, including foundation, fabrication, cutting, and pole confirming to latest relevant IS made of steel tube of following size as per attached drawing.

Overall Dimension – 4.5mtr Long, 60.3mm OD & 3.25mm thick.

Plus 240X240X16mm thick MS base plate welded to pole.

The complete civil work for erection of the Post top lantern shall be included in the scope of work.

Both types of poles shall be purchased form GETCO approved vendor.

2.13.3 Both types of lighting poles shall be complete with fixing brackets and junction boxes. Junction boxes should be mounted one meter above ground level.

2.13.4 The galvanized sheet steel/ FRP / SMC press moulded junction box for the street lighting poles shall be completely weather proof conforming to IP-55 and provided with a lockable door and HRC fuse mounted on a fuse carrier and fuse base assembly. The fuses & junction box shall be as specified in the specification. However, terminals shall be stud type and suitable for 2 nos. 16 sq.mm. cable.

2.13.5 Wiring (by 2.5 sq.mm. wire) from junction box at the bottom of the pole to the fixture at the top of the pole shall be included in the price of the pole.

2.13.6 Distance of centre of pole from street edge should be approximately 1000 to 1200 mm.

2.13.7 Earthing of the poles should be connected to the switchyard main earth mat wherever it is available and Where it is not available the same should be earthed through 3M long, 20 mm dia, earth electrode having rating of 20KA, 1sec.

2.14 CEILING FANS

Ceiling fans (1400 mm sweep, AC 230 volts with Electronic regulator) shall be provided the control room building. Wall mounted fans shall be provided in the shift room / electrical engineer room in control room building.

2.15 CONDUITS & CONDUIT ACCESSORIES

2.15.1 The conduits shall conform to IS:9537. All conduits shall be seemed by welding, shall be of heavy gauge and shall be hot dip galvanized.

2.15.2 Flexible conduits wherever required shall be made with bright, cold rolled annealed and electro-galvanized mild steel strips.

2.15.3 All conduits accessories shall conform to relevant IS and shall be hot dip galvanized.

2.15.4 Galvanized Rigid Steel Conduits of 19mm / 25mm / 32mm / 40mm dia.

2.16 **TERMINAL BLOCKS**

2.16.1 Each terminal shall be suitable for terminating up to 2 Nos. 10 sq.mm. stranded Aluminium Conductors without any damage to the conductors or any looseness of connections. Terminal strips provided in street - lighting poles shall be suitable for terminating up to 2 nos. 4C x 16 sq. mm aluminium cables.

2.17 **PULL OUT BOXES**

2.17.1 The pull out boxes shall be suitable for mounting on walls, column, structures etc. The supply of bolts, nuts and screws required for the erection shall be included in the installation rates.

2.17.2 The pull out boxes shall be circular of cast iron or 16 SWG sheet steel and shall have cover with good quality gasket lining.

2.17.3 The pull out boxes and cover shall be hot dip galvanized.

2.17.4 The pull out boxes shall be completed with conduit knock outs/threaded hubs and provided at approximately 3 meters intervals in a conduit run.

2.17.5 The pull out boxes used outdoor shall be weather proof type with gaskets conforming to IP-55 as per IS:13947 (Part-I).

3.0 **PAINTING OF SHOP MADE ITEMS**

3.1 All sheet steel work shall be phosphated in accordance with the following procedure and in accordance with IS: 6005 'Code of Practice for Phosphating Iron and Steel'.

3.2 Oil grease and dirt shall be thoroughly removed by emulsion cleaning.

3.3 Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

3.4 After phosphating through rinsing shall be carried out with clean water, followed by final rinsing with diluted dichromate solution and oven drying.

3.5 The phosphate coating shall be sealed by the application of two coats of ready mixed stoving type metal primer (comprising of red oxide and Zinc

chromate in a synthetic medium). The first coat may be 'flash dried' while the second coat shall be stoved.

3.6 After application of the primer, two coats of finishing synthetic enamel paint shall be applied with each coat followed by stoving. The second finishing coat for the external of panels shall be applied after completion of tests.

3.7 Both outside and inside of lighting panel, sheet metal fabricated junction boxes etc. and outside of lighting fixtures shall be finished in light grey (IS-5 shade 631). Inside of lighting fixtures shall be finished in white.

3.8 Each coat of primer and finishing paint shall be of slightly different shade so as to enable inspection of the painting.

3.9 The final finished thickness of paint film on steel shall not be less than 100 microns and shall not be more than 150 microns.

3.10 Finished painted appearance on equipment shall present on aesthetically pleasing appearance, free from dents and uneven surfaces.

4.0 TESTS AND TEST REPORTS

4.1 All lighting panels shall have to be tested for the following items and test certificates shall be furnished for the same:

(i) Wiring continuity test
(ii) High voltage (2.5 KV for 1 minute) and insulation test
(iii) Operational test
(iv) Degree of protection
(v) Heat run test

4.2 All the items covered under this section should be type tested, design and conforming to the relevant standard.

5.0 LIGHTING SYSTEM INSTALLATION WORKS

General

5.1 In accordance with the specified installation instructions as shown on manufacturer's drawings or as directed by Employer, Contractor shall unload, erect, install, test and put into commercial use all the electrical equipment included in the contract. Equipment shall be installed in a neat, workmanship manner so that it is level, plumb square and properly aligned and oriented. Tolerances shall be as established in manufacturers drawing or as stipulated by Purchaser.

5.2 All apparatus, connections and cabling shall be designed so as to minimize risk of fire or any damage which will be caused in the event of fire.

5.3 **Conduit System**

5.3.1 Contractor shall supply, store and install conduits required for the lighting installation as specified. All accessories / fittings required for making the installation complete, including but not limited to pull our boxes (as specified in specification ordinary and inspection tees and elbow, checknuts, male and female bushings (brass or galvanized steel), caps, square headed make plugs, nipples, gland sealing fittings, pull boxes, conduits terminal boxes, glands, gaskets and box covers, saddle terminal boxes, and all steel supporting work shall be supplied by the Contractor. The conduit fittings shall be of the same material as conduits.

5.3.2 All unarmoured cables shall run within the conduits from lighting panels to lighting fixtures, receptacles etc.

5.3.3 Size of conduit shall be suitably selected by the Contractor.

5.3.4 Conduit support shall be provided at an interval of 750 mm for horizontal runs and 1000 mm for vertical runs.

5.3.5 Conduit supports shall be clamped on the 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. Wooden plut inserted in the masonary or concrete for conduit support is not acceptable.

5.3.6 Where conduits are along with cable trays they shall be clamped to supporting steel at an interval of 600 mm.

5.3.7 For directly embedding in soil, the conduits shall be coated with an asphalt-base compound. Concrete pier or anchor shall be provided wherever necessary to support the conduit rigidly and to hold it in place.

5.3.8 For long conduit run, pull boxes shall be provided at suitable intervals to facilitate wiring.

5.3.9 Conduit shall be securely fastened to junction boxes or cabinets, each with a lock nut inside and outside the box.

5.3.10 Conduits joints and connections shall be made through water-tight and rust proof by application of a thread compound which insulates the joints. White lead is suitable for application on embedded conduit and red lead for exposed conduit.

5.3.11 The entire metallic conduit system, whether embedded or exposed, shall be electrically continuous and thoroughly grounded. Where slip joints are used, suitable bounding shall be provided around the joint to ensure a continuous ground circuit.

5.3.12 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.

5.4 **Wiring**

5.4.1. Wiring shall be generally carried out by PVC FR wires in conduits. All wires in a conduit shall be drawn simultaneously. No subsequent drawings of wires is permissible.

5.4.2. Wires shall not be pulled through more than two equivalent 90 deg. bends in a single conduit run. Where required, suitable junction boxes shall be used.

5.4.3. Wiring shall be spliced only at junction boxes with approved type terminal strip.

5.4.4. For lighting fixtures, connection shall be teed off through suitable round conduit or junction box, so that the connection can be attended without taking down the fixture.

5.4.5. For vertical run of wires in conduit, wires shall be suitably supported by means of wooden / hard rubber plugs at each pull/junction box.

5.4.6. Maximum two wires can be terminated to each way of terminal connections.

5.4.7. Separate neutral wires are to be provided for each circuit.

5.4.8. AC and DC wiring should not run through the same conduit.

5.5 **Lighting panels**

5.5.1 The lighting panels shall be erected at the locations to be finalized during detailed engineering.

5.5.2. Suitable foundations/supporting structures for all outdoor type lighting panels and necessary supporting structures for indoor lighting panels shall be provided by the Contractor.

5.6 **Foundation & civil works**

5.6.1 Foundation for street lighting poles and panel foundation and transformer foundation shall be done by the Contractor. The rates for these civil works shall be included in the erection rates of respective items.

5.6.2 All 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 works as may be required for erection.

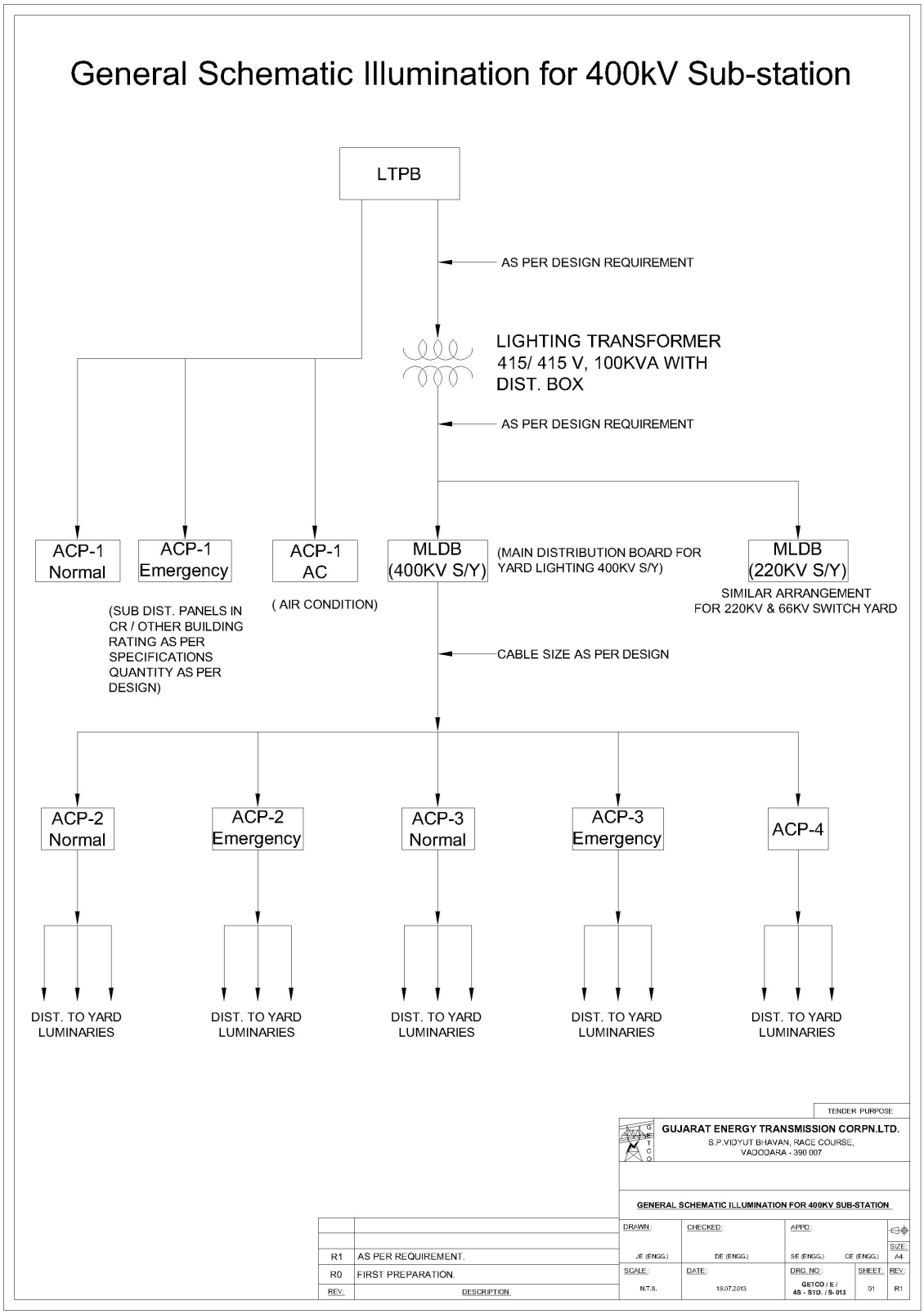
5.6.3 Any cutting of masonry/concrete work, which is necessary shall be done by the Contractor at his own cost and shall be made good to match the original work.

6 ***LT Distribution Box***

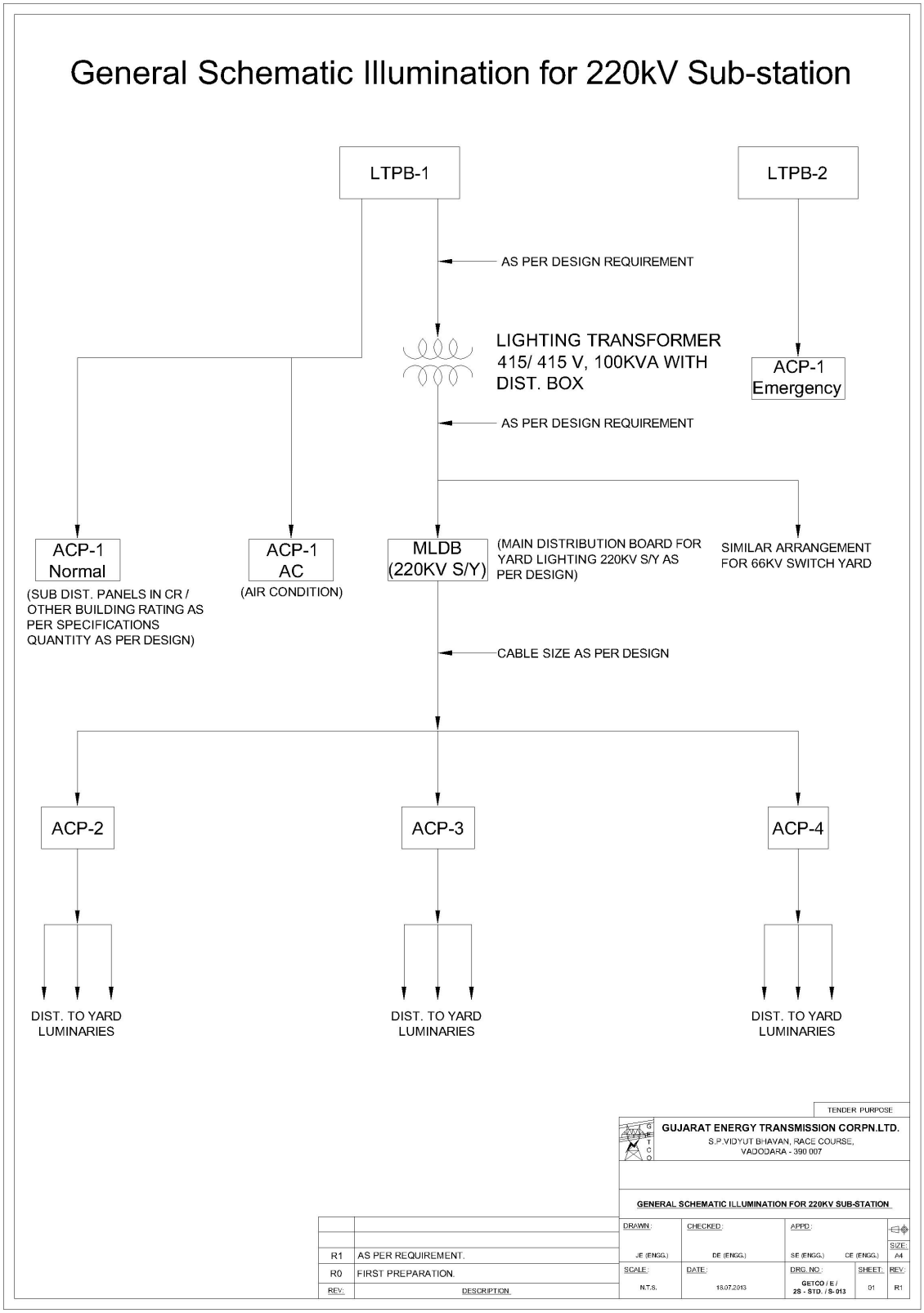
6.1. 415V AC LT Distribution Box with 800A, 3 phase 4 wire bus and one no. 800A, change over switch with neutral unit as incomer, the details are as follows.

SR. NO.	***TYPE***	***DESCRIPTION***	***DETAILS OF OUTGOING FEEDERS***
1	*LT Distribution Box*	*Outdoor*	*3 Nos – 400 A TPN MCCB*

6.2 The panels shall conform to IS-8623. Constructional features and other details of Dist. Box shall be as per clause 2.2 and 2.3.



SIGN & SEAL OF BIDDER



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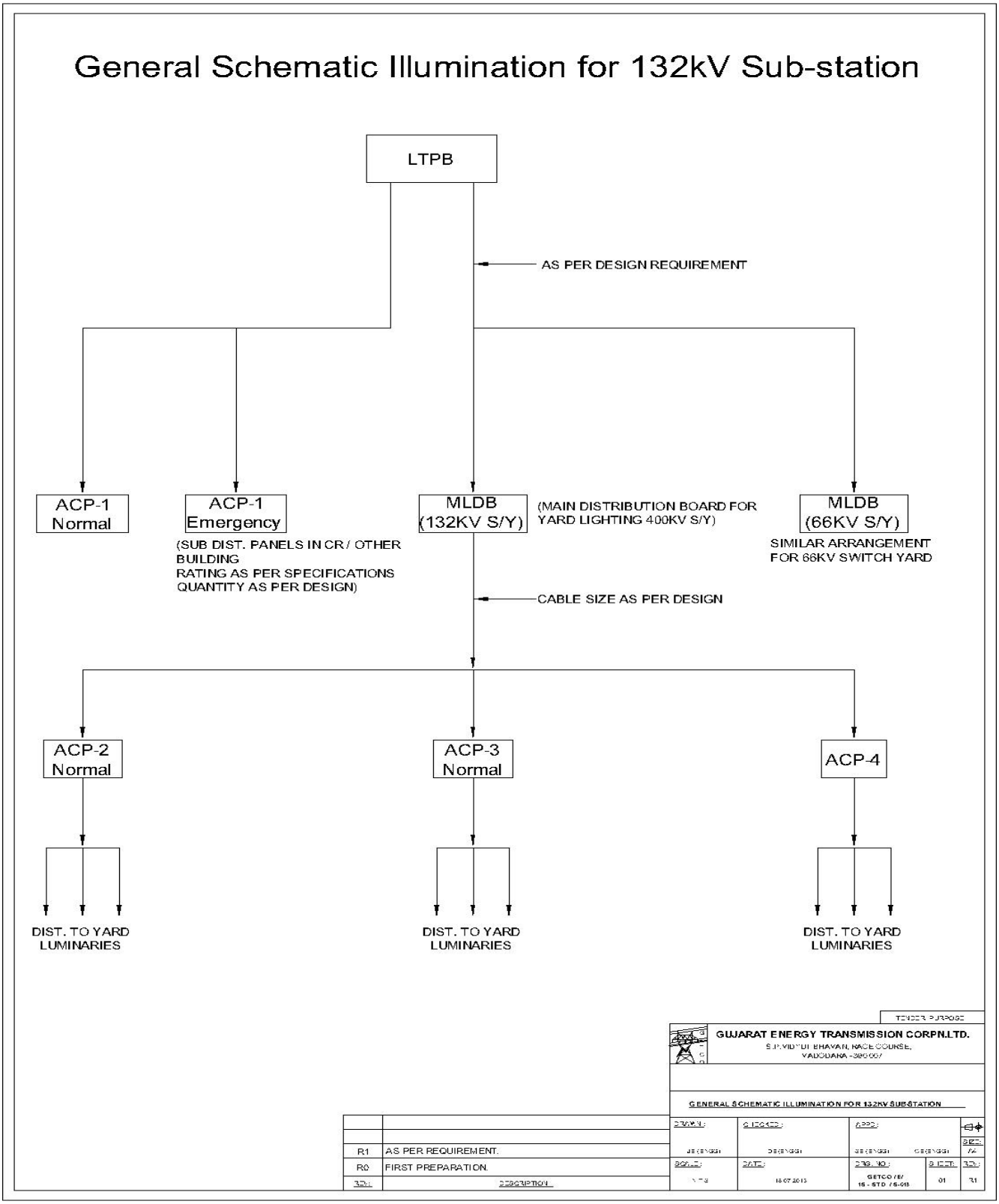

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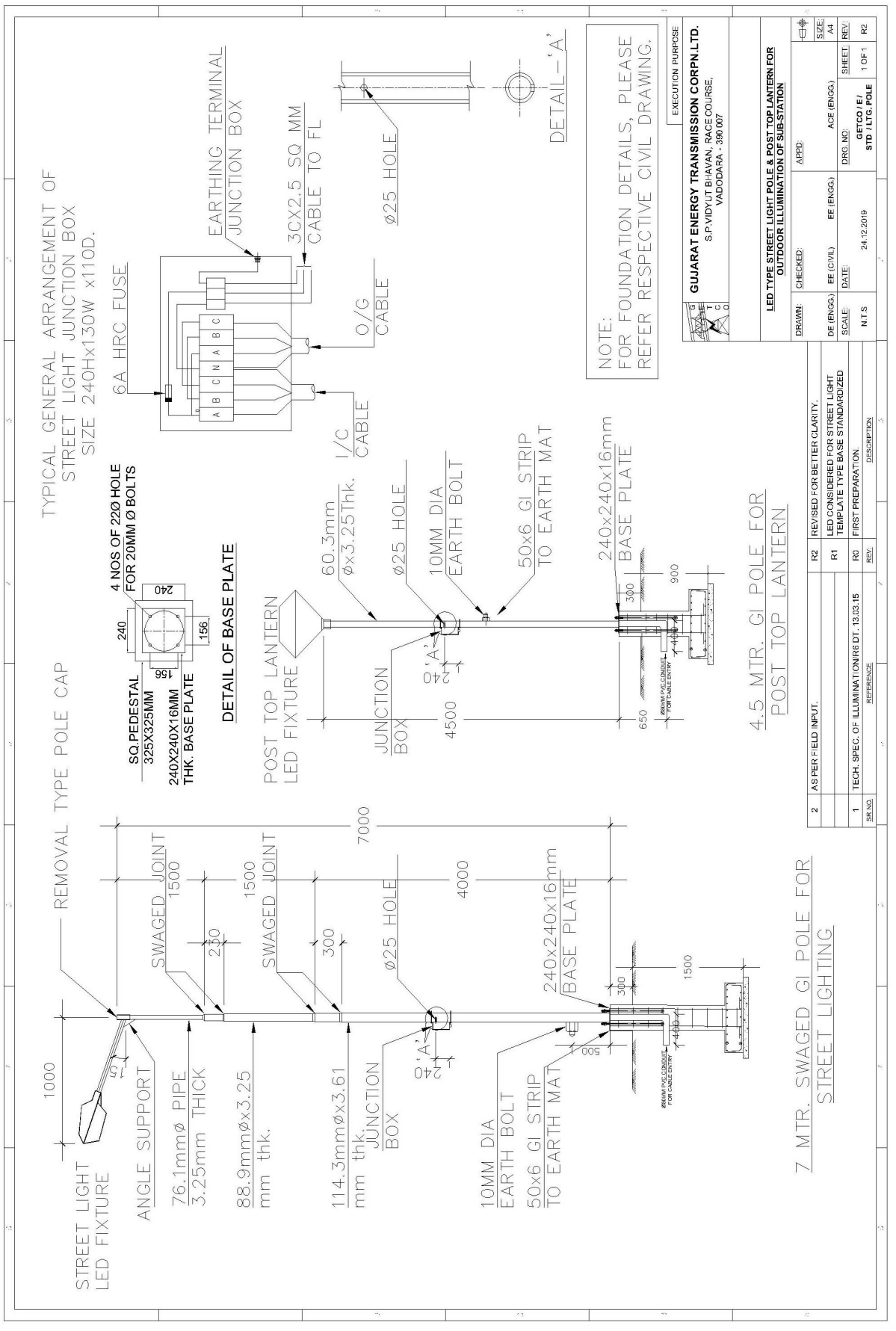

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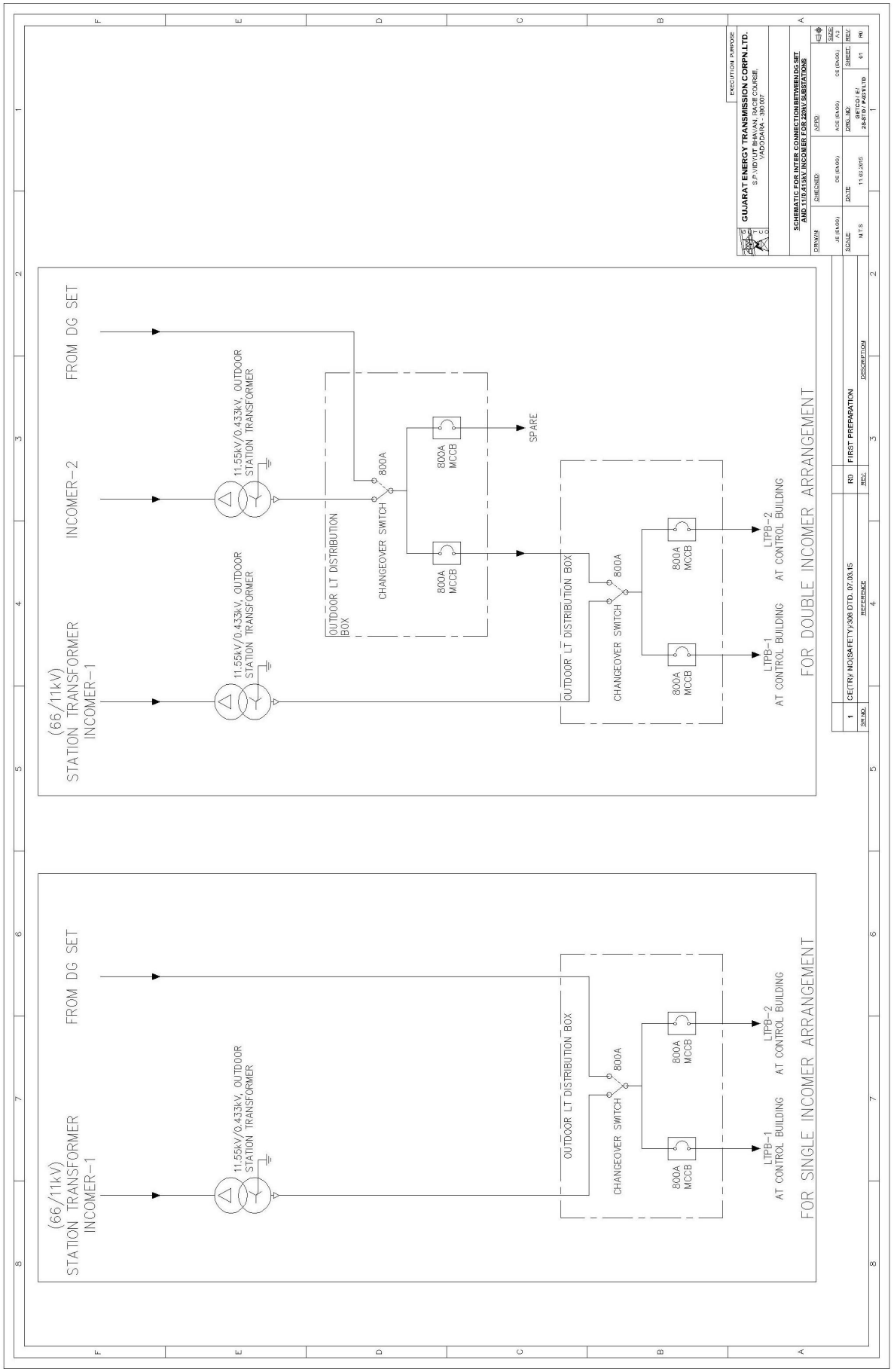

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