Section -LIGHTING SYSTEM (Rev.07)

Major Changes in Technical Specification Lighting System (Rev.07 w.r.t. Rev.06):-

1. For Indoor Lighting, LED fixtures to be supplied as per Quantity specified in Technical Specification.
2. For Outdoor Lighting & GIS Building, LED fixtures have been envisaged in place of Conventional Sodium Vapor Lamps (Quantity to be supplied as per BPS).
3. Firewall mounted Flood Lights have been envisaged for Transformer & Reactors (to be supplied as per BPS).
4. Portable Flood Light Panel for Maintenance purpose has been specified. Typical Drawing is also enclosed (to be supplied as per BPS).
5. Bidder shall be required to submit LM-79 & LM-80 reports for LED Luminaries.
6. Roof top Solar Grid System **with battery** has been replaced by Roof Top Solar Grid System of 50kW, 30kW & 20kW for 765kV, 400kV & 220kV Substation respectively (without Battery) to be integrated in ACDB. (to be supplied as per BPS).
7. Considering maintenance issue of Pole mounted battery, **Solar Panel along with battery** used for Street Lighting System has been deleted and Street Lighting using LED Luminaries is retained.
8. AC Emergency Lighting in GIS building, SPR, DG Area and LT Transformer Area has been specified.
9. Use of Occupancy Sensor has been deleted.
10. Lighting System for Township & Transit Camp included in line with Rev.05.
11. **Stainless steel** Panels/Junction Boxes of thickness 1.5 mm for Outdoor application has been specified.
12. Indoor Lighting Panels Bus Bar has been changed from Copper to Copper/**Aluminum Alloy**.
13. Technical Specification for Receptacle RQ-1 (250A) & RQ-2 (400A), 415V, 3-phase has been included for Oil filtration purpose.
14. All concealed Conduit shall be PVC type and all surface mounted conduit shall be of Galvanized steel.
15. Lighting Steel tubular Poles **painting changed** to hot deep galvanizing with PU (Polyurethane) coating in Suzuki Silver color.
16. Fixtures Model and Vendor names have been deleted and general technical parameters of LED fixtures have been included for Indoor as well as Outdoor Fixtures.
17. Bottom of Outdoor Lighting Panels mounting height shall be 1000mm from FGL.

Note : Above are major changes made in the Model TS, however Bidder is advised to refer Technical Specification in detail for other changes in the specification.

Section -LIGHTING SYSTEM (Rev.07)

1 GENERAL

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 with electronic regulators, exhaust fans with accessories, lighting panels, Sub-Lighting Panels, lighting poles with distribution boxes, PVC conduits, lighting wires, G.I. earth wire, receptacles, tag block & telephone socket, switchboards, modular switches, junction boxes, pull out boxes, aluminum ladders for maintenance, **solar grid system** complete with accessories.

The following specific areas are included in the scope of lighting as applicable (as per BPS):

i) Indoor Lighting

a) Control Room cum administrative building
b) Firefighting pump house
c) Switchyard panel rooms
d) GIS Building
e) Township & Transit Camp
f) Other Buildings

ii) Outdoor Lighting

a) Switchyard Area including DG Set & LT Transformer area
b) Street Lighting
c) Open Store

2 General Design Criteria

The illumination system shall be designed on the basis of best engineering practice and shall ensure uniform, reliable, aesthetically pleasing and glare free illumination. The finish of the fixtures shall be such that no bright spots are produced either by direct light source or by reflection. The diffusers/ louvers used in the lighting fixtures shall be made of impact resistant polystyrene sheet and shall have no yellowing property over a prolonged period Illumination. The type of Lighting Fixture to be used in different areas shall be as per **Annexure-I**.

For Indoor and Outdoor Illumination, detailed drawings showing the lighting layout and electrical distribution diagram shall be prepared by the Contractor and submitted for approval. Conduiting shall be done as per approved Lighting Layout and no separate drawings for the same shall be submitted for approval. The above layout drawings will include disposition and location of lighting fixtures, receptacles, lighting panels etc. While finalizing the detailed layout of lighting fixtures, the position/location and layout of equipment should be taken into account

to have adequate illumination at desired locations. In false Ceiling, surface wiring is permissible but all down run conduit will be concealed in wall below the false Ceiling.

2.1 **Indoor Illumination**

Indoor illumination shall be done by LED Luminaries as per the requirement of false ceiling and non-false ceiling of buildings.

2.2 **Outdoor Illumination**

Outdoor illumination shall be done by LED luminaries as per the requirement. For Outdoor Switchyard area, LED fixtures shall be installed at gantry structures (For 400kV & below voltage level) & available lightning masts (if any). However for 765kV Switchyard, LED fixtures will be installed at 28 meter height on the towers. For other outdoor areas, Street Lighting, lighting poles & nearby buildings (if any) shall be used for installation of LED fixtures. Additional firewall mounted Flood Lights have to be provided for Transformer & Reactors as specified in the BPS. Mounting structure /Accessories for Mounting of LED Lighting Fixtures will be prefabricated and will be hot dip galvanized.

Portable Flood Light Panel (PFLP): Portable Flood Light Panel along with fixture is to be supplied as per BPS for maintenance purpose of the Substation. The detailed drawing for the PFLP shall be as per the drawing attached in the specification (Annexure-IV). Fixture shall be FL-2 type on PFLP.

3 **Grid Interactive Solar PV Power Plant:**

Solar Grid System shall be supplied as specified in BPS. Solar PV Power Plant of PV array Capacity shall be 50kWp for 765kV Substation, 30kWp for 400kV Substation and 20kWp for 220kV & below Substation.

3.1 **General**

Grid Interactive Solar PV Power Plant of PV array shall be provided over Control Room building. This installation shall be a supplement source to Substation ACDB bus, to save on conventional energy supply from the grid during solar energy generation from the plant. The equipment and materials shall include but not limited to the following:

a) PV Modules (Crystalline)
b) Module Mounting Structure and frames
c) Array Terminal Box
d) Grid Interactive Inverters
e) Solar AC Panel
f) Cable & Wires
g) Earthing system

h) Civil works for Foundation of PV Array

All civil works associated with the installation & commissioning of PV Array shall be done by the Contractor including necessary structural work, cost of the same shall be deemed included in the erection work.

The Solar PV Module will be installed over the Control Room Building while the Inverters, Grid interfacing LT Panels etc. will be placed in Substation ACDB Room of Control Room Building. The Contractor shall specify and submit detail GA drawing indicating indoor equipment as well as PV Array. Contractor shall provide necessary supporting documents to the employer including typical solar PV module electrical characteristics including current-voltage (I-V) performance curves and temperature coefficients of power, voltage and current of the proposed PV Module (s).

3.2 Solar PV Modules

Solar PV module shall include but not limited to the following**:**

- PV Module shall be mono or poly crystalline high power silicon cells.
- The solar cells shall have anti-reflective surface coating to help to absorb more light in all weather conditions.
- The PV modules shall comply the relevant standards.
- Each module shall have superior light transmission, tampered & textured glass with antireflective coating. It shall also have tough multi-layered polymer back sheet for environmental protection against moisture & to provide high voltage electrical insulation.
- Solar PV module shall be highly reliable, light weight and shall be designed to have a long service life.
- Major technical parameters for PV module shall be as under:-

Type	Mono or Poly Crystalline silicon
Efficiency	>= 16%
Fill factor	>=70%
Module frame	Non-corrosive and electrolytic ally compatible with the mounting structure material
Array Termination box	Thermo-plastic, IP 65, UV resistant
Module Rated power	The nominal power of a single PV module shall not be less than 300Wp. The rated output of any supplied module shall not vary by more than 3% from average power rating.
Environmental Conditions	It shall perform satisfactorily in relative humidity up to 95% and temperature between 0-85 deg. C.

Applicable standards	IEC 61215 IEC 61730 Part 1 and 2
Salt Mist Corrosion Test	As per IEC 61701

3.3 **Module Mounting Structure and frames**

- Entire system shall be installed by providing necessary steel structures. The array structure and its legs shall be made of hot dip galvanized MS angles or galvanized MS tubular frame. The structure shall be designed for simple mechanical and electrical installation. It shall support PV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly. The minimum thickness of the galvanization shall be as per Section-GTR.
- The array structure shall be so designed that it will occupy minimum space without sacrificing the output from SPV panels. The structure shall be designed to allow easy replacement of any module & shall be in line with the site requirement. Array structure shall also have tilt arrangement to adjust the plane of the array for optimum tilt during erection.
- Minimum Ground Clearance of the lowest part of the module structure should be at least 700mm.
- All fasteners for supporting conduits, Nut & Bolts shall be of stainless steel (SS-304 Grade).
- The array structure shall be grounded properly.

3.4 **Array foundation**

Foundation is to be made above the surface and no grouting to be done. If any grouting is done on the concrete foundation, necessary modification shall be done to avoid any seepage to the Ceiling. The base plate arrangement may be made on RCC blocks. Grade of concrete for all RCC blocks shall be 1:1.5:3 mix.

3.5 **Grid Interacting Inverter**

The inverter shall be pure sine wave inverter of high efficiency. Inverters shall have display to show its own parameters along with the parameters of PV array connected to the Inverter. The inverter shall be compatible as On Grid Connected Mode (Synchronization with grid). The inverter shall include but not limited to the following**:**

- The inverter shall be highly efficient based on Maximum Power Point Tracking (MPPT) control providing a fixed DC input voltage to inverter. MPPT must be able to extract maximum energy from Solar array and produce 415 V, 3-ph, 50Hz AC to synchronize with the grid through Substation ACDB panel.
- The Inverter shall not produce Electromagnetic interference (EMI) which may cause malfunctioning of electronic and electrical

instruments including communication equipment, which are located within the facility in which the inverter is housed

- Inverter shall have facility to display basic parameters of the system through LED/LCD display.

Display
- Voltage & Frequency
- Power
- Energy

Indications
- DC Input Line Status
- Inverter under voltage/ over voltage
- Inverter over load

Protections
- Over voltage both at input & output
- Over current both at input & output
- Over/ under grid frequency
- Reverse Polarity Protection
- Reverse current to PV array protection
- Short circuit
- Protection against lightning
- Protection against Surge voltage induced at output due to external source

Major Technical Parameters for Inverter shall be as follows:-

Inverter Capacity	50kW/30kW/20kW
Input DC voltage range	As required for the solar grid
Operation AC voltage	3-phase, 415V±10%
Total Harmonic Distortions on AC side	THD<3%
Operating Frequency range	50Hz ± 3%
Power factor of the inverter	>0.98 at rated power
Operating ambient temperature	-20ºC to +60ºC
Humidity	0 – 95% Rh
Inverter efficiency	>=96%
Inverter weighted (EURO) efficiency	>=95%
Protection degree	As per GTR
Communication interface	IEC 61850 Protocol or through IEC 61850
Safety compliance	IEC 62103, IEC 62109
Display type	LCD / LED

The manufacturer shall facilitate for smooth interfacing of Inverter (Alarm & Analog measured Values) with Substation SAS.

3.6 **Solar AC Panel**

AC Power output of Inverters shall be fed to the Solar AC Panel through suitably rated MCCBs. Output of Solar AC panel shall be connected to Substation ACDB bus through available MCCB in ACDB Panel.

3.7 **Provision for Module Cleaning**

For cleaning of the PV Modules, necessary plumbing & piping work shall be done by tapping from the existing pipeline available at the roof top so that water is easily available near the PV modules.

4 **LIGHTING SYSTEM DESCRIPTION**

The lighting system shall comprise of the following:

4.1 **AC Normal Lighting System**

All the Lighting fixtures connected to the AC Normal Lighting system in different areas will be fed from the 415 V main lighting distribution board through Lighting Panel & Sub-lighting panels (SLP).

4.2 **AC Emergency Lighting System**

The lighting panels of this system will be connected to the 415 V Emergency lighting distribution board (ELDB) which is fed from diesel generator during the emergency. This system will be provided in Control Room building, GIS Building, Switchyard Panel Room, Firefighting pump house, Switchyard Area including DG Set & LT Transformer Area. AC Emergency lighting load will be connected to this system which will be normally 'ON'. Approximate 25 % of lighting fixtures (distributed over all above areas) shall be connected on AC emergency lighting system.

4.3 **D.C. Emergency lighting System**

DC emergency LED lighting fixtures of 8W DC Input Down Lighter shall be operated on the 220/110V DC system (as per available Station DC Supply) and will be provided in the strategic locations in Control Room Building, Fire Fighting Pump House and GIS Building .

The supply to the DC lighting panels shall be automatically switched ON in case of loss of Normal & Emergency AC supply at station or when under voltage occurs in the AC MLDB. The DC supply will be automatically switched OFF after about 3 minutes following the restoration of supply to normal AC or emergency AC lighting system.

Exit Lightings Signage are to be provided in the all rooms of Control Room Building, Fire Fighting pump house & GIS Building including

Corridors & Staircase so that the operating personnel can safely find their way even during emergency of total AC failure.

5 LIGHTING SYSTEM DESCRIPTION- TOWHSHIP & TRANSIT CAMP

The scope of work comprises of design, engineering, testing, supply, installation, testing and commissioning of 415V, 400Amp, Main Township Distribution board/Energy meter Boards/Flat DBs etc. as per single line diagram (C/ENGG/TS/STD/ILLU/TOWNSHIP/01), Power and Control cables, various lighting fixtures complete with lamps, supports and accessories, ceiling fans complete with electronic regulators, exhaust fans for toilets and pantry & accessories, lighting panels, lighting poles complete with distribution boxes, galvanized rigid steel/PVC conduits, lighting wires, G.I. Earthwire, receptacles, tag block & telephone socket, bells, boxes for telephone/television & Air-conditioners points, switchboards, switches, junction boxes, pull out boxes complete with accessories as outlined in electrical drawings enclosed with tender documents for various type of quarters, parking, pump house, recreation centre and transit camp associated with township.

The township lighting system shall comprise of the following:

5.1 EXTERNAL ELECTRIFICATION WORKS

The entire External Electrification work including connection to various quarters, recreation centers & transit camp associated with township including street lighting of township shall be in the scope of the contractor. 415V, 400A Main Township distribution board shall be fed from 415V, 1000A Main switchboard (being supplied under LT switchgear package) located in ACDB/DCDB Room of main Switchyard through 2-3 ½ x300 sq.mm XLPE insulated power cable from each source. **Supply of Main Township DB & associated 3 ½ x300 sq.mm XLPE cable along with its interconnection, installation etc. shall be as per BPS.**

Further typical distribution from 415V Main Township DB is indicated in the drawings. The entire external electrification work comprising of feeder pillars, Cables and associated glands and lugs, steel tubular poles, street lights, MS junction boxes, GI pipes for cable protection, danger plates, Hume pipes, fire extinguishers, cable route markers etc. as required shall be in the scope of the contractor. The exact location of quarters, recreation center, transit camp, streets etc. shall be intimated to successful bidder during detailed engineering.

5.2 INTERNAL ELECTRIFICATION WORKS

The bidder shall quote for each type of quarters, recreation center and transit camp separately as per BPS, including entire scope pertaining to lighting system, earthing and lightning protection.

The scope shall broadly consist of entire concealed conduit work, wiring for lights/power/fans/telephones/cables & air-conditioners, supply and fixing of metal boxes, plates, switches, sockets, call bells, buzzers,

exhaust fans, ceiling fans, MCBs, MCCBs, light fittings, energy meters boards & flat DBs etc. as per the requirements of various quarters, recreation centers and transit camps.

In addition to above complete earthing (through separate earth pit) and lightning protection for each type of quarters, recreation center and transit camp shall be provided as per standard guidelines given in relevant Indian standards and code of practices. The complete drawing for earthing and lightning protection shall be submitted to owner for approval. The loop earthing inside the buildings shall be carried out with minimum 1Cx1.5 sq.mm PVC stranded Copper wire. All materials required or earthing and lightning protection of township buildings shall be in the scope of contractor.

Any item not specifically outlined in the layouts and specifications enclosed herein shall necessarily be included by the contractor as per applicable buildings codes, statutory electricity rules and code of practices for the completion of scope.

6 DESCRIPTION OF ITEMS

The Contractor shall supply and install the following equipment and accessories in accordance with the specification and applicable standards:

6.1 LED LUMINAIRES

LED Luminaries shall be used for the lighting of all the indoor and outdoor areas. In false ceiling area, LED luminaries shall be recessed mounting type & in non-false ceiling area, the LED luminaries shall be surface mounting type.

Suitable heat sink with proper thermal management shall be provided in the luminaries. All LED Luminaries shall be POWERGRID approved make. The marking on luminaries & safety requirements of luminaries shall be as per IS standards.

Necessary Care shall be taken so that there is no water stagnation anywhere in the Luminaries. The entire housing shall be dust and water proof protection as per IS 12063.

Parameters of outdoor & indoor Lighting fixtures are detailed in **Annexure-II**.

6.2 LIGHTING PANELS

6.2.1 CONSTRUCTIONAL FEATURES OF LIGHTINNG PANELS

i) The Lighting panels shall conform to IS-8623.

ii) All Outdoor Lighting Panels shall be **Stainless sheet steel** of Grade 304 and shall be dust, weather and vermin proof. Panels shall be of

thickness not less than 1.5 mm smoothly finished, leveled and free from flaws. Stiffeners shall be provided wherever necessary.

iii) The panels shall be of front single door hinged construction, suitable for either floor mounting on channels, sills or on walls/columns by suitable M.S. brackets. Indoor Lighting panels shall be modular flush mounted and wall embedded of slim depth.

iv) All panels shall have a dead front assembly provided with hinged door(s) and with suitable locking arrangement.

v) All Outdoor panel's removable covers and doors shall be gasketed all around with neoprene/EPDM gaskets/ puff arrangement.

vi) The outdoor panels shall be suitable for cable/conduit entry from the bottom. Suitable removable cable gland-plate shall be provided in the bottom of panels. For indoor lighting panels the provision of cable/conduit entry shall be from both top and bottom side with suitable removable gland plate. The thickness of the gland plate shall be 3 mm. Necessary number of double compression brass type cable gland shall be supplied, fitted on to these gland plates.

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

viii) Each panel shall have a caution notice fixed on it.

ix) Each panel will be provided with laminated as built circuit diagram suitably pasted in the panel.

x) Main Bus Bars

Bus bars shall be of **Copper/aluminum alloy** conforming to IS: 5082 and shall have adequate cross-section to carry the rated continuous current 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.

xi) All Outdoor Lighting Panels shall be erected such that a minimum height of 1000mm is maintained between FGL & bottom of the Lighting Panel. Size of Outdoor Lighting panels shall be such that cables are properly terminated and wires are dressed with provision of loops.

6.2.2 CONFIGURATION OF INDOOR AND OUTDOOR LIGHTING PANELS (AS PER BPS).

Type of Panel	Description	Detail Of Feeders
ACP 1	Indoor AC	**Bus Bars:** 415V, 63A, 3 phase 4

	Lighting panel	wire bus bars with Colored LED indication lamps with fuse for each phase. **Incomer:** One no. 415V, 63A TPN MCB with 300mA 63A Four Pole RCCB. **Outgoings:** 12 nos. 230V, 16A Single Pole MCB and 1 no. 5/15A Switch with Socket. **Mounting:** The indoor ACP shall be of slim depth suitable for embedding in the wall and will be flush mounted.
ACP 2	Outdoor-Switchyard AC Lighting panel	**Bus Bars:** 415V, 63A, 3 phase 4 wire bus bars with Colored LED indication lamps with fuse for each phase. **Incomer:** One no. 415V, 63A TPN MCB & Contactor with suitable Photo-sensitive automatic switching system. **Outgoings:** 6 nos., 230V, 20A Single Pole MCB and 3 Nos. 230V, 32A TPN MCB and 1 no. 5/15A Switch with Socket. **Mounting:** Suitable for Outdoor applications**.**
ACP 3	Outdoor - Street AC Lighting Panel	**Bus Bars:** 415V, 63A, 3 phase 4 wire bus bars with Colored LED indication lamps with fuse for each phase. **Incomer:** One no. 415V, 63A TPN MCB & Contactor with suitable Photo- sensitive automatic switching system. **Outgoings:** 3 nos. 32A TPN MCB and 1 no. 5/15A Switch with Socket. **Mounting:** Suitable for Outdoor applications**.**

DCP	Indoor DC Lighting panel	**Bus Bars:** 220/110V DC (as applicable) 32A two wire Bus Bar. **Incomers:** 220/110V DC (as applicable) with one 32A DP Contactor (for AC fail Logic) backed up by 32A double pole MCB with DC test push button. **Outgoings:** 6 nos.16 A Double Pole MCB **Mounting:** The indoor DCP shall be of slim depth suitable for embedding in the wall and will be flush mounted
SLP	Outdoor AC Sub-lighting panel	**Incomers:** 415V, 32A TPN MCB **Outgoings:** 8 nos. terminal blocks suitable for cable upto 16 sq. mm cable. **Mounting:** Suitable for Outdoor applications with Loop in and Loop out facility.
Sub-DB	Indoor AC Sub Distribution Box	**Incomers:** 415V, 32A TPN MCB. **Outgoings:** 6 nos. 230V, 16A Single Phase feeder with Single Pole MCB. **Mounting:** The Sub-Distribution Box shall be of slim depth suitable for embedding in the wall and will be flush mounted/surface mounted as per site requirement.

6.2.3 AUXLIARY ITEMS FOR LIGHTING PANELS

(i) TERMINAL BLOCKS

Each terminal shall be suitable for termination of suitable size of Cable/Wire Conductors without any damage to the conductors or any looseness of connections.

(ii) RESIDUAL CURRENT CIRCUIT BREAKERSS (RCCB)

For indoor panels (ACP 1), 63A, 4pole 300 mA RCCB conforming IS 12640 will be provided along with incomer.

(iii) **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. MCB of Type C tripping characteristics as per IS 8828 will be used for Illumination purposes.

b) The MCBs and MLDB panel MCCBs together shall be rated for full fault level. In case the MCB rating is less than the specified fault level the Contactor shall co-ordinate these breaker characteristics with the backup MCCB in such a way that if fault current is higher than breaker rating, the MCCB should blow earlier than the MCB. If the fault current is less than MCB breaking capacity, MCB shall operate first and not the incomer MCCB.

c) The MCBs shall be suitable for housing in the lighting panels and shall be suitable for connection with stranded copper/Al wire connection at both the incoming and outgoing side by copper/Al lugs or for bus bar connection on the incoming side.

d) The terminals of the MCBs and the 'open/trip' and 'close' conditions shall be clearly and indelibly marked.

(iv) **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. 3-Phase Contactor shall be provided with the three elements, 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 check the adequacy of the Contactors rating, wires with respect to lighting load.

(v) **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.

(vi) **LABELS**

a) Designation labels shall be provided on the front of lighting Panels. The panel designation labels shall be of 3 mm thick plastic plate. 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 lamicoid. Labels shall have white letters on black or dark blue background.

(vii) **EARTHING TERMINALS**

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

6.3 EARTHING & LIGHTNING PROTECTION FOR CONTROL ROOM BUILDING, GIS BUILDING , TRANSIT CAMP & TOWNSHIP

Earthing and lightning protection system installation shall be in strict accordance with the latest editions of Indian Electricity Rules, relevant Indian Standards and Codes of practice and Regulations existing in the locality where the system is installed.

a) Code of practice for Earthing IS: 3043
b) Code of practice for the protection of Building and allied structures against lightning IS : 2309.
c) Indian Electricity Rules 1956 with latest amendments.

Lighting Fixtures & Miscellaneous Items For Township Lighting:-
Please refer Annexure-I

6.4 POWER AND CONTROL CABLES:-

Power and Control cables required under township lighting shall conform to standard technical specification, Section-Power and Control cables.

6.5 RECEPTACLES (AS PER BPS).

All receptacles shall be of heavy duty type, suitable for fixing on wall/column and complete with individual switch. The outdoor Receptacles shall have IP 55 protection. The receptacles shall be of following types:

Type RO : 20A, 240V, 3 pin type (third pin grounded) plug and socket with body earthing arrangement with Single Pole MCB, metal clad with gasket having cable gland entry suitable for 2Cx6 sq.mm. PVC/aluminum armoured cable and a spring loaded cover suitable for installation in moist outdoor location. Receptacles shall be housed in a box made out of 1.5 mm thick Stainless Steel of Grade 304 with hinged doors with suitable locking arrangements. Door shall be lined with good quality gasketing.

Type RP - 63A, 3ph, 415V AC receptacles shall be provided for welding purposes in GIS Halls and near major equipments in switchyard.63A, 415V, 3 phase, 4 pin interlocked plug and socket with

body earthing arrangement with TPN MCB. Receptacles shall be housed in a box made out of 1.5 mm thick Stainless Steel of Grade 304, with hinged door with suitable locking arrangement The receptacle shall be suitable for 3.5C x 35/3.5Cx70 sq.mm and suitable for installation in moist outdoor location. Aluminum conductor cable entry and shall also be suitable for loop-in and loop out connection of cables of similar size. . Door shall be lined with good quality gasketing.

Type RQ-1 (250A)/ Type RQ-2(400A):- 250A/400A Receptacle shall be provided for oil filtration purpose near alternate Transformer/Reactor. 250A/400A, 415V, 3 phase, 4 pin, Switch Box with body earthing arrangement with TPN MCB, suitable for outdoor application. The enclosure shall be made out of 1.5 mm thick Stainless Steel of Grade 304, with hinged door with suitable arrangement and having cable gland entry suitable for 3.5C X 300 sq.mm XLPE armoured cable. The bus bar shall have adequate cross-section to carry the rated continuous current and withstand short circuit currents. The receptacle shall be suitable for loop-in and loop out connection of cables of similar size. Door shall be lined with good quality gasketing.

6.6 LIGHTING ACCESSORIES

Various accessories mentioned below shall be supplied as per site requirement and cost of the same shall be deemed to be included in overall Lighting System cost.

(i) JUNCTION BOXES

a) The Indoor junction boxes shall be provided with 4 way knockouts suitable for two numbers 10 sq. mm. wire/ Cable. These junction boxes shall be concealed type for indoor lighting.

b) The outdoor junction boxes shall be complete with conduit knockouts/threaded nuts and provided with terminal strips. The junction boxes shall be suitable for termination of Cable glands of required size. The junction boxes shall be provided with 4 way knockouts suitable for street lighting/switchyard lighting terminals suitable for 2 numbers 4C x 16 Sq.mm Al. cable or as per requirement. All Outdoor Junction boxes shall be of Stainless Steel of thickness 1.5mm of grade 304. Outdoor Junction Boxes shall be suitable for mounting on columns, structures etc for Outdoor Lighting. The outdoor Junction shall have IP 55 protection.

c) 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.

(ii) SWITCH AND SWITCHBOARD

a) All Switch board/boxes and electronic fan regulators located in office/building areas shall be modular flush mounted type.

b) Switch boards/boxes shall have conduit knock outs on all the sides.

c) The exact number of Switches including regulator for fans and layout of the same in the switchboard shall be suitable as per the requirement during installation.

d) The maximum number of luminaries controlled by one no. 6 Amp Switch shall be 8 nos. However each Switchboard shall have minimum 2 Nos. of 6A Switches to control the Luminaries. For DC fixtures there will be no switch and the same shall be directly controlled from DCP.

e) The Luminaries shall be wired in such a fashion that luminaries on each phase are evenly distributed all over the room.

f) 6/16A, 240V AC modular flush mounted socket with switch outlet shall be provided in indoor areas like offices, cabins, Security Room, Control Room, Switchyard Panel Room etc.

g) 25A, 240V AC modular flush mounted socket with switch shall be provided at strategic locations in GIS Halls, ACDB/Switchgear room etc.

(iii) **CONDUITS & CONDUIT ACCESSORIES**

a) The conduits shall be Rigid PVC conduits of 20/25 /32 mm diameter for Lighting, Telephone wiring & LAN Cabling and shall be ISI marked.

b) Flexible conduits wherever required shall be PVC type.

c) All conduits accessories shall be ISI marked.

d) Galvanized Steel Conduits for Surface Conductor (e.g. GIS Hall).

(iv) **PULL OUT BOXES**

a) The pull out boxes shall be concealed type for indoor lighting and suitable for mounting on column, structures etc., for outdoor lighting.

b) The pull out boxes shall be circular of minimum 16 SWG sheet steel and shall have cover with good quality gasket lining.

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

(v) **CEILING, WALL MOUNTED & EXAUST FANS AND REGULATORS**

a) The Contactor shall supply and install 1400 mm sweep ceiling fans complete with electronic regulator and board for mounting switch, suspension rod, canopy and accessories. The electronic regulator for Ceiling fans will be housed in common switchboard for lighting and shall be of similar make and model as that of modular switches. The wall mounted fans shall be of 400 mm sweep. Exhaust fans shall be of 300mm size.

b) Winding of the fans shall have Class-E insulating material. Winding shall be of copper wire.

(vi) **LIGHTING WIRES**

a) Wiring from Lighting/Sub-Lighting Panels to junction boxes / Switchboards/ fixtures etc. is covered under Lighting Wires. The wiring used for lighting shall be standard products.

b) The wires shall be of 630V grade (Phase to ground), PVC insulated products.

c) The conductor sizes for wires used for point wiring shall be 1.5 sq.mm, 2.5 sq.mm, 4 sq.mm and 6 sq.mm stranded copper wire as required.

d) The wires used for connection of a lighting fixture from a nearest junction box or for loop-in loop-out connection between two fixtures shall be single core copper stranded conductor, 630V grade (Phase to ground) flexible PVC insulated cords, unsheathed, conforming to IS:694 with nominal conductor cross sectional areas of 2.5 sq. mm.

e) The wires shall be colour coded as follows:

Red for R - Phase
Yellow for Y - Phase
Blue for B - Phase
Black for Neutral
White for DC (Positive)
Grey for DC (Negative)
Green for Earth

6.7 **LIGHTING POLES (AS PER BPS).**

(i) The Contactor shall supply, store and install the following types of galvanized steel tubular lighting poles required for street lighting and decorative lighting, as per the attached drawing of poles.

(i) Type L1 Street Lighting Pole of 6 meter - for SL-L1 type fixture
(ii) Type D1 Post top lantern pole of 4 meter - for Sl-D1 type fixture

(ii) “L1” type poles shall be used for street lighting. “D1” type (Decorative

post top lantern) poles and Bollards shall be installed In front of control room building, Fire Fighting Buildings as finalized during detailed engineering.

(iii) Lighting poles shall be complete with fixing brackets. Cable termination box will be built inside the pole itself as per drawing enclosed.

(iv) Poles and its Cable termination box shall be hot dip galvanized and PU (Polyurethane) coated in Suzuki silver color and inside with bituminous paint.

(v) Terminal strips provided in street - lighting poles shall be suitable for terminating up to 2 nos. 4C x 16 sq. mm aluminum cables.

(vi) Wiring from junction box at the bottom of the pole to the fixture at the top of the pole shall be done through 2.5 sq. mm Copper wire laid inside the tubular pole.

(vii) Distance of center of pole from street edge should be approximately 1000 to 1200 mm or as per site conditions.

(viii) Earthing of the poles should be connected to the switchyard main earth mat wherever it is available, else, the same should be earthed through 3M long, 20 mm dia, earth electrode.

6.8 LADDER(AS PER BPS).

Following ladders shall be supplied as per BPS for maintenance purpose of illumination system:

(i) A type Aluminum ladder of 3 Mtr vertical height.
(ii) Cartwheel mounted aluminum ladder Vertical Extendable from 5.1m to 11m.

7 TYPE TEST REQUIREMENT:

a) Lighting Panels, Receptacles, Junction Boxes etc. shall conform to following degree of protection:

- Installed outdoor: IP- 55
- Installed indoor in air conditioned area: IP-31
- Installed in covered area: IP-52
- Installed indoor in non-air conditioned area where possibility of entry of water is limited: IP-41.

b) Lighting fixtures LED type shall conform to type test requirements of LM-79, LM-80 and TTC.

8 LIGHTING SYSTEM INSTALLATION WORKS

Section -LIGHTING SYSTEM (Rev.07)

8.1 General

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.

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. All Lighting accessories mentioned in Clause 6.7 shall be supplied and erected as a part of Lighting System Installation works. Cost of Erection, Foundation & Civil Works of the above accessories and Lighting Poles are to be included in the Cost of the erection of Lighting system, no extra payment shall be made on account of the same.

Further, lighting control in GIS Hall has to be done in staggered way for the minimum basic illumination. Further separate switchboard shall be provided to have enhanced lighting for each bay.

8.2 Conduit System

(i) 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 out boxes (as specified in specification ordinary and inspection tees and elbow, check nuts, 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. In case of false ceiling surface conduiting is permissible however all down run conduits will be concealed in wall below the false ceiling. The conduit fittings shall be of the same material as conduits. Separate Conduit should be laid for Communication purpose .The contractor shall also supply & install 20 mm PVC conduit and accessories for telephone wiring and LAN Cabling wherever feasible, telephone and LAN cabling can be laid in the same conduit.

(ii) In case of false Ceiling surface conduiting (GI Pipe) is permissible under the ceiling.

(iii) All unarmored cables/wires shall run within the conduits from lighting panels to lighting fixtures, receptacles. etc.

(iv) Size of conduit shall be suitably selected by the contactor.

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

(vi) Conduit supports shall be clamped-on 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 raw plugs. Wooden plug inserted in the masonry or concrete for conduit support is not acceptable.

(vii) 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.

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

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

(x) 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.

(xi) The entire GI conduit system (if used) shall be embedded, electrically continuous and thoroughly grounded. Where slip joints are used, suitable bounding shall be provided around the joint to ensure a continuous ground circuit.

(xii) 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.

8.3 **Wiring**

i) The scope also includes wiring from nearest Lighting/Sub-Lighting Panel to the Controlling Switch/MCB/Lighting Fixtures.

ii) Wiring shall be generally carried out by PVC insulated wires in conduits. All wires in a conduit shall be drawn simultaneously. No subsequent drawing of wires is permissible.

iii) 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.

iv) Wiring shall be spliced only at junction boxes.

v) 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.

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

vii) AC and DC wiring should run through the separate conduits. Similarly Communication & LAN cables shall run in separate conduit than that of AC & DC Conduits.

8.4 **Lighting Panels**

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

ii) Suitable foundations/supporting structures for all outdoor type lighting panels shall be provided by the Contractor.

iii) The Sub lighting Panel shall be provided where independent switch of fixtures are required.

8.5 **General Requirements for Cabling Work**

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

ii) The tag shall be made up of aluminum 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.

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

iv) The location of underground cable joints if any shall be clearly indicated with cable marker with an additional inscription "cable joint".

v) 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.

vi) Road crossing of cables through suitable size of GI pipe/Hume pipe as required at site.

8.6 **Foundation & civil works**

i) Foundation for street lighting poles and panels shall be done by the

Contractor.

ii) 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.

iii) 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.

ANNEXURE-I

BILL OF QUANTITY

Sr. No	Locations	Type & No of Lighting Fixture	With Anti Glare Film over the Fixture	Type of Fans
01.	**Control Room cum Administrative Building-Single Storey (As applicable)**			
(i)	Control Room	RSQ-I: 10 Nos.	Yes	--
(ii)	Station- In Charge Room	RSQ-I: 4 Nos. and RC-I : 4 Nos.	Yes	--
(iii)	Administrative Area	RSQ-I: 12 Nos. and RC-I : 9 Nos.	Yes	Pedestal Fans
(iv)	Conference Room	RSQ-I: 9 Nos. and RC-I : 4 Nos.	Yes	Wall Mounted Fans
(v)	Electrical Room/Telecommunication Room	RSQ-I: 4 Nos. and RC-I : 2 Nos.	Yes	Wall Mounted Fans
(vi)	ACDB/DCDB Room	SL-I: 16 Nos.	Yes	Ceiling Fan
(vii)	Battery & Battery Charger Room	RL-I: 6 Nos.	Yes	--
(viii)	Corridor & Reception	SC/RC-I: 8 Nos. and SL/RL-I: 2Nos.	Yes	Ceiling Fan
(ix)	Toilets	SC-I: 2 Nos.(in each Toilet)	No	Exhaust Fans
(x)	Pantry	SL-I: 2 Nos. and SC-I: 1 No.	Yes	Exhaust Fans
(xi)	Periphery of the Building	BL: 10Nos.	No	--
02.	**Control Room cum Administrative Building- Double Storey (As applicable)**			
(i)	Control Room	RSQ-I: 12 Nos.	Yes	--
(ii)	Station- In Charge Room	RSQ-I: 4 Nos. and RC-I : 2 Nos.	Yes	--
(iii)	Administrative Area	RSQ-I: 16 Nos. and RC-I : 12 Nos.	Yes	Pedestal Fans
(iv)	Conference Room	RSQ-I: 9 Nos. and RC-I : 5 Nos.	Yes	Wall Mounted Fans
(v)	Electronic Test Lab/Telecommunication Room	RSQ-I: 4 Nos.	Yes	Wall Mounted Fans
(vi)	ACDB Room	SL-I: 16 Nos.	Yes	Ceiling Fan
(vii)	DCDB Room	SL-I: 9 Nos.	Yes	Ceiling Fan
(viii)	Battery & Battery Charger Room	RL-I: 6 Nos.	Yes	--
(ix)	Store	SL-I: 6 Nos.	No	--
(x)	Lobby/ Waiting Area	SSQ-I: 5 Nos. and RC-I : 4 Nos.	Yes	Ceiling Fan
(xi)	Toilet	SC-I: 2 Nos. (in each Toilet)	No	Exhaust Fans
(xii)	Pantry	SL-I: 2 Nos. and SC-I: 1 No.	Yes	Exhaust Fans
(xiii)	Corridors	SC/RC-I: 36 Nos. and SL/RL-I: 6 Nos.	No	--
(xiv)	Periphery of the Building	BL: 15 Nos.	No	--
03.	**GIS Building**			
(i)	765kV, 400kV & 220kV GIS Hall	IHB: As per BPS	No	--
(ii)	AHU Room	SL-1: : As per BPS	Yes	--
(iii)	C&R Room	RSQ-I: : As per BPS	Yes	--
04.	**Fire Fighting Pump House**			
(i)	FFPH Building	SL-1: 9 Nos.	Yes	Wall Mounted Fan
(ii)	Periphery of the Building	BL: 4 Nos.	No	--
05.	**Switchyard Panel Room (SPR) (9 meter)**	SSQ-I: 10 Nos.	Yes	--
06.	**Switchyard Panel Room (SPR) (6 meter)**	SSQ-I: 8 Nos.	Yes	--
07.	**Switchyard and Outdoor Substation Area**	FL-1 & FL-2: As per BPS	No	--
08.	**Street lighting roads**	SL-LI & SL-DI:As per BPS	No	--

Section -LIGHTING SYSTEM (Rev.07)

TOWNSHIP & TRANSIT CAMP ILLUMINATION (As Applicable)

ANNEXURE-I

Sr. No	Locations	Type & No of Lighting Fixture	Anti-Glare Film Requirement	Type of Fans
01.	**Township Quarters**			
(i)	Bed Room	SL-I :1 Nos. and SC: 2 Nos.	Yes	Ceiling Fan
(ii)	Drawing Room	SSQ-I: 2Nos. and SC 2 Nos.	Yes	Ceiling Fan
(iii)	Dining Room	SSQ-I: 2 Nos.	Yes	Ceiling Fan
(iv)	Kitchen	SL-I: 1 Nos. and SC: 1 Nos.	Yes	Exhaust Fan
(v)	Lobby	SSQ-I and SC 2 Nos.	Yes	--
(vi)	Toilet	SC-I: 1 Nos.	No	Exhaust Fan
(vii)	Servant Room	SL-I: 1 Nos.	Yes	Ceiling Fan
(viii)	Car Parking	BL-I: 1 Nos.	No	--
(ix)	Stair	SC-I: 4 Nos.	No	--
(x)	Terrace/Balcony	BL-I : 1 Nos.	No	--
02.	**Transit Camp**			
(i)	VIP Lounge	SSQ-I:2 Nos. and SC: 2 Nos.	Yes	Ceiling Fan
(ii)	Dining Room	SSQ-I: 2 Nos. and SC: 2 Nos	Yes	Ceiling Fan
(iii)	Drawing Room	SSQ-I: 1 Nos. and 2 Nos.	Yes	Ceiling Fan
(iv)	Dormitory	SL-I : 4 Nos.	Yes	Ceiling Fan
(v)	Bed Room	SL-I :1 Nos. and SC: 2 Nos.	Yes	Ceiling Fan
(vi)	Store	SL-1: 2 Nos.	No	Exhaust Fan
(vii)	Corridors	SC-I: 2 Nos.	No	--
(viii)	Terrace/Balcony	BL-I : 1 Nos.	No	--
(ix)	Care Taker Room	SL-I: 1 Nos.	Yes	Ceiling Fan
(x)	Kitchen	SL-I: 1 Nos.	Yes	Exhaust Fan
(xi)	Stair	SC-I: 4 Nos.	No	--
(xii)	Toilet	SC-I: 1 Nos.	No	Exhaust Fan
(xiii)	Other Rooms	SC-I: 2 Nos.	No	--

ANNEXURE-II

Details of Lighting Fixture

(a) Indoor Application

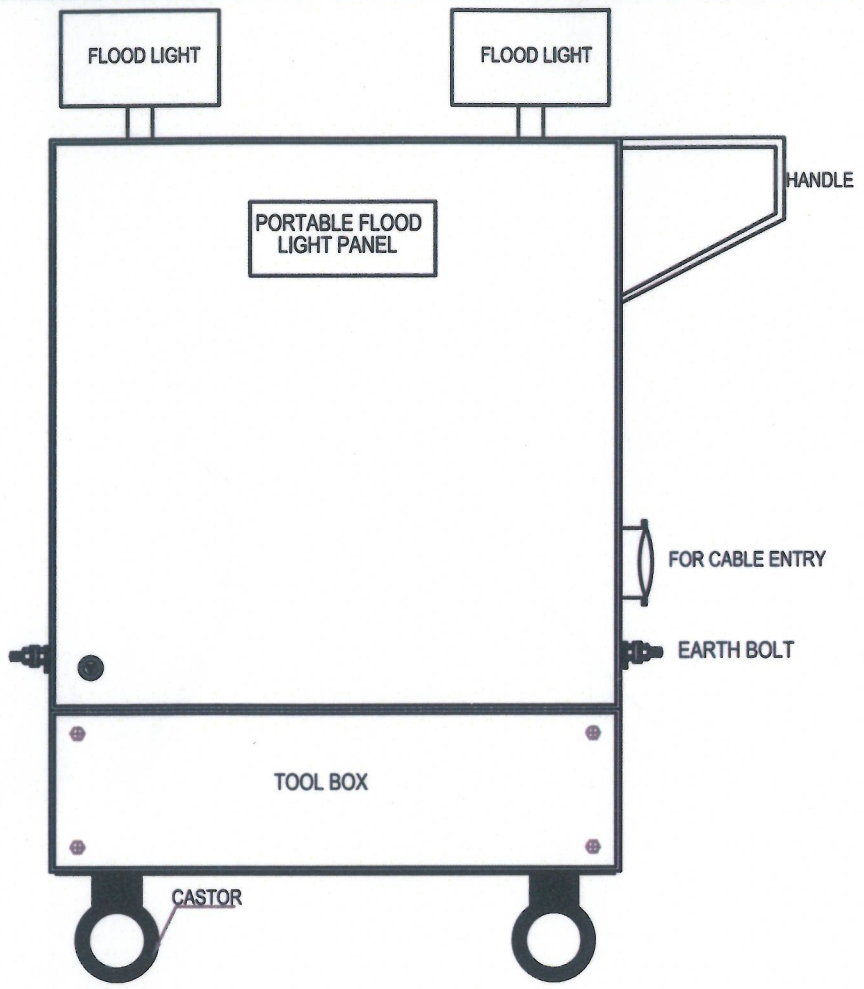
Sr. No	Technical Specification	SL-1 (Surface Mounted Linear LED Tube with Box)	RL-I (Recessed Mounted 4 x 1 Feet LED Panel)	SC-I (Surface Mounted Circular LED Downlight Luminaire)	Type RC-I (Recessed Mounted Circular LED Downlight Luminaire)	Type SSQ-1 (Surface Mounted 2X2 LED Luminaire)	Type RSQ-1 (Recessed Mounted 2x2 LED Luminaire)	Type IHB (LED Indoor High Bay)
1	System Wattage	≤ 2 X 20 W	≤ 40 W	≤ 15 W	≤ 15 W	≤ 40 W	≤40 W	≤150W
2	System Lumen Output	≥ 3600	≥ 3600	≥ 1200	≥ 1200	≥ 3400	≥ 3400	≥14000
3	System efficacy (Lumens/Watt)	≥ 100	≥ 100	≥ 80	≥ 80	≥ 85	≥ 85	≥ 100
4	Housing	CRCA Housing	CRCA Housing	Pressure Die Cast Housing	Pressure Die Cast Housing	CRCA Housing	CRCA Housing	Pressure Die Cast Aluminum Housing
5	Ingress Protection	IP20	IP-20	IP20	IP-20	IP-20	IP-20	IP-65
6	Surge Protector	2kV	2kV	2kV	2kV	2kV	2kV	4kV (Internal) & 10kV (External)
7	Mounting	Surface Mounted	False Ceiling	Surface Mounted	False Ceiling	Surface Mounted	False Ceiling	Hanging Type under Shed
8	THD	<10%	<10%	<10%	<10%	<10%	<10%	<10%
9	CRI	>80	>80	>80	>80	>80	>80	>70
10	CCT	5700k±300k	5700k±300k	5700k±300k	5700k±300k	5700k±300k	5700k±300k	5700k±300k
11	Power Factor	>0.95	>0.95	>0.95	>0.95	>0.95	>0.95	>0.95
12	Ik Protection	NA	NA	NA	NA	NA	NA	IK-05
13	Operating Humidity	90% RH	90% RH	90% RH	90% RH	90% RH	90% RH	90% RH
14	Burning Hours	50,000	50,000	50,000	50,000	50,000	50,000	50,000
15	Operating Temperature	-5℃ to 45℃						
16	Lumen Maintenance	70% at the End of Burning Hours						

Section -LIGHTING SYSTEM

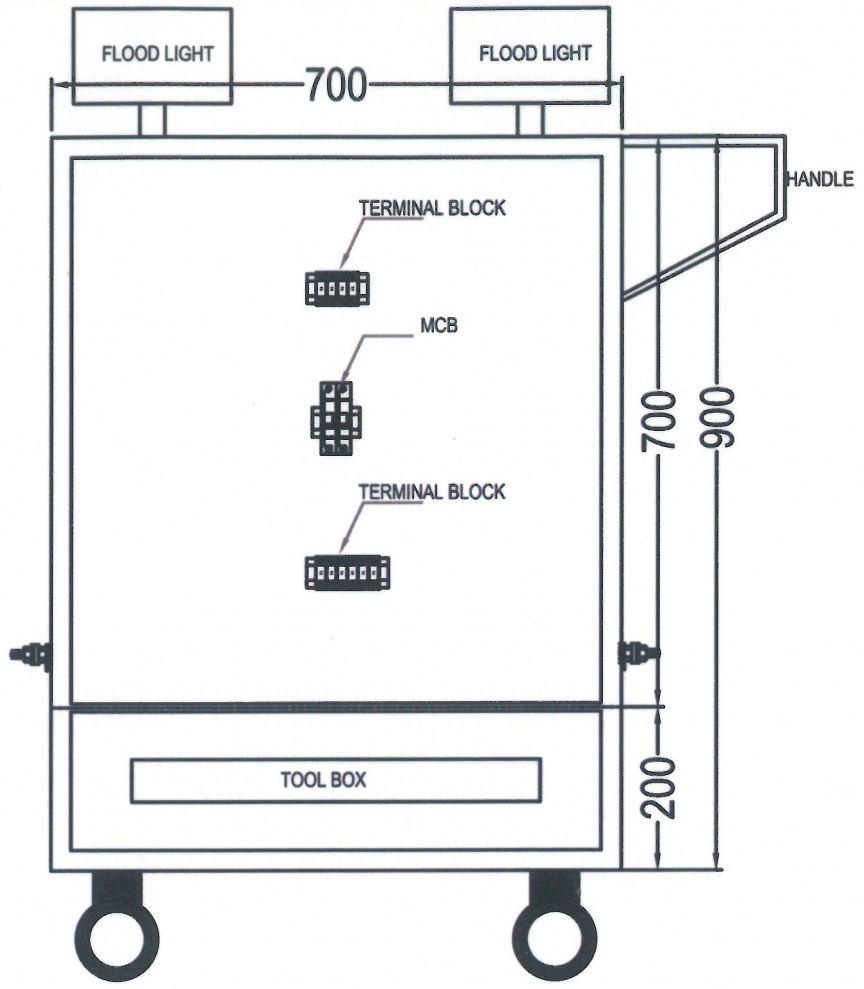
Details of Lighting Fixture

(b) Outdoor Application

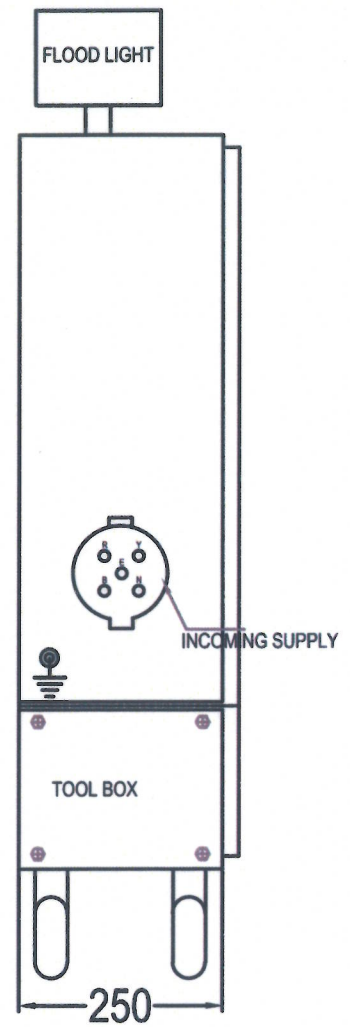
Sr.No	Technical Specification	BL (Surface Mounted Bulk Head)	Type SL-L1 (LED Street Light Luminaire)	Type SL-D1 (Pole Mounted LED Post Top Luminaire)	Type FL-1 (LED Flood Light Luminaries)	Type FL-2 (LED Flood Light Luminaries)
1	System Wattage	≤ 10W	≤45W	≤ 30W	≤150W	≤250W
2	System Lumen Output	≥ 800	≥4000	≥ 2600	≥ 14000	≥ 23000
3	System efficacy (Lumens/Watt)	≥ 80	≥ 100	≥ 90	≥ 100	≥ 100
4	Housing	Pressure Die Cast Housing and with Polycarbonate diffuser	Pressure Die Cast	Die Cast Aluminum	Pressure Die Cast Housing	Pressure Die Cast Housing
5	Ingress Protection	IP-65	IP-65	IP-65	IP-65	IP-65
6	Surge Protector(Internal)	3kV	3kV	3kV	3kV	3kV
7	Surge Protector(External)	10kV	10kV	10kV	10kV	10kV
8	Mounting	Wall Mounting	Pole Mounting for 40mm max O.D	Suitable for 60mm max O.D	On Lattice Structure	On Lattice Structure
9	THD	<20%	<10%	<10%	<10%	<10%
10	CRI	>70	>70	>70	>70	>70
11	CCT	5700k±300k	5700k±300k	5700k±300k	5700k±300k	5700k±300k
12	Power Factor	>0.90	>0.95	>0.95	>0.95	>0.95
13	Ik Protection	IK-09	IK-05	IK-05	IK-05	IK-05
14	Operating Humidity	90% RH	90% RH	90% RH	90% RH	90% RH
15	Burning Hours	50,000	50,000	50,000	50,000	50,000
16	Operating Temperature	-5℃ to 45℃				
17	Lumen Maintenance	70% at the End of Burning Hours				



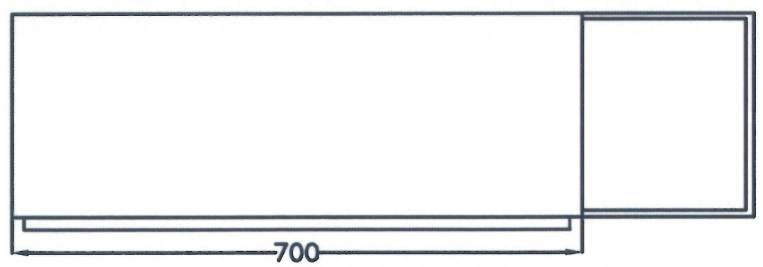
FRONT VIEW WITH DOOR



INTERNAL FRONT VIEW



SIDE VIEW



TOP VIEW

GENERAL NOTES

1	PANEL NAME	PORTABLE FLOOD LIGHT PANEL
2	TYPE OF PANEL	SINGLE FRONT FIXED TYPE
3	PANEL DIMENSION	SIZE: 700W X 900H X 250D MM
4	PANEL BODY	STAINLESS STEEL SS-304
5	IP CLASS OF PANEL	IP-55

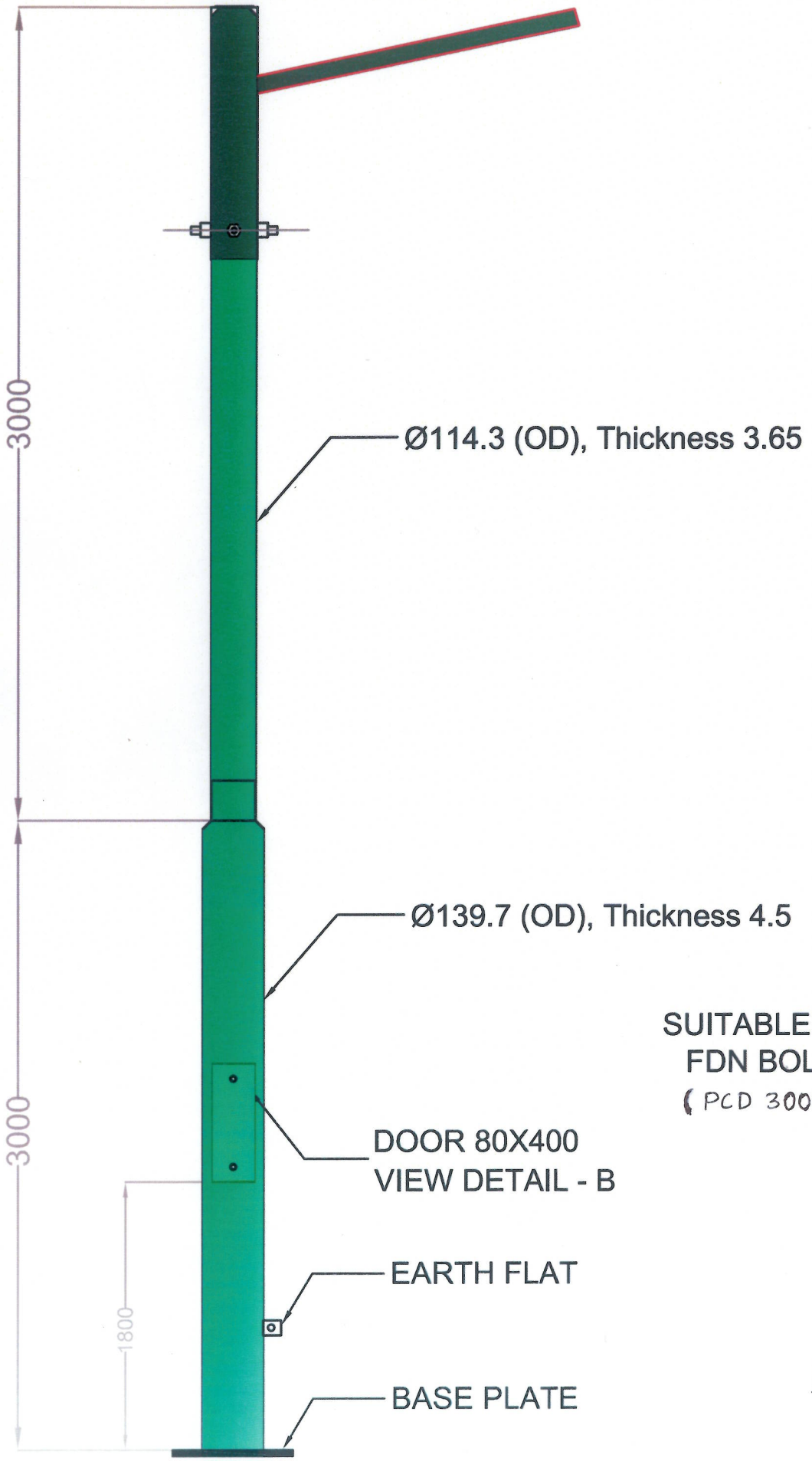
PORTABLE CORD OF 25 METER WITH PLUG TO BE PROVIDED ALONGWITH THE PORTABLE FLOOD LIGHT PANEL

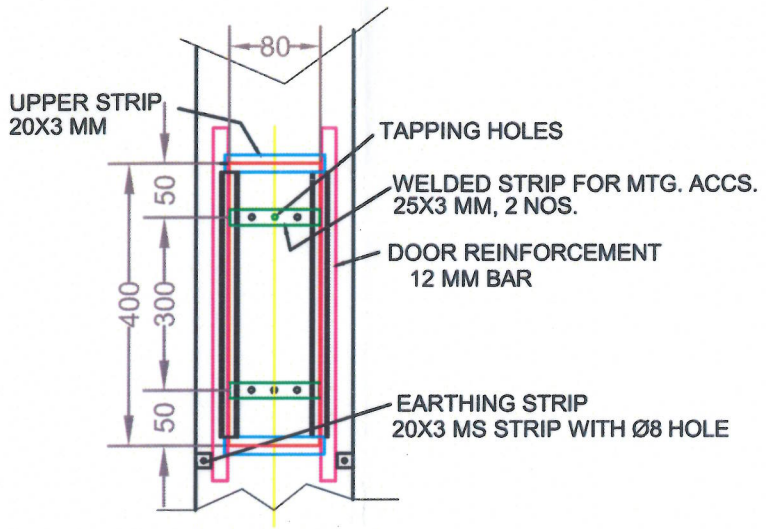
OWNER:-
POWERGRID CORPORATION OF INDIA LTD

PROJECT:- STANDARD DRAWING

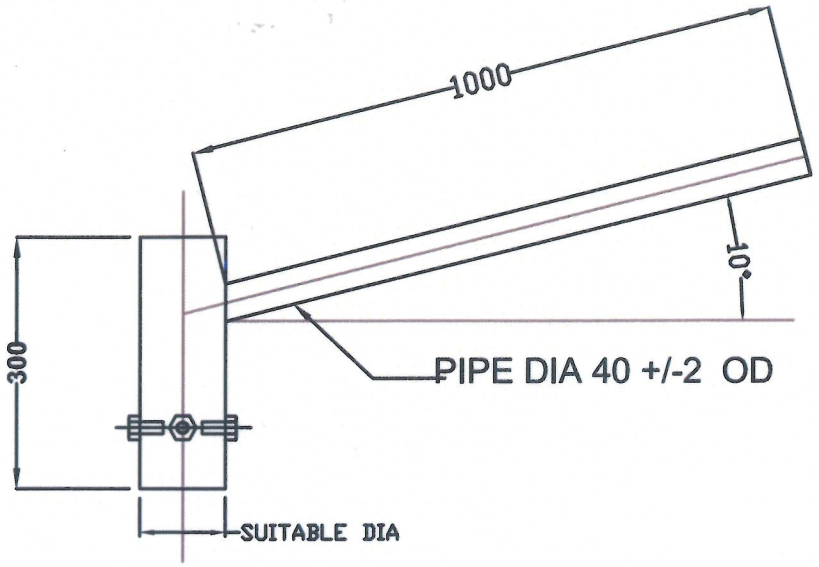
TITLE:- TYPICAL DRAWING FOR PORTABLE FLOOD LIGHT PANEL

DRAWN BY :-	DRAWING NO: -C/ENGG/GA/PFL.	SHEET NO.	SCALE
CHECKED BY :-	APPROVEDBY :-	1 OF 1	N.T.S.

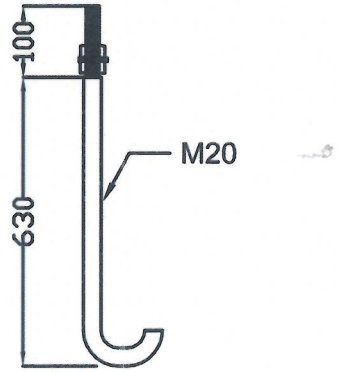




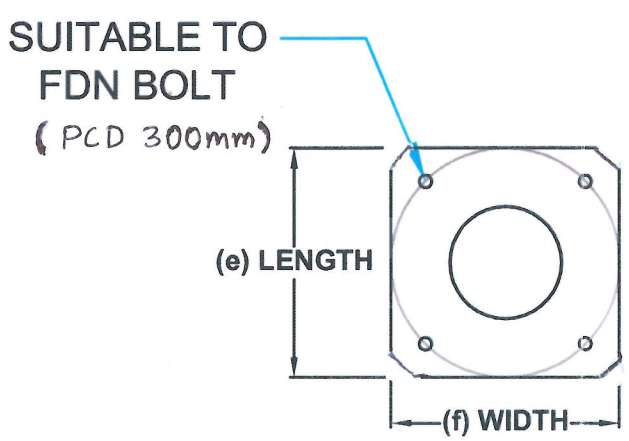
DETAIL - B
(AFTER REMOVE DOOR COVER)



SINGLE ARM BRACKET



FOUNDATION BOLTS J-TYPE
WITH HARDWARE

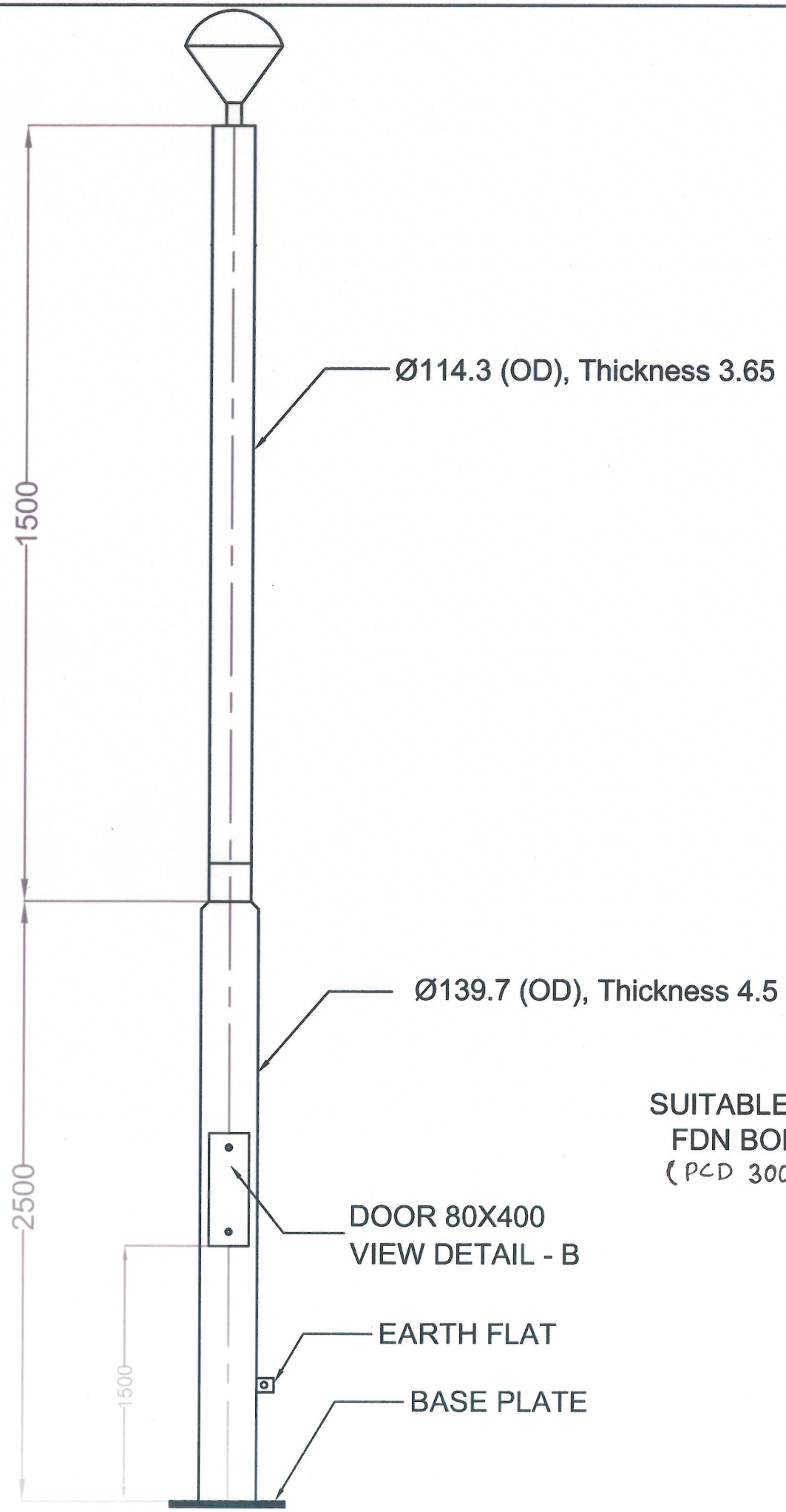


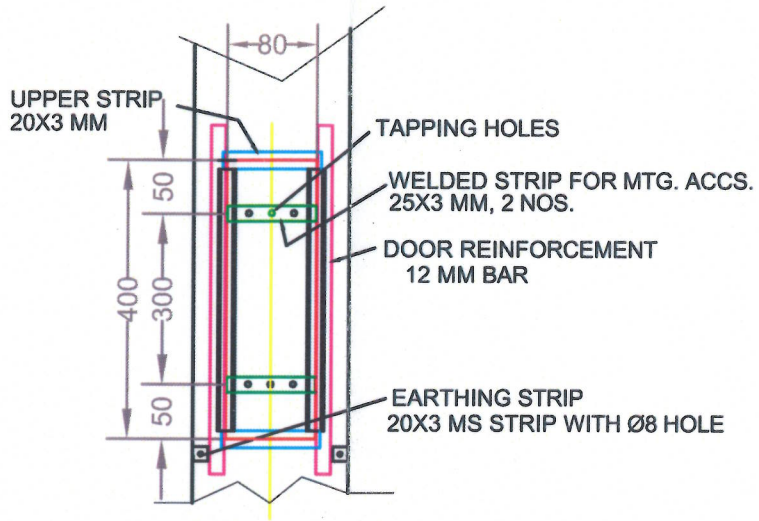
BASE PLATE 300 x 300 x 12mm
BOTTOM VIEW

NOTES:

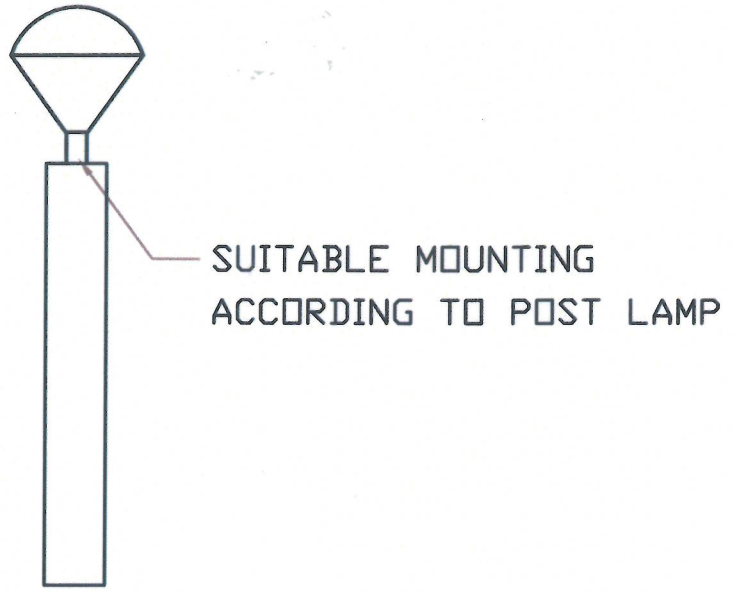
1. ALL DIMENSIONS ARE IN MM.
2. STEEL PIPES AS PER IS: 1161. & MS PLATES AS PER IS 2062.
3. TOLERANCES AS PER IS 1161 - 1979 & AS PER IS 2713.
4. POLE SHALL BE HOT DIP GALVANISED INSIDE & OUTSIDE & PU PAINTED IN APPROVED SHADE ON OUTSIDE OF POLE.

OWNER:- POWERGRID CORPORATION OF INDIA LIMITED			
PROJECT:- STANDARD DRAWINGS			
TITLE:- GA DRAWING FOR 6 METER STEEL TUBULAR POLE-SL-L1			
DRAWN BY:	DRG. NO:C/ENGG/GA/POLE/SL-L1		
CHECKED BY:-	APPROVED BY:-	1 OF 3	NTS

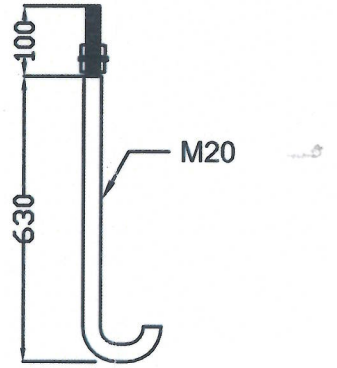




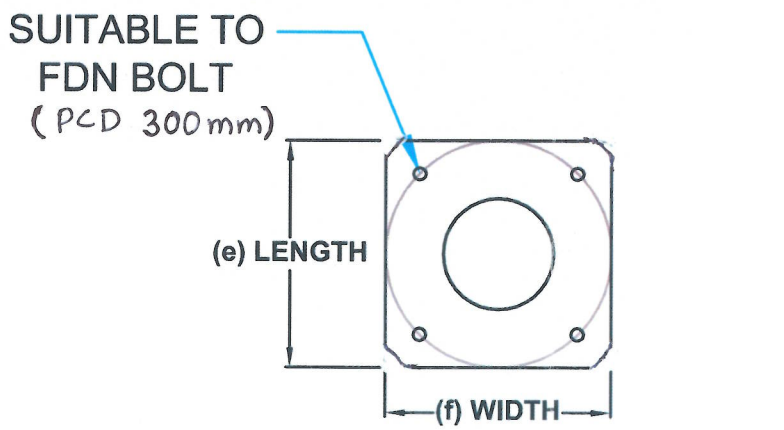
DETAIL - B
(AFTER REMOVE DOOR COVER)



DETAIL - A
POST TOP LAMP



FOUNDATION BOLTS J-TYPE
WITH HARDWARE

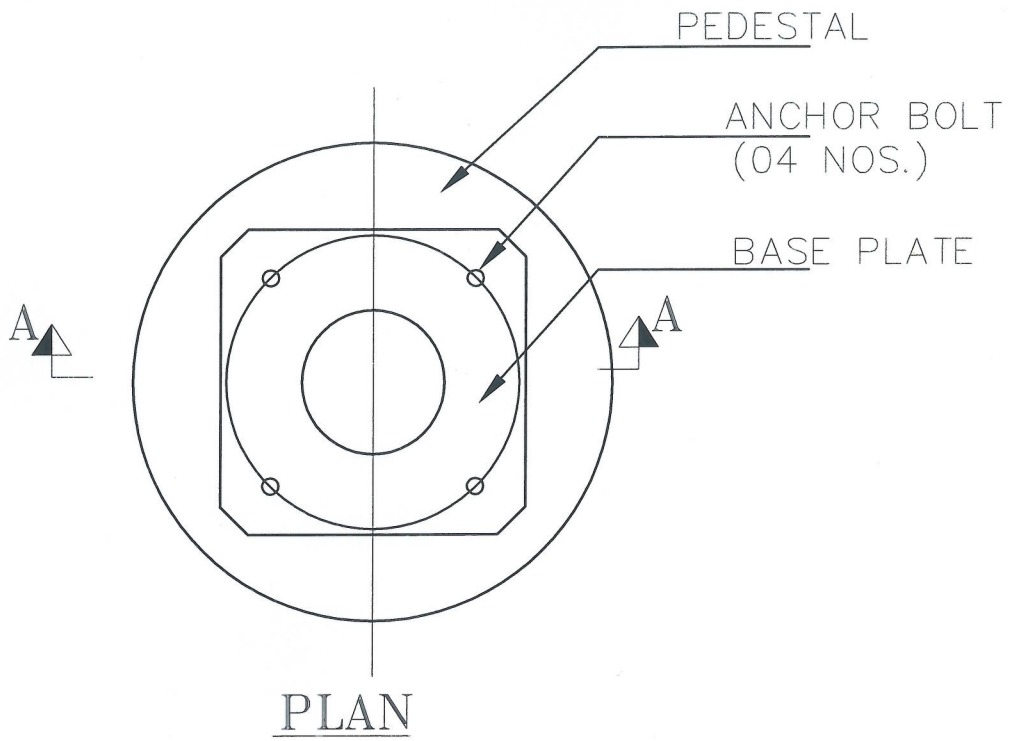


BASE PLATE 300 x 300 x 12mm
BOTTOM VIEW

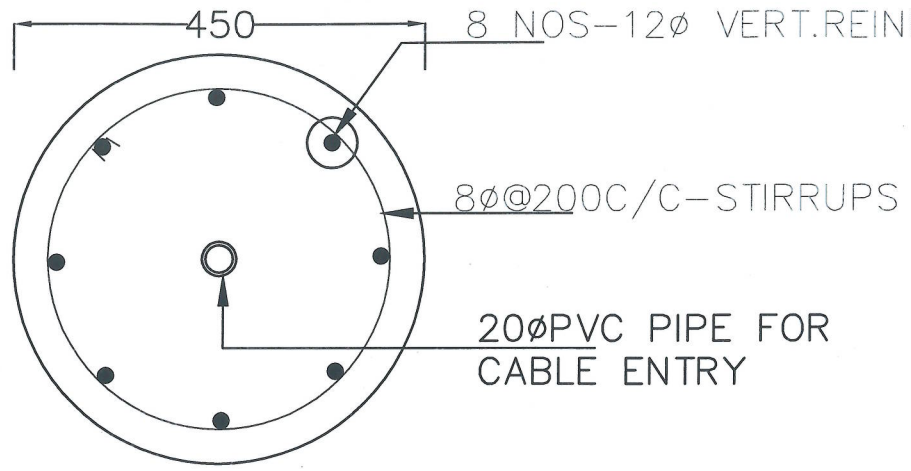
NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. STEEL PIPES AS PER IS: 1161. & MS PLATES AS PER IS 2062.
3. TOLERANCES AS PER IS 1161 - 1979 & AS PER IS 2713.
4. POLE SHALL BE HOT DIP GALVANISED INSIDE & OUTSIDE & PU PAINTED IN APPROVED SHADE ON OUTSIDE OF POLE.

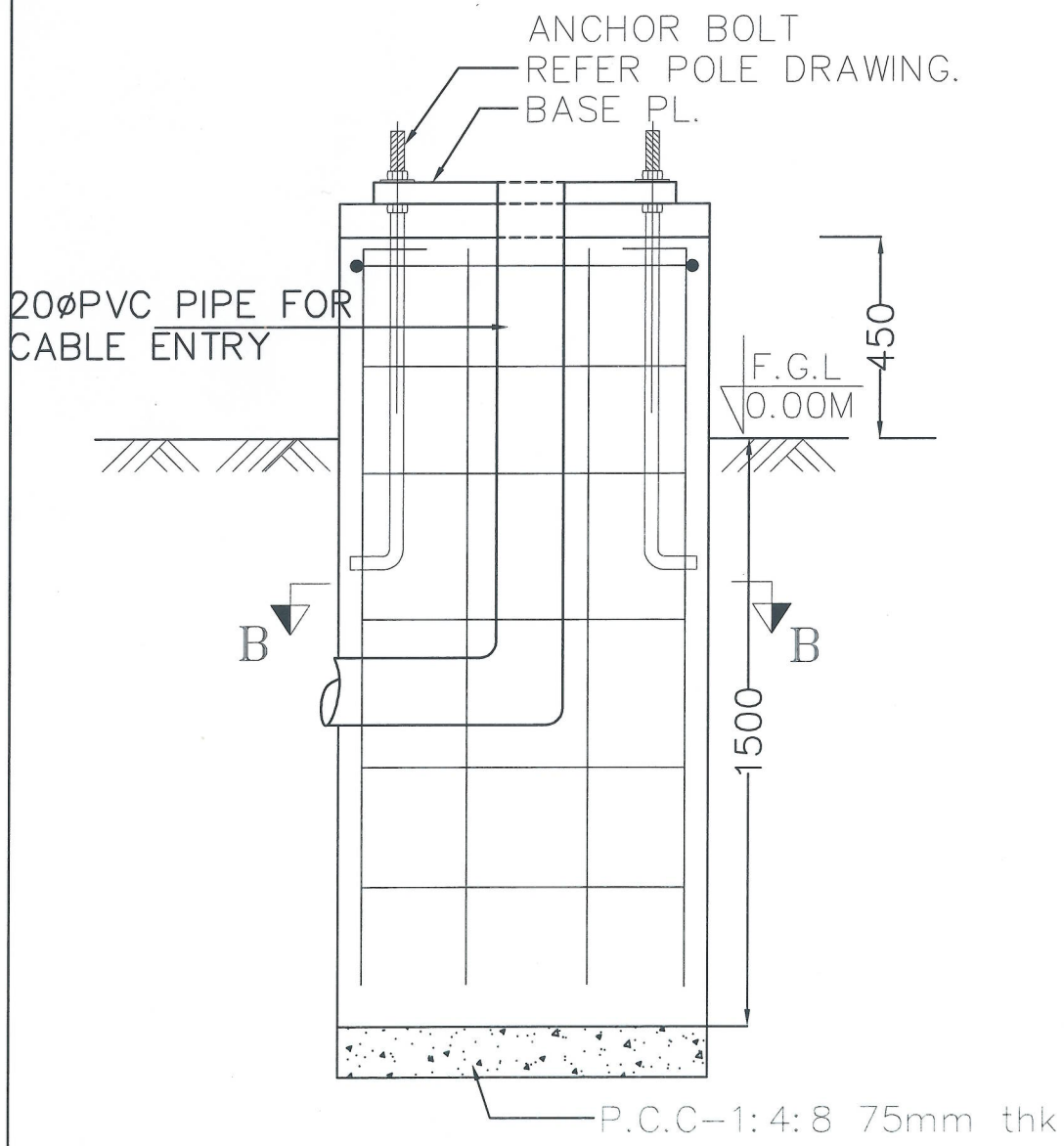
OWNER:- POWERGRID CORPORATION OF INDIA LIMITED			
PROJECT:- STANDARD DRAWINGS			
TITLE:- GA DRAWING FOR 4 METER POST LAMP -SL-D1			
DRAWN BY:	DRG. NO:C/ENGG/GA/POLE/SL-D1		
CHECKED BY:-	APPROVED BY:-	2 OF 3	NTS



PLAN



SECTION:B-B



SECTION:A-A

(A) GENERAL NOTES:

ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES
ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED. THE DRAWINGS SHALL NOT BE SCALED.
ALL STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH ARCHITECTURAL
DISCREPANCY IN DRAWINGS IF ANY SHALL BE BROUGHT TO THE NOTICE OF THE DESIGN OFFICE PRIOR TO CONSTRUCTION.
EXCUTION OF R.C.C. WORKS/STRUCTURAL STEEL WORK AS PER OUR DRAWINGS SHALL BE THE RESPONSIBILITY OF SITE ENGINEER.

(B) SPECIFICATION NOTES FOR R.C.C WORK:

(GRADE OF CONCRETE)

CONCRETE FOR ALL WORKS AS PER BPS.

(REINFORCING STEEL)

ALL REINFORCING STEEL EXCEPT M.S LUGS FOR INSERT PLATES SHALL BE HIGH YIELD STRENGTH DEFORMED BARS CONFORMING TO GRADE Fe 415. OR Fe 500 AS

LUGS FOR INSERT PLATES SHALL BE PLAIN M.S BARS CONFORMING TO GRADE 1 OF IS:432 (PART-1) 1966.IF FLATS OR ANGLES ARE USED AS LUGS,THEY SHALL CONFORM TO

(CLEAR COVER TO MAIN REINFORCEMENT)

UNLESS SHOWN OTHERWISE MIN.CLEAR COVER TO MAIN REINFORCEMENT SHALL BE AS FOLLOWS

BOTTOM	40mm.
TOP,SIDES	40mm.

(LAP LENGTH OR DEVELOPMENT LENGTH FOR DEFORMED BARS SHALL BE AS FOLLOWS)

-45xDIA OF BAR.

NOT MORE THAN 50% BARS SHALL BE SPLICED AT A SECTION.
(LOCATION OF SPLICE SHALL BE DECIDED IN CONSULTATION WITH SITE ENGINEER & PRIOR APPROVAL OF DESIGN OFFICE).

IMP NOTE :THIS DRAWING IS NOT APPLICABLE FOR MARSHY LANDS

OWNER:- POWERGRID CORPORATION OF INDIA LIMITED			
PROJECT:- STANDARD DRAWINGS			
TITLE:- FOUNDATION DRAWING FOR POLE			
DRAWN BY:	DRG. NO:C/ENGG/FDN/POLE		
CHECKED BY:-	APPROVED BY:-	3 OF 3	NTS

NOTE:-

1.INTERLOCK SHALL BE PROVIDED BETWEEN INCOMER-1 & 2. BUSCOUPLER TO AVOID PARALLELING OF SUPPLIES IN TOWNSHIP DB.

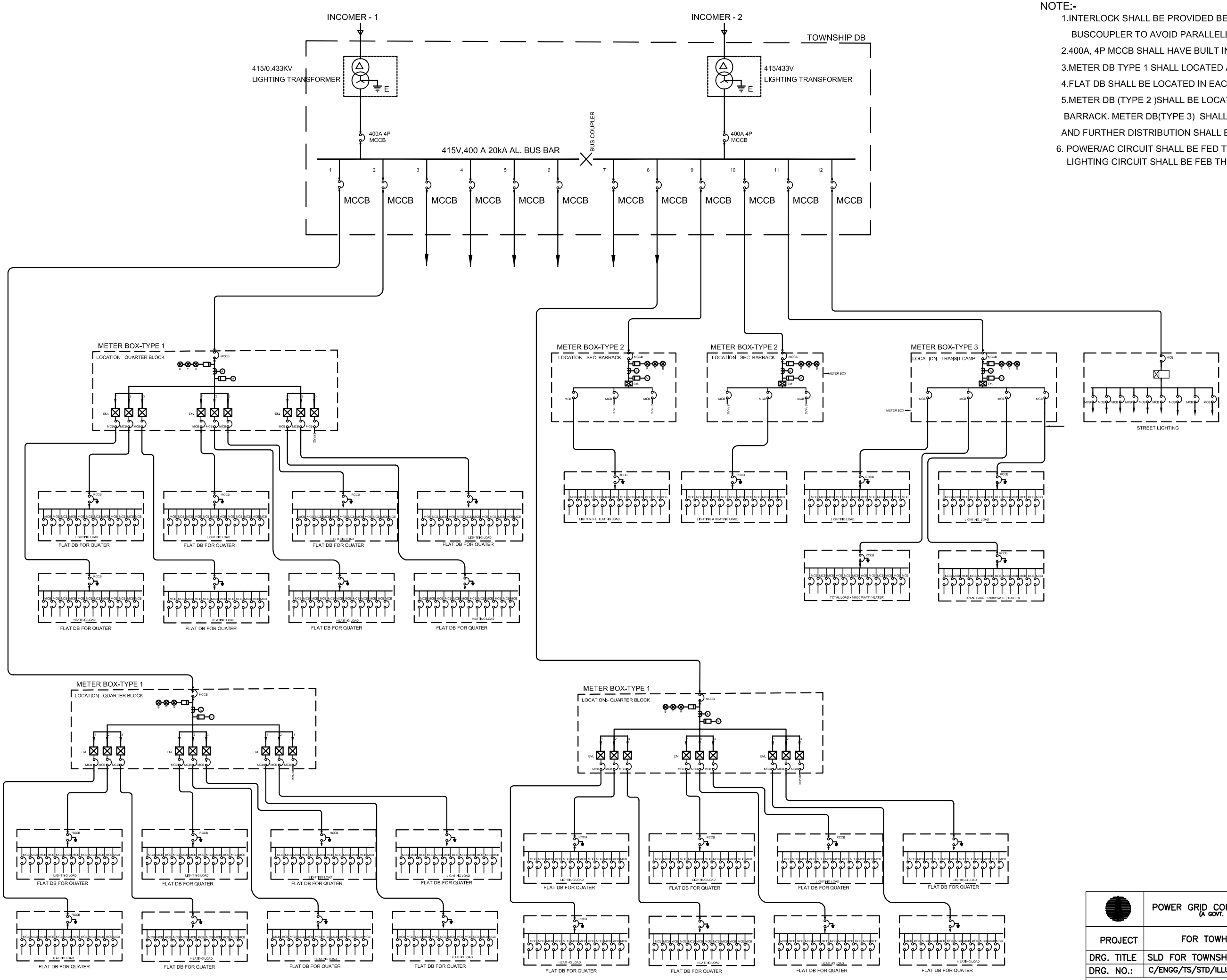
2.400A, 4P MCCB SHALL HAVE BUILT IN OL/SC PROTECTION.

3.METER DB TYPE 1 SHALL LOCATED AT G.F OF EACH TYPE OF BUILDING.

4.FLAT DB SHALL BE LOCATED IN EACH FLAT.

5.METER DB (TYPE 2)SHALL BE LOCATED AT EACH THE SECURITY BARRACK. METER DB(TYPE 3) SHALL BE LOCATED AT TRANSIT CAMP AND FURTHER DISTRIBUTION SHALL BE DONE THROUGH THE FLAT DBs.

6. POWER/AC CIRCUIT SHALL BE FED THROUGH DOUBLE POLE MCB WHILE LIGHTING CIRCUIT SHALL BE FEB THROUGH SINGLE POLE MCB.



SCHEDULE OF SYMBOL

SR. NO.	SYMBOL	DESCRIPTION
1.		MCCB
2.		RCCB
3.		MCB
4.		TIMER
5.	A	AMMETER
6.	V	VOLTMETER
7.		ENERGY METER
8.		FUSE
9.	E	TRANSFORMER

	POWER GRID CORPORATION OF INDIA LTD. (A GOVT. OF INDIA ENTERPRISE)
PROJECT	FOR TOWHSHIP ILLUMINATION
DRG. TITLE	SLD FOR TOWNSHIP (TYPICAL)
DRG. NO.:	C/ENGG/TS/STD/ILLU/TOWNSHIP/01
	SCALE: NTS | SHEET: 01 OF 01