VOLUME II

2 X 660 MW UDANGUDI SUPERCRITICAL THERMAL POWER PROJECT-STAGE-1

TECHNICAL SPECIFICATION

FOR

LIGHTING FIXTURES, LAMPS AND MISCELLANEOUS ITEMS

SPECIFICATION NO: ***PE-TS-435-558-E006***

REVISION: **0**

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP (INDIA) – 201301

	TECHNICAL SPECIFICATION FOR LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS	SPECIFICATION NO. PE-TS-435-558-E006	
		VOLUME II	
		SECTION - I	
	2 X 660MW UDANGUDI STPP STAGE-I	REVISION 0	DATE: 18.07.2020
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COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.

2. There is no deviation with respect to specification other than those furnished in the 'schedule of deviations'.

3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.

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

5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in BOQ-Cum-Price schedule of the specification shall not be considered (i.e. technical description & quantities as per specification shall prevail).

SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS

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1.0 SCOPE OF SUPPLY AND SERVICES

1.1 SUPPLY:

Design, manufacture, assembly, inspection & testing at vendor's/ sub-vendor's works, proper packing and delivery to site of **LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS** as mentioned in different sections of this specification, complete with all accessories for efficient and trouble-free operation.

It is not the intent to specify completely herein all details of the equipment, nevertheless, the equipment shall be complete and operative in all respects and shall conform to the highest standard of engineering, design and workmanship.

1.2 SYSTEM DESIGN ENGINEERING:

System Design Engineering is included in vendor's scope, which includes design of complete lighting system for indoor and outdoor areas of the power plant. Please refer the list of LLO/LDC/CLO/PDS drawings as per Annexure-B for the tentative areas to be covered by the lighting system. The aspect of engineering covers preparation of electrical distribution and control schemes, quantity estimation, luminaire layout drawings, conduit layout drawings, wiring schemes upto luminaires, cable schedules and all associated design work not specifically mentioned in the specification. The quantity estimation to include all items required for the complete lighting system viz. lighting fixtures, lamps, Lighting DBs, Welding DBs, lighting panels, conduits, PVC wires etc.

1.3 Supervision of Erection & Commissioning (as required by site) of lighting system is included in vendor's scope.

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

1.5 Standard technical requirements of the lighting fixtures, lamps & miscellaneous items and lighting system design requirements are indicated in Section-II. Project specific requirements/changes are listed in Section-I.

1.6 The stipulations of Section-I, followed by those of Data Sheet-A shall prevail and govern in case of conflict between the corresponding requirements of Section-I and Section-II.

1.7 Review of sub-vendor's documents by the purchaser shall not relieve the vendor from the responsibility of design & supply.

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

1.9 Make of all equipment and components shall be as per attached Sub-Vendor List enclosed as per Annexure-A to section- I. However same shall be subject to end customer approval without any commercial implication.

2.0 BILL OF QUANTITIES:

2.1 Quantity requirements shall be as per BOQ-cum-price schedule as part of NIT.

3.0 STATUTORY AND REGULATORY REGULATION

3.1 Statutory and regulatory regulation shall be applicable as per Indian Electricity Rule, 1956 with amendment-3 Rule no. 35, 48, 49, 50, 61 & 64 for illumination & low voltage power services.

4.0 DOCUMENTATION

4.1 Documents required along with the technical offer: -

a) Signed & Stamped copy of Compliance certificate

b) Signed & stamped copy of unpriced price schedule with "quoted" word indicated against all items.

4.2 Documents required after award of LOI/PO shall be as per Annexure -B (to be submitted by successful bidder).

5.0 SPECIFIC TECHNICAL REQUIREMENTS

5.1

S. No.	Reference clause No. of Section-II	Specific requirement/Change
1	4.2.3(c), Page-7 of 38	The supply to the DC lighting panels shall be **ALWAYS ON**.
2	5.2.1(n), Page-17 of 38	The luminaire efficacy shall be not less than **90 Lm/W** for LED luminaries.
3	5.2.1(n), Page-17 of 38	The LED used in the luminaires shall have colour rendering index (CRI) of Min **70**. Colour designation of LED shall be "cool day light" (min 5700K) type **for indoor areas. However, for outdoor areas, the colour temperature of LED shall be min. 4000K, including rough & dust prone areas. LED shall conform to the LM 80 requirements.**
4	5.12(g) (IV), Page-23 of 38	Type RD: It shall have the following: i. **250A**, 415V, 3-phase-neutral earth, metal clad socket with cover. ii. Rotary/ **MCCB**, heavy duty **250A** switch conforming to applicable standard.
5	5.14(b), Page-24 of 38	They shall be flush mounted in the walls in the office areas where false ceiling is provided. **Also, switch control shall be provided for controlling lighting fixtures located indoor.**
6	-	For recessed type fixtures provided in Aluminium Frame type false ceiling, suitable provision for removing the fixture and accessing the driver for maintenance from bottom shall be provided.

7	-	Please note that following items are excluded from the supply of this package: Poles, Mast, LDB, WDB, LP, Rigid conduit, Wire & Mini truck.
8	Additional Clause No. 6.0 to be added under Annexure-I of Section-II as below: -	

6.0

SL. No.	Type of Luminaire	Description	Total Luminous flux (Lumen) of luminaire-Minimum value	Measured Electrical Input Power(Watt)-Maximum value
1	FC02 (LED)	LED, General Purpose, Industrial Pendant Type, approx. 40 W fixtures suitable to meet the Switchgear Room aesthetic requirement, comparable to FC02		
2	FC06 (LED)	LED, General Purpose, Industrial Pendant Type, approx. 40 W fixtures suitable to meet the Switchgear Room aesthetic requirement, comparable to FC06		
3	FC26 (LED)	Panel (approx. 1200 mm X 300 mm) LED luminaire, approx. 40 W fixtures suitable for recess mounting in false ceiling with integral driver aesthetically designed for Control Room/ Office, comparable to FC26		
4	FC81 (LED)	LED, Pendant or ceiling mounted type, corrosion and dust proof IP65 approx. 40W. Fixture shall be suitable & comparable to FC81		
5	FC32 (LED)	LED, Decorative, surface mounted with mirror optic, approx. 40W fixtures suitable to meet the Switchgear Room aesthetic requirement, comparable to FC32		
6	FC07 (LED)	Industrial type LED fixture suitable for conduit/ surface/ suspended/ column mounting, having integral driver. Approx. 10W fixture shall operate on 220V DC input supply. Necessary accessories like DC to AC convertor etc. to be included accordingly, if required.		
7	FC33 (LED)	Decorative, recessed type LED fixture having integral driver. Approx. 10W fixture shall operate on 220V DC input supply. Necessary accessories like DC to AC convertor etc. to be included accordingly, if required		

8	FC34 (LED)	Well glass, dust proof type LED fixture having integral driver. Approx. 10W fixture shall operate on 220V DC input supply. Necessary accessories like DC to AC convertor etc. to be included accordingly, if required		
9	SF63 (LED)	LED, Flood Light, weather proof, cast aluminium body, protection class IP65, approx. 120W. Fixtures suitable to meet the Flood light requirement, comparable to SF63		
10	SF64 (LED)	LED, Flood Light, weather proof, cast aluminium body, protection class IP65, approx. 250W. Fixtures suitable to meet the Flood light requirement, comparable to SF64		
11	SF66 (LED)	LED, Flood Light, weather proof, cast aluminium body, protection class IP65, approx. 400 W. Fixtures suitable to meet the Flood light requirement, comparable to SF66		
12	SB11 (LED)	LED, Weather Proof, Dust Proof, chain or bracket mounting. Cast Aluminium Alloy body, dome type, Protection class IP65, approx. 80W. Fixtures suitable to meet the medium bay fixture, comparable to SB11		
13	SB02 (LED)	LED, Weather Proof, Dust Proof, chain or bracket mounting. Cast Aluminium Alloy body, dome type, Protection class IP65, approx. 120W. Fixtures suitable to meet the high bay fixture, comparable to SB02		
14	SB03 (LED)	LED, Weather Proof, Dust Proof, chain or bracket mounting. Cast Aluminium Alloy body, dome type, Protection class IP65, approx. 210W. Fixtures suitable to meet the high bay fixture, comparable to SB03		
15	SS62 (LED)	LED, Street Lighting, Weather Proof, cast aluminium Housing, Heat resistant, clear acryl Bowl or better, Protection class IP65, approx. 100 W. Fixtures suitable to meet the street light fixture requirement, comparable to SS62		
16	SS63 (LED)	LED, Street Lighting, Weather Proof, cast aluminium Housing, Heat resistant, clear acryl Bowl or better, Protection class IP65, approx. 150 W. Fixtures suitable to meet the street light fixture requirement, comparable to SS63		
17	SW41(LED)	LED, Dust Tight/Water Proof, GFR Polyester canopy Body or better and Acrylic Diffuser or better, Protection class IP 65 approx. 30 W. Fixtures suitable to meet the open area requirement in Boiler/ESP platforms etc., comparable to SW41		

18	SW42(LED)	LED, Dust Tight/Water Proof, GFR Polyester canopy Body or better and Acrylic Diffuser or better, Protection class IP 65 approx. 70 W. Fixtures suitable to meet the open area requirement in Boiler/ESP platforms etc., comparable to SW42		
19	MW96	1 x 125 W Mercury well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing for Div. 2 areas. gas group IIA/IIB Or LED type flame proof increased safety luminaire (approximately 40 W) which can be integral or retrofit type suitable for Div-2 areas gas group IIA/IIB		
20	MW98	1 x 125 W Mercury, well glass, explosion proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing suitable for Div-2 areas gas group IIC Or LED type explosion proof increased safety luminaire (approximately 40 W) which can be integral or retrofit type suitable for Div-2 areas gas group IIC		
21	FC30 (LED)	LED, General Purpose, Recessed mounting type approx. 30-40 W (2ft X 2ft) Fixtures suitable to meet the Control Room aesthetic requirement, comparable to FC30		

Notes:

1) LED must comply all the parameters of IS 16105 or IESNA LM-80-08.
2) The Luminaire must comply all the parameters of IS 16106 or IESNA LM-79-08.
3) The LED driver should comply to IEC 61347-2-13, IS 15885: Part 2: Sec 13, IEC 62384, IS 16104 and CISPR 15.
4) The luminaire complete with all accessories shall comply to relevant specified standards.
5) The values of maximum measured electrical input power are specified above for the luminaire (including any accessories like driver module etc.). Values of luminous flux and maximum input power shall be measured as per IS 16106 & shall not be subject to any further tolerance.
6) All parameters mentioned in Section-II, Clause 5.2.1 are to be complied in totality.

5.0 SPECIFIC TECHNICAL REQUIREMENTS (Continued)

5.2 LIGHTING SYSTEM DESIGN:

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

5.2.2 All fixtures shall be of a proven design for applications in power plant environment. All outdoor fixtures shall be weatherproof type.

All outdoor fixtures shall be with DOP IP-55.

Type of fixtures/ lux level shall be as per Annexure-I

5.2.3 LED medium bay fixtures will be installed in areas with sufficient minimum headroom of more than 5 meter.

However, above minimum headroom may or may not be feasible in boiler/ HRSG area and fixture will be mounted on columns/bottom of platform as per site requirement. Separate mounting arrangement shall be provided that shall be supported from handrails provided on boiler platform walkway, if mounting structure is not available.

5.2.4 Flame proof lighting fixtures will be installed in hazardous area as per area classifications. All highbay fixtures will have vibration damper.

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

5.2.6 Switch control shall be provided for controlling lighting fixtures located indoor.

5.2.7 Lighting panel (LP) for controlling lights with additional provision for manual control shall be provided:

Indoor lighting panel: With Timer

Outdoor lighting panel: With Timer or Photocell

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

5.2.9 Type of luminaries used for lighting of all indoor & Outdoor areas as per Annexure-I. For DC lighting LED type luminaries shall be used.

5.3 ILLUMINATION DESIGN CALCULATION:

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

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

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

where,

L= Length of room (Restricted to Max. 5 times of width)

W= Width of room

LUMEN= Lumen output of each lamp

COU= Coefficient of Utilisation

MF= Maintenance Factor

Coefficient of Utilisation (COU) is determined from the COU chart for a particular luminaire of the manufacturer, corresponding to selected reflection factors and calculated Room Index.

The working plane from the floor level considered at : 0.85 meter

The Room Index is calculated by the following formula:

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

where, MH = Mounting height of luminaire.

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

	Ceiling (rc)	Wall (rw)	Floor (rf)
For clear areas such as switchgear room/ control room etc	70	50	10
For Dusty area such as conveyor galleries/tunnels, TPs/ Crusher House etc	50	30	10

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

Air-conditioned clean interiors such as office rooms, Control and Electrical room = 0.8

Clean interiors such as office rooms, laboratories, Electrical room = 0.75

Industrial areas with normal interiors such as workshops= 0.7

Industrial areas with dusty interiors such as Boiler, ESP areas = 0.6

Industrial areas with very dusty interiors = 0.5

Indoor area non-AC(fluorescent fixture) = 0.61$

$: (0.7x0.87=0.61,where 0.87 is the ambient temperature correction factor for fluorescent fixture at 50 degree C in motionless air.

Ambient temperature considered for above correction factor 50 deg C

5.3.2 Lighting design for outdoor area, open area shall be done by computer programme as per standard norms for lighting design to meet the specified lux level.

Average maintenance factor for outdoor and road lighting : 0.6

For outdoor lighting and road lighting ratio of minimum to average illumination will not be less than 0.25 and for minimum to maximum will not be less than 0.05.

5.4 LIGHTING SYSTEM DESCRIPTION

Lighting system will be provided with AC normal, AC emergency and DC emergency as listed against various areas as per Annexure-II enclosed.

The sources of power lighting are as below :

(i) 415V AC Normal (ACN) Supply from different station PMCCs /MCCs

(ii) 415V AC Emergency (ACE) Supply from Emergency Board

(iii) 220V DC Emergency Supply from DC Distribution Board

(iv) 24V AC Supply for maintenance

For main plant area normally all AC luminaries will be in service on normal AC supply.

Approximately distribution of AC Luminaries on AC normal and AC emergency shall as below:

AC Normal (ACN) supply: 80 %

AC Emergency (ACE) supply: 20 %

Normally all DC luminaries shall be 'ON'. Upon failure of AC supply, DC luminaries will be 'ON' through DC supply. On restoration of AC Emergency supply through DG, ACE luminaries will be put-on.

For other auxiliary areas AC Normal lighting will provide 100% illumination level and normally all AC lighting fixture shall remain "ON" as long as normal AC supply is available. In DG room, in addition to DC emergency lighting, 100% AC emergency lighting will be provided.

Lighting level by DC emergency lighting will be provided to meet functional/ operational requirements. DC fixtures will be located at strategic locations such as near entrance, staircase, landings etc. for safe personnel movement during emergency.

In off-site areas/odd locations, for safe movement of personal during emergency, self contained battery operated emergency lighting units (ELUs) is envisaged.

The junction boxes shall be of FRP weather proof type. 650 Volt grade multiday terminal blocks complete with screws, nuts, washers and marking strips shall be furnished for connection of incoming/outgoing wires in the junction boxes. The Junction box shall be suitable for mounting on wall/column/poles/masts.

5.4.1 AC Normal Lighting Systems:

AC Normal lighting fixtures are fed through a number of conveniently located AC Lighting panel (ACLP) which are fed from Lighting Distribution Board (LDB).

LDBs consisting of dry type isolation transformer housed in LDB with proper separation from distribution panels as per details indicated below is envisaged:

Transformer rating:	50 / 100 kVA
Transformer voltage ratio:	415 / 415 Volt, taps of +5% to -5% in steps of 2.5%.
Transformer type:	Encapsulated
Distribution Panel type:	Single front fixed type
LDB Configuration:	One incomer
Incomer type:	TPN MCCB
Incomer rating:	As per lighting transformer rating
Outgoing feeder type:	TPN MCCB
Outgoing feeder rating:	63A

- AC LDB shall be 3Ph, 4Wire, 50Hz effectively grounded System.
- AC LDB shall have 20% spare feeders.
- Voltage drop at the fixture from the LDB bus shall not exceed 3%.

AC normal lighting panel as per details given below is envisaged:

Incomer type:	TPN MCB WITH
Incomer rating:	63A
Outgoing feeder type:	SPN MCB
Outgoing feeder rating:	20A
Short circuit rating:	10kA
ELCB in Incomer:	Yes

Street lighting panel as per details given below is envisaged:

Incomer type:	TPN MCB
Incomer rating:	63A
Outgoing feeder type:	TPN MCB
Outgoing feeder rating:	20A
Short circuit rating:	9kA
ON/ OFF control	With Timer & photocell

- AC NLP shall have 20% spare feeders.
- Circuit loading of each Lighting panel shall be done in such a way that almost balance loading in all the phases will be achieved.
- Minimum two phases will be used for Illumination of a particular area.
- Load on each lighting circuit and single phase receptacle circuit shall be limited to about 1500W and the number of luminaries connected to lighting circuit shall be limited to about fifteen (15).

5.4.2 AC Emergency Lighting Systems:

AC Emergency lighting fixtures are fed through a number of conveniently located AC Lighting panel (ACELP) which are fed from AC Emergency Lighting Distribution Board (ELDB).

ELDBs consisting of encapsulated, dry type isolation transformer housed in ELDB with proper separation from distribution panels as per details indicated below is envisaged:

Transformer rating:	50 / 100 kVA
Transformer voltage ratio:	415 / 415 Volt, taps of +5% to -5% in steps of 2.5%.
Transformer type:	Encapsulated
Distribution Panel type:	Single front fixed type
LDB Configuration:	One incomer
Incomer type:	TPN MCCB
Incomer rating:	As per lighting transformer rating
Outgoing feeder type:	TPN MCCB
Outgoing feeder rating:	63A

- AC ELDB shall be 3Ph, 4Wire, 50Hz effectively grounded System.
- AC ELDB shall have 20% spare feeders.

AC emergency lighting panel as per details given below is envisaged:

Incomer type:	TPN MCB
Incomer rating:	63A
Outgoing feeder type:	SPN MCB
Outgoing feeder rating:	20A
Short circuit rating:	10kA
ELCB in Incomer:	Yes

5.4.3 DC Emergency Lighting Systems:

DC Emergency lighting fixtures fed through suitable numbers of conveniently located DC Emergency Lighting panel (DCELP) which are fed through DC Lighting Distribution Board (DCLDB).

The DCLDB shall be fed from DCDB. The emergency lighting fixtures connected to this system shall remain 'ON' all the time from DC supply system.

DCLDBs as per details given below is envisaged:

Distribution Panel type:	Single front fixed type
DC Incomer type:	DP Switchfuse unit with contactor
DC Incomer rating:	125A
Outgoing feeder type:	DP Switchfuse unit
Outgoing feeder rating:	32A

DCLPs as per details given below is envisaged:

Incomer type:	DP MCB
Incomer rating:	32A
Outgoing feeder type:	DP MCB
Outgoing feeder rating:	20A

5.4.4 The LDBs shall be made of sheet steel of 2 mm thickness for load bearing members and 1.6 mm for other members and shall be provided with voltmeter and ammeter along with selector switch, supply ON indicating lamps etc. All indicating lamps will be cluster LED type. The DOP for LDB will be IP-54 for indoor and for transformer cubicle IP-42. Where as the DOP for LP will be IP-54 for indoor and IP-55 with canopy for outdoor.Lighting distribution boards & panels shall be powder coated with color shade RAL7035.

5.4.5 24V AC Supply system:

Each 24V AC supply module will have one no. dry type two winding, 1 phase transformer and necessary terminals for incoming and outgoing connections. The 240V terminals of 24V AC supply module will be fed from AC emergency lighting panels (ACELP). Details of 24V supply modules shall be as given below:

Module type:	Portable type / Fixed type
Enclosure:	Steel sheet of 2MM Thickness with louvers
Transformer rating:	500 VA
Transformer voltage ratio:	240 / 24 Volt
Primary side isolation:	DP MCB with HRC fuse
Isolator rating:	16A
HRC fuse rating:	6A
Secondary side isolation:	SPN MCB with HRC fuse
Isolator rating:	6A
HRC fuse rating:	16A

Fixed type 24V supply modules shall be provided in following areas:

Boiler/ HRSG area:	Near inspection manholes on boiler platforms and boiler drum.
TG Building:	Near HP & LP heaters, turbine flash tank, blow down tank, near condenser water box and near bus duct termination of generator end.
ESP area:	Near inspection manholes.
other area:	Near Deaerator

Suitable numbers of 24V portable halogen lamp unit along with flexible copper cable shall also be supplied as per details below:

Lamp wattage:	40 W
Cable size:	2.5 sq. mm
Cable length:	20 meter

5.4.6 Emergency EXIT lamps:

Emergency exit lamps backed up by battery shall be provided at all door locations and strategic locations of the building for safe exit of personnel. These exit lamps will remain ON all the time and normally received power supply from ACELP.

Exit lamp unit shall contain maintenance free Ni-Cd battery with 4 hours backup capacity.

5.4.7 ELUs shall contain maintenance free Ni-Cd battery with 4 hours backup capacity. Each ELU will have battery charger and 2x9W fluorescent lamp with test switch.

5.5 STREET LIGHTING / OUTDOOR LIGHTING

5.5.1 The roads within BHEL scope as per contract will be considered for lighting.

5.5.2 Street lights / outdoor lighting will be fed from separate panel located at suitable places. Automatic switching ON/OFF of these circuits shall be done from street light panel.

5.5.3 For street lighting, street light pole will be used. For outdoor area lighting if required flood light pole will be used. Pole type shall be as below:

Material: Octagonal Poles HT Steel Conforming to grade S355JO.
Base Plate: Fe 410 conforming to IS 226 / IS 2062
Foundation Bolt: EN.8 grade

The Octagonal Poles shall be in single section (upto 7.5/9/11 Mtr). The poles shall be hot dip galvanized as per IS 2629 / IS 2633 / IS 4759/ BS EN ISO 1461 standards with average coating thickness of 70 micron.

The Octagonal Poles shall be designed to withstand the maximum wind speed of 47 meter/ sec. The top loading i.e. area and the weight of fixtures are to be considered to calculate maximum deflection of the pole and the same shall meet the requirement of BS: 5649 Part VI 1982/ BSEN 40-3:2000, pr EN-10-3-3.

The pole shaft shall have octagonal cross section and shall be continuously tapered with single longitudinal welding. There shall not be any circumferential welding joint.

The octagonal Poles shall have door of approximate 500 mm length at the elevation of 500 mm from the Base plate. The door shall be vandal resistance and shall be weather proof to ensure safety of inside connections. The door shall be flush with the exterior surface and shall have suitable locking arrangement. There shall also be suitable arrangement for the purpose of earthing. The pole shall be adequately strengthened at the location of the door to compensate for the loss in section. Separate lighting pole junction box shall be provided along with octagonal pole.

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

The poles will be located 1.5 M away from the road edge. The buried cable will run in hume pipe (100 mm dia) wherever it is crossing the roads.

5.5.4 High mast will be 30 meter high, hot dip galvanised and polygonal shaped. Total 25 Nos. high mast shall be provided for the project. The location of high mast will be decided during detailed engineering.

Each Lighting Mast shall be 30 M high, complete with the following accessories.

- High mast shaft in two/three section, hot dip galvanised
- Head frame, steel wire rope & double drum winch.
- Galvanised Lantern carriage arrangement
- Integral power tool installed inside base compartment for its operation.
- Foundation bolts
- Luminaires
- Aviation obstruction light with 2 nos. LED lamps.
- Control panel
- Power & control cables and cabling accessories required for the installation.
- Special tools & tackles

The High mast shall be of continuously tapered, polygonal cross section, at least 20 sided, presenting a good and pleasing appearance and shall be based on proven design to give an assured performance, and reliable service. The entire fabricated mast shall be hot dip galvanized, internally and externally, having a uniform average thickness of atleast 85 microns.

An adequate door opening shall be provided at the base of the mast and the opening shall permit clear access to equipment like winches, cables, plug and socket, etc. and also acilitate easy removal of the winch.

A fabricated Lantern Carriage shall be provided for fixing and holding 12 nos flood light fittings and its control gearboxes. The lantern carriage shall be of steel tube construction, the tubes acting as conduits for wires, with holes fully protected by grommets.

The winch shall be completely self-sustaining type, without the need for brake shoe, springs or clutches. Each driving spindle of the winch shall be positively locked when not in use, gravity activated PAWLS. Individual drum also shall be operated for fine adjustment of lantern carriage. The minimum-working load shall be not less than 750 kg. The winch shall be selflubricating type by means of an oil bath and the oil shall be readily available grades of reputed producers.

The suspension system shall essentially be without any intermediate joint and to consist of only non-corrodible stainless steel of AISI 316 grade. The breaking load of each rope shall not be less than 2350 kg, giving a factor of safety of over 5 for the system at full load. The thimbles shall be secured on ropes by compression splices.

A suitable, high-powered, electrically driven, internally mounted power tool with motor, with manual over ride shall be supplied for the raising and lowering of the lantern carriage for maintenance purposes. The power tool shall be of single speed, provided with a motor of the required rating. The power tool shall be supplied complete with suitable control.

5.6 LOW VOLTAGE POWER SERVICES

5.6.1 Different type of receptacles as per details below will be provided:

(i) Decorative receptacle:

At least 01 number 5/15A, 3-Pin, 230V AC decorative socket will be provided in office, store, cabin etc. In service building, atleast 4 nos. 5 Amp plug points shall be provided in each cubicle

(ii) Industrial receptacle:

At least 01 number 20A, 3-Pin, 240V AC industrial type receptacles with switch will be provided at suitable location in generation building/industrial area. The receptacles shall be provided at interval of 50m or part thereof. All receptacles will be controlled with a switch. In hazardous area receptacles will be of flameproof type.

(iii) Welding receptacle:

63 Amp, 415 V, 3 phase welding receptacle with isolating switch shall be provided in plant area. The receptacles shall be provided in all the floors of power house building at 50 m interval along Arow and B-row. Further in Boiler at alternate floors, welding receptacles shall be provided. In ESP top platform welding receptacle at 100 m interval shall be provided. In chimney at alternate floors, welding receptacles shall be provided. In outdoor locations, in the vicinity of major equipment, welding receptacles shall be provided. In pump houses, water treatment plant, compressor house, coal crushers, mill bay, coal transfer towers, ash handling plant, fuel oil pump house, H2 plant, GIS building, Switchyard, etc., minimum one welding receptacle shall be provided. Maximum 04 nos. receptacles will be fed through one feeder. In hazardous areas these receptacle will be located in MCC room at interval of 50m.

In Transformer yard, 4 nos. 63 Amp welding receptacle and 4 nos. 250 Amp receptacle with MCCB unit shall be provided to extend power for oil filtration units during maintenance.

5.6.2 Transformer rating for welding distribution board shall be 100kVA. Other construction details shall be identical to AC LDB. Welding distribution boards shall only provided in main plant.For offsite areas,welding receptacles shall be fed directly from nearest ACDB.

5.6.3 Based on room size, suitable nos. of ceiling fans (1200mm sweep) with Stepped electronic regulator shall be provided in office rooms, store rooms and social buildings which are not covered by air-conditioned or ventilation system. Pedestal fans and wall mounted fans shall also be provided, if required.

5.6.4 For the maintenance of lighting fixtures within the power house, 4 nos. free standing adjustable aluminium ladder, adjustable from 05M to 10M shall be provided and 3 nos. free standing adjustable aluminium ladder, adjustable from 0.5M to 1.5M shall be provided. For the maintenance of street lights, 01 no. of mini truck mounted adjustable hydraulic lift (for details, refer Annexure-C) shall be provided.

5.7 WIRING / CONDUITS

5.7.1 Wiring of lighting system will be done as follows:

(i) Wiring installation will be done by multi-stranded, PVC insulated, colour coded wires laid in GI conduits of min. 20 mm dia size (minimum) conforming to IS-9537. The thickness of conduits upto & including 25 mm dia will be 1.6 mm and conduits above 25 mm will be 2.0 mm. Colour of the PVC insulation of wires shall be Red,Yellow,Blue,black for R,Y,B phases & neutral respectively and white & grey for DC positive & DC negative circuits respectively.

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

(iii) Flexible conduits made with bright, cold rolled annealed and electro galvanised mild steel strips and coated with PVC will be used where required.

(iv) Conduits in control room, service building, laboratory building and other air-conditioned areas will be surface mounted on the roof above false ceiling, however vertical drops of conduits will be concealed along walls and finally plastered for better aesthetics.Vertical drops along RCC cloumn shall be exposed.

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

(vi) Wiring for AC Normal, AC Emergency, and DC Emergency services will run in separate conduits.

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

(viii) Maximum 03 numbers of 1-phase receptacles will be loop in & loop out in a circuit.

5.7.2 Following sizes of 1100 V grade, PVC insulated, single core, stranded copper conductor wires will be used:

Lighting Panel to Fixtures:	2.5 sq. mm (Cu)
Lighting Panel to JBs/ Switches:	2.5 sq. mm (Cu)
JBs/ switches to Fixtures:	2.5 sq. mm (Cu)
Panel to First receptacles:	4.0 sq. mm (Cu)
First receptacles to looping other receptacles:	4.0 sq. mm (Cu)
In case of only one receptacles in ckt., Panel to receptacles:	4.0 sq. mm (Cu)
Panel/ JBs to flood light fixtures:	2x2.5 sq. mm (Cu)

5.7.3 Wiring in hazardous area, transformer yard, outdoor area (like Tank area, GT area) will be done using 3C-2.5 sq. mm (Cu), PVC insulated, FRLS PVC sheathed cable.

5.8 EARTHING

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

Lighting Distribution Board:	GS Flat 50x6 mm
Lighting Panels:	GS Flat 25x6 mm
Lighting fixtures, receptacles, conduits, junction boxes & switch boxes:	14 SWG GI wire
Welding receptacles:	GS Flat 25x6 mm
Street light pole/ flood light pole/ High Mast:	GS Flat 25x3 mm
Electrode for Pole/ Mast:	1 nos, 20 mm dia MS rod, 3 mtr long
Street lighting panel:	GS Flat 25x6 mm

5.9 STATUTORY & REGULATORY REQUIREMENT

Statutory and regulatory regulation shall be applicable as per Indian Electricity Rule, 1956 with amendment-3 Rule no. 35, 48, 49, 50, 61 & 64 for illumination & low voltage power services.

	2 X 660MW UDANGUDI STPP STAGE-I	SPECIFICATION NO. PE-TS-435-558-E006
	TECHNICAL SPECIFICATION FOR LIGHTING FIXTURES, LAMPS AND MISCELLANEOUS ITEMS	VOLUME II SECTION - I, REV-0
		Date: 18.07.2020

ANNEXURE-I

AVERAGE LUX LEVEL & TYPE OF FIXTURES

S. No.	LOCATION	AVERAGE LUX LEVEL	TYPE OF LIGHTING FIXTURES
01	TG Hall operating floors	200	LED High bay
02	TG hall ground, mezzanine floor	100	LED Medium bay/ LED well glass fixture
03	Boiler Platforms & ESP Platforms	100	LED well glass fixture
04	Switchgear/MCC rooms, Elevator Machine room	200	LED, General Purpose, Industrial Pendant Type.
05	DG room	200	LED High bay/Medium bay/ LED well glass fixture
06	UPS, Battery Charger Room	200	LED, General Purpose, Industrial Pendant Type.
07	Battery Room	200	LED Pendant/ Ceiling Mounted type Corrosion proof.
08	Transformer yard	50	LED flood light fixtures on steel poles/Mast
09	Control Room	400/ 500	Decorative recessed mounted type LED.
10	Control equipment Room	300	Decorative recessed/surface mounted type LED.
11	Office area,	300	Decorative recessed/surface mounted type LED.
12	Service Building, Admin Building	300	Decorative recessed/surface mounted type LED.
13	Air Compressor house	150	LED Medium bay
14	Pump houses, AHU room	150	LED Medium bay/ High bay Fixture
15	Water Treatment Plant, DM Plant	150	LED well glass fixture
16	Chlorination building, Chemical House	150	LED Pendant/ Ceiling Mounted type Corrosion proof.
17	Fuel Oil Pump House	150	HPMV/ LED, well glass, Flame Proof luminaire*
18	Hydrogen Plant	150	HPMV/ LED, well glass, Explosion Proof luminaire*
19	Sea water intake pump house	150	LED, well glass luminaire
20	Main Road	20	LED Street Light on Galvanised Steel Pole
21	Secondary Roads	10	LED Street Light on Galvanised Steel Pole
22	Cable galleries	100	LED well glass fixture
23	Stair case, Passages, Toilets	100	LED, General Purpose, Industrial Pendant Type.
24	Tank area and Outdoor equipment location	20	LED flood light fixtures on steel poles/Mast

Note: * The fixture will be suitable for Division-2, Group IIA/IIB/IIC of hazardous area as per IS-2148.
Decorative type fixtures will be provided for false ceiling areas.
For DC lighting LED type luminaries shall be used.
Medium bay light shall be used if mounting height vary from 5Mtr to 8Mtr

	2 X 660MW UDANGUDI STPP STAGE-I	SPECIFICATION NO. PE-TS-435-558-E006
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ANNEXURE-II

LIGHTING & LV POWER SERVICES IN DIFFERENT AREAS

S. No.	AREA	ACN	ACE	DCE	5/15A Socket	20A Socket	63A Socket	ELU $
01	TG building (Turbine Hall, Switcgear room etc)	Y	Y	Y	Y*	Y	Y	-
02	Ac Plant	Y	Y	-	-	Y	Y	-
03	Boiler platforms & boiler area	Y	Y	Y	-	Y	Y	-
04	ESP platforms & Mill area	Y	Y	Y	-	Y	Y	-
05	ID, FD & PA FAN area	Y	Y	Y	-	Y	Y	-
06	Transformer Yard	Y	Y	Y	-	Y	Y	-
07	ESP control room	Y	Y	Y	Y*	Y	Y	-
08	DG room	-	Y	Y	-	Y	Y	-
09	Compressor house	Y	-	-	Y*	Y	Y	Y
10	Fuel oil PH	Y	-	-	Y*	Y#	Y$	Y
11	Hydrogen Plant	Y	-	-	Y*	Y#	Y$	Y
12	Outdoor area	Y	-	-	-	-	-	-
13	Aux. boiler MCC Room	Y	-	-	Y*	Y	Y	Y
14	Service building	Y	-	-	Y*	Y	-	Y
15	Admin building	Y	-	-	Y*	-	-	Y
16	CPU Regeneration Building/ Air Washer Room	Y	-	-	Y*	Y	Y	Y

LEGEND:

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

2 x 660MW UDANGUDI STPP: LIGHTING SYSTEM

Tentative Locations of Lighting Distribution Boards (LDB)

S.No.	*Location*	*Type*	*Rating*	*Quantity*
1.	LT Switchgear Room EL+12.0Mtr.	ACN	100 kVA	04
2.	LT Switchgear Room EL+12.0Mtr.	ACN	50 kVA	02
3.	LT Switchgear Room EL+12.0Mtr.	DC	125A	01
4.	Boiler MCC room EL+28.0Mtr.	ACN	100 kVA	04
5.	Boiler MCC room EL+28.0Mtr.	DC	125A	01
6.	ESP Control Room Building	ACN	100 kVA	02
7.	WDB, UNIT-1 MV SWGR ROOM EL 3.5M	ACN	100 kVA	01
8.	WDB, UNIT-1 LV SWGR ROOM EL 12.0M	ACN	100 kVA	02
9.	ADMIN BUILDING	ACN	100 kVA	01
10.	ADMIN BUILDING	ACN	100 kVA	01
11.	SERVICE BLDG	ACN	100 kVA	01
12.	SERVICE BLDG	ACN	100 kVA	01
13.	FUEL OIL PUMP HOUSE	ACN	50 kVA	01
14.	CPU REGENERATION	ACN	100 kVA	01
15.	HYDROGEN GENERATION	ACN	100 kVA	01
16.	DESALINATION & DM PLANT	ACN	100 kVA	01
17.	SEA WATER INTAKE	ACN	100 kVA	01
18.	SEA WATER INTAKE	ACN	50 kVA	01
19.	ETP	ACN	100 kVA	01
20.	CANTEEN	ACN	50 kVA	01
21.	WORKSHOP	ACN	100 kVA	01
22.	CWPH	ACN	100 kVA	01

NOTES:

1. Items mentioned at Sr. no. 1 to 8 are of Unit-1, similar quantity shall be considered for unit-2 also.

	TECHNICAL SPECIFICATION FOR LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS	SPECIFICATION NO. PE-TS-435-558-E006	
		VOLUME II	
		SECTION - I	
	2 X 660MW UDANGUDI STPP STAGE-I	REVISION 0	DATE: 18.07.2020
		SHEET 1 OF 5	

DATA SHEET –A

S. No.	Description	Unit	Value
1.0	**SYSTEM DESIGN DATA**		
1.1	Design ambient	^{0}C	50
1.2	**AC Supply**		
a)	Rated voltage	V	415
b)	Rated frequency	Hz	50
c)	Voltage variation (permissible)	%	+10% to -10%
d)	Frequency variation (permissible)	%	+3% to -5%
e)	Combined voltage & frequency variation (sum of absolutes permissible)	%	10%
f)	System fault level & duration	kA, sec.	50kA for 1 sec.
1.3	**DC Supply**		
a)	Rated voltage	V	220
b)	Voltage variation (permissible)	%	+10% to -15%
c)	System fault level & duration	kA, sec.	25kA for 1 sec.
2.0	**SCOPE OF SYSTEM DESIGN ENGINEERING**		Included in vendor's scope
3.0	**LIGHTING CONCEPT**		
3.1	Types of supplies considered (other than AC Normal)		
a)	AC emergency		[√] Yes [ ] No
b)	DC emergency		[√] Yes [ ] No
c)	DC Normal		[ ] Yes [√] No
3.2	Diversity Factor for Sockets	%	25%
4.0	**LUMINAIRES, LAMPS & ACCESSORIES**		
4.1	Type of false ceiling for recessed fluorescent luminaire		Grid False ceiling (600mm X 600mm) / Aluminium false ceiling (for Control Room).
4.2	Degree of protection for drip proof luminaires		IP65
4.3	Flame proof luminaires		
a)	Hazardous area classification		IS-2148 Zone II Group-IIA, IIB & IIC
b)	Degree of protection		IP65

c)	Mounting type for well glass		[√] Eye-bolt [ ] MS Galvanised Strap
4.4	Non-integral control gear box for HPMV lamps		
a)	Material		[ ] CRCA sheet steel [√] Cast Aluminium LM6
b)	Sheet thickness	mm	[ ] 2 for CRCA sheet [√] 3 for Cast Aluminium LM6
c)	Degree of protection		IP55
d)	Surface treatment		[√] Painted [ ] Galvanized
e)	If painted		
	Paint shade		during detailed engineering
	Minimum paint thickness (DFT)	micron	50
4.5	Lamps		
a)	Type of Fluorescent Lamps		[√] Cool Daylight [√] White Light
b)	Type of cap for incandescent lamp		[ ] Screw type [ ] Pin type [√] Not Applicable
c)	Type of HPMV lamp		[√] Clear [ ] Fluorescent powder coated
d)	Type of cap for HPMV lamp		Screw type
e)	Type of beam for		
	HPMV lamps		[ ] Short beam [ ] Long beam [√] Both
4.6	**Emergency Lighting Unit**		
a)	Lamp type		[ ] FLT [ ] CFL [√] LED
b)	Nos. of Lamp		2
c)	Lamp wattage	W	9
d)	Lumen output of lamp at rated voltage	Lumen	To furnished by Vendor
e)	Type of battery (Rechargeable type)		Ni-Cd
f)	AH capacity of battery	AH	To furnished by Vendor
g)	Battery voltage	V	To furnished by Vendor
h)	Battery backup time	Hr	4
i)	In built charger		Yes
4.7	**Exit Sign**		

a)	Lamp type		FLT / LED
b)	Nos. of Lamp		1
c)	Lamp wattage	W	20
d)	Lumen output of lamp at rated voltage	Lumen	To furnished by Vendor
e)	Type of battery		Ni-Cd
f)	AH capacity of battery	AH	To furnished by Vendor
g)	Battery voltage	V	To furnished by Vendor
h)	Battery backup time	Hr	4
4.8	**24V AC Supply Module (Fixed type & portable type)**		
a)	Enclosure		
	Enclosure material		CRCA sheet steel
	Enclosure thickness	mm	2 mm for CRCA sheet steel
	Louvers provided		[√] Yes [ ] No
b)	Surface treatment		[ ] Painted [√] Galvanized
c)	If galvanized		
	Process		Hot dip
	Weight of zinc	g/m^2	460 gm / mm^2 (65 microns)
d)	Transformer		
	Rating	VA	500
	Voltage ratio & Current Rating	V	240V/24V [6A/16A]
	Class of insulation		Class F, temperature rise limited to Class-B
e)	24V Hand lamp unit		
	Lamp type		[√] Halogen [ ] LED
	Lamp wattage	W	40
f)	No. of outgoing sockets		4
g)	Whether cord coiling arrangement provided		[√] Yes air cooled [ ] No
5.0	**Junction Box**		
a)	Enclosure material		FRP
b)	Enclosure thickness	mm	3 (min.)
c)	Galvanized (applicable for CRCA sheet)		NOT APPLICABLE
d)	Degree of protection		IP-55 (indoor) / Weather proof IPW-65 with canopy for outdoor area

6.0	**Industrial/ Welding Receptacle**		
a)	Enclosure material		Thermoplastic
b)	Enclosure thickness	mm	3 (min.)
c)	Surface treatment		NOT APPLICABLE
d)	If galvanized		
	Process		NOT APPLICABLE
	Weight of zinc	g/m^2	NOT APPLICABLE
e)	Degree of protection		IP-55 / IP 65 for Flameproof (used in hazardous area)
7.0	**Decorative Receptacle**		
a)	Enclosure material		Thermoplastic
b)	Enclosure thickness	mm	3 (min.)
c)	Surface treatment		NOT APPLICABLE
d)	If galvanized		
	Process		NOT APPLICABLE
	Weight of zinc	g/m^2	NOT APPLICABLE
e)	Degree of protection		IP-20 / IP 65 for Flameproof (used in hazardous area)
8.0	**Switch Box**		
a)	Enclosure material		[ ] FRP [√] CRCA Sheet.
b)	Enclosure thickness		2 MM CRCA sheet with 6mm thick Bakelite cover
c)	Galvanized		[√] Yes [ ] No
d)	Painted		[ ] Yes [√] No
e)	Degree of protection		IP-55
9.0	**Conduit (Flexible)**		
a)	Type		Cold rolled annealed and electro galvanised mild steel strips and coated with PVC
b)	Size	mm	20
c)	Standard length	m	25 to 50
d)	Thickness of Galvanization	microns	25 (min.)
10.0	**Cable Glands**		**By vendor for all incoming and outgoing cables**
a)	Type		Double compression
b)	Material		Brass
c)	Nickel Plating provided		[√] Yes [ ] No
d)	Flameproof glands with flameproof equipment		[√] Yes [ ] No

11.0	**Cable Lugs**		**By vendor for all incoming & outgoing cable**
a)	Type		Crimping type/ ring type
b)	Material		Tinned copper
12.0	**LADDERS**		
a)	Type		Free standing and wheel mounted both
b)	Material		[ ] Steel [√] Aluminium
c)	Duty		[ ] Heavy [√] Medium
d)	Surface treatment		[√] Galvanised [ ] Painted
e)	Reference Standard		IS: 4571, 3696
13.0	**SEARCH LIGHT**		Search lights of halogen lamps having adequate coverage shall be provided in watch towers

Note :

1. Detailed luminaire and lamp data shall be provided by vendor after award of contract.
2. Galvanization wherever applicable shall be hot dip galvanized with weight of Zinc as 460g/m² (65micron).

LIST OF APPLICABLE STANDARDS

ILLUMINATION

Code of practice for interior illumination	IS 3646
Code of practice for industrial lighting	IS 6665
Code of practice for lighting of public thoroughfare	IS 1944

LUMINAIRES

Luminaires	IS 10322
Industrial luminaires with metal reflector	IS 1777
Industrial lighting fittings with plastic reflectors	IS 3287
Decorative lighting outfits	IS 5077
Waterproof electric lighting fittings	IS 3528
Watertight electric lighting fittings	IS 3553
Dust-proof electric lighting fittings	IS 4012
Dust-tight electric lighting fittings	IS 4013
Flameproof electric lighting fittings - well glass & bulk head types	IS 2206
Electric lighting fittings for division 2 areas	IS 8224
General & Safety requirement of Luminaire	IS 1913
General Lighting. LEDs and LED modules Terms and definitions	IS 16101
Self Ballasted LED Lamps for General Lighting Services.	IS 16102
LED modules for General lighting Safety Requirements.	IS 16103
Lamp control gear Part 2 particular	IS 15885(Part 2)
Requirements d.c. or a.c. Supplied Electronic control gear for LED modules	IS 16104

LAMPS

Tungsten filament lamps for domestic and similar general lighting purpose	IS 418
Tubular fluorescent lamps for general lighting service	IS 2418
High pressure mercury vapour lamps	IS 9900
High pressure sodium vapour lamps	IS 9974

LUMINAIRE COMPONENTS

Ballast for fluorescent lamps for switch start circuits	IS 1534
Ballast for high pressure mercury vapour lamps	IS 15882
Capacitors for use in tubular fluorescent high pressure mercury and low pressure sodium vapour discharge lamp circuits	IS 1569
Bi-pin lamp holders for tubular fluorescent lamps	IS 3323

Methods of measurement of lamp cap temperature rise	IS 8913
Starters for fluorescent lamps	IS 2215
Holders for starters for tubular fluorescent lamps	IS 3324
Cast acrylic sheets for use in luminaires	IS 7569

ASSEMBLED EQUIPMENT AND COMPONENTS

Low voltage switchgear and control gear.	IS 60947
Code of practice for selection, installation & maintenance of switchgear & control gear	IS 10118
Explosive atmospheres	IS 60079
Classification of hazardous areas for electrical installations	IS 5572
Dry type transformers	IS 11171
Electrical Accessories - circuit breakers for over protection for household and similar installations	IS 60898
Low voltage Fuses for voltages not exceeding 1000 V ac or 1500 V dc	IS 13703
Indicator lamps (visual)	IS 1901

POLES, SOCKETS AND OTHER MISCELLANEOUS

Plugs and socket outlets of rated voltage upto and including 250 volts and rated current upto and including 16 amperes	IS 1293
Interlocking switch socket outlet	IS 4160
Electric ceiling type fans and regulators	IS 374
Structural steel (Standard quality)	IS 2062
Danger notice plates	IS 2551
Enclosures for accessories for household and similar fixed electrical installations	IS 14772
General construction in steel - Code of practice	IS 800
Wrought aluminium and aluminium alloy bars, rods, tubes and sections for electrical purposes	IS 5082
Code of practice for phosphating of iron and steel	IS 6005
Colour for ready mixed paints & enamels	IS 5
Recommended practice for hot dip galvanising of iron & steel	IS 2629
Method of testing uniformity of coating on zinc coated articles	IS 2603
Flexible steel conduits for electrical wiring `	IS 3480
Conduits for electrical installations	IS: 9537
Scaffolds & ladders - Code of safety	IS: 3696
Aluminium extension ladders	IS: 4571
General Requirement for enclosures for accessories for household & similar fixed electrical installations	IS: 5133

38210/2020/PS-PEM-EL

ANNEXURE-A
2 X 660MW UDANGUDI STPP STAGE-I
LIST OF MAKES (SUB-VENDOR ITEMS)

SL NO.	ITEM DESCRIPTION	VENDOR NAME	ADDRESS	REMARKS
1	CABLE GLANDS	ALLIED TRADERS & EXPORTERS	C-124 A, SECTOR-2, NOIDA -201 301, UTTAR PRADESH, INDIA	
2	CABLE GLANDS	ARUP ENGG & FOUNDARY WORKS	391/119,PRINCE ANWAR SHAH ROAD, CALCUTTA-700068	
3	CABLE GLANDS	BALIGA LIGHTING EQPT.PVT.LTD.	63A,CP RAMASWAMY ROAD, ALWARPET,P.B.No 6910, CHENNAI-600018	
4	CABLE GLANDS	COMMET BRASS PRODUCTS	NUTAN CHEMICAL COMPOUND, WALBHAT ROAD, GOREGAON, MUMBAI-400063	
5	CABLE GLANDS	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST). MUMBAI 400 063.	
6	CABLE GLANDS	ELECTROMAC INDUSTRIES	27/28AF NEW EMPIRE IND.ESTT., R.KRISHNA MANDIR RD.JB NGR ,ANDHERI(E),MUMBAI-400059	
7	CABLE GLANDS	INCAB	HARE STREET,KOLKATA,WEST BENGAL-700001	
1	CABLE LUGS	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST). MUMBAI 400 063.	
2	CABLE LUGS	UNIVERSAL MACHINES LTD.	4,B.B.D.BAG (EAST) 90,STEPHEN HOUSE,5TH FLR CALCUTTA-700001	
1	FLEXIBLE CONDUIT (PVC COATED)	REPUTED MAKE		
1	GALVANISING	Jenco Industrial Corporation	Chincholi Bunder Khkar Road Near Link Road Devruwadi Malad (W) Mumbai 400064	
2	GALVANISING	National Galvanizing Company	66, Barrackpore Kamarhatt Trunck Road Calcutta-700058	
3	GALVANISING	Sigma Galvanising Pvt. Ltd.	Plot No.C-169, TTC, MIDC Ind Area Navin Mumbai-400705	
4	GALVANISING	B.P. Projects PVT LTD	167A, Vivekananda Road Kolkata-700006	
5	GALVANISING	Standard Galvanisers	Makardah Road, Kabar Para, Bankra, Howarah -711403	
6	GALVANISING	Steel Products	National Highway No. 6, Chamrail, Kona, Howrah-711114	
7	GALVANISING	Unitech Fabricators & Engineers Pvt. Ltd.	Village- Ajab Nagar, P.O. -Molla Simlla, P.S. - Singur, Dist - Hoogly, Pin-712223	
8	GALVANISING	Shivam Engineers & Fabricators	A0-282-284, Industrial Area, South Side of G.T. Road, Ghaziabad, U.P.	
9	GALVANISING	B.G. Shirke Construction Technology Pvt. Ltd	72-76, Mundhawa, Pune - 401 036	
10	GALVANISING	Galbro Ispat Galvanizers Pvt. Ltd.	GUT 11 AND 12, OPP. Kudus Steel,Rolling Mill, Wada, Thane , Mumbai	
11	GALVANISING	Eros Metals	G-97, MIDC, Bhutibori , Nagpur	
12	GALVANISING	Industrial Perforation (India) Pvt. Ltd.	Ganganagr, Katakhal, Kolkata-700132	
13	GALVANISING	Indmark Formtech Pvt. Ltd.	Phase - 3, E - 11 / 1, M. I. D. C., Chakan, Pune - 410 501, Maharashtra, India.	
14	GALVANISING	Namdhari Industrial Traders Pvt. Ltd.	Village Latton Dana, Chandigarh Road, Ludhiana	
15	GALVANISING	Neha Galvaniser	Jalan Industrial Estate, Gate No-1, 1st Right Choise Lane, Near N.G-6, Jangalpur, PO Domjur Howrah - 700071, West Bengal, India	
16	GALVANISING	Patny Systems (P) Ltd.	Unit-IV, Sy No. -228/9, Plot No. 6, IP Kuchavaram, Toopran(M) Dist.- Medak, Telegana - 502336	
17	GALVANISING	Parmar Metal Company	Survey No.207,Veraval (Shapar) Dist. Rajkot, India.	

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ANNEXURE-A
2 X 660MW UDANGUDI STPP STAGE-I
LIST OF MAKES (SUB-VENDOR ITEMS)

SL NO.	ITEM DESCRIPTION	VENDOR NAME	ADDRESS	REMARKS
18	GALVANISING	Rukmani Electrical & Fabricators Pvt, Ltd.	Urla Industrial Area, Urla Sarora Road, Raipur– 493 221 (Chhattisgarh)	
	GALVANISING		Shankharidaha Baniyarah, Jalan Industrial Complex, Gate no.3, Lane no. 4, Domjur, Howrah , W.B .- 71141	
19	GALVANISING	DMP Projects Pvt.Ltd.	Dulagarh Industrial Park , PS-Sankrail , Howrah -711302	
20	GALVANISING	Vinfab Engineers India Private Limited	Gut no. 224/1 &2 Bhiwandi Wada State Highway, Village khupri, Dist. Thane, Maharashtra -421303	
21	GALVANISING	Saral Projects & Processors	B-1, Industrial Area, Site-II, Amawan Road Rae Bareli	
22	GALVANISING	Brahampuri Steels Limited	172 (F) Industrial Area, Jhotwara, Jaipur-302013	
23	GALVANISING	Indiana Gratings PVT. LTD	F-5, MIDC Jejuri, Pune-412 303	
24	GALVANISING	M/s AVAIDS TECHNOVATORS PVT. LTD.	131, MATSYA INDUSTRIAL AREA, ALWAR RAJASTHAN	
1	IND.POWER & WLDG SOCKETS	CROMPTON GREAVES	3RD FLOOR, EXPRESS BUILDING,9-10, BAHADUR SHAH ZAFAR MARG, NEAR ITO CROSSING,NEW DELHI-110002, INDIA	
2	IND.POWER & WLDG SOCKETS	CYCLO ELECTRIC DEVICE & SERV.CO.	: A-3, NEAR ANTHEM BIOSCIENCE, KSSIDC INDUSTRIAL AREA, BOMMASANDRA, BOMMASANDRA INDUSTRIAL AREA, BANGALORE, KARNATAKA 560099	
3	IND.POWER & WLDG SOCKETS	BCH	20/4, MATHURA ROAD, FARIDABAD - 121006, HARYANA, INDIA	
4	IND.POWER & WLDG SOCKETS	BEST & CROMPTON	Best & Crompton Engineering Ltd 28C, Ambattur Industrial Estate (North) Ambattur, Chennai - 600 098	
5	IND.POWER & WLDG SOCKETS	AJMERA INDUSTRIES & ENGG. WORKS	AJMERA INDL. AND ENGG. WORKS. AJMERA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	
1	JUNCTION BOXES (NON FLAME PROOF)	JASPER ENGNIREES PVT. LTD.	A-23, SECTOR - 8, NOIDA-201301	
2	JUNCTION BOXES (NON FLAME PROOF)	Electro Controls & Devices	M/S ELECTRO CONTROLS & DEVICES, F-41, SITE-C, SURAJPUR INDUSTRIAL AREA GREATER NOIDA, UTTAR PRADESH :201308	
3	JUNCTION BOXES (NON FLAME PROOF)	M/s Shrenik & Co.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR, AHMEDABAD – 382 213	
4	JUNCTION BOXES (NON FLAME PROOF)	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	
5	JUNCTION BOXES (NON FLAME PROOF)	Adroit Control Engineers Pvt.Ltd.	M/S ADROIT CONTROL ENGINEERS PVT.LTD. PLOT-3, KRISHNA INDL. AREA, SECTOR-25 FARIDABAD – 121004	
6	JUNCTION BOXES (NON FLAME PROOF)	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	
7	JUNCTION BOXES (NON FLAME PROOF)	MIKA ENGINEERS	BRANCH OFFICE : 'D'-101, DHEERAJ HERITAGE RESIDENCY II, SHASTRI NAGAR, SANTACRUZ (W), MUMBAI 400 054.	TYPE-S ONLY
8	JUNCTION BOXES (NON FLAME PROOF)	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	
9	JUNCTION BOXES (NON FLAME PROOF)	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	
10	JUNCTION BOXES (NON FLAME PROOF)	AJMERA INDUSTRIES & ENGG. WORKS	AJMERA INDL. AND ENGG. WORKS. AJMERA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	
11	JUNCTION BOXES (NON FLAME PROOF)	S.B. ELECTRICAL ENGINEERING CORPORATION	03, SARDAR GRIHA BUILDING, LOHAR CHAWAL, MUMBAI-400002	
12	JUNCTION BOXES (NON FLAME PROOF)	RITTAL INDIA PVT. LTD.	Espire Building ,Level -1 A-41, Mohan Co-Operative Industrial Estate ,Mathura Road, New Delhi -110044	

ANNEXURE-A

2 X 660MW UDANGUDI STPP STAGE-I

LIST OF MAKES (SUB-VENDOR ITEMS)

SL NO.	ITEM DESCRIPTION	VENDOR NAME	ADDRESS	REMARKS
1	JUNCTION BOXES (FLAME PROOF)	SUDHIR SWITCHGEAR	305/6, APEEJAY HOUSE, 130, BOMBAY SAMACHAR MARG, MUMBAI - 400 023. INDIA	
2	LIGHTING FIXTURES (NON LED)	BALIGA LIGHTING EQPT PVT LTD	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	
3	LIGHTING FIXTURES (NON LED)	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	
4	LIGHTING FIXTURES (NON LED)	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	
5	LIGHTING FIXTURES (NON LED)	CROMPTON GREAVES	3RD FLOOR, EXPRESS BUILDING,9-10, BAHADUR SHAH ZAFAR MARG, NEAR ITO CROSSING,NEW DELHI-110002, INDIA	
6	LIGHTING FIXTURES (NON LED)	EVERGREEN ENGG. CO.	EVERGREEN ENGG COMPANY WORKS-5, PLOT NO. 9,10,11,12, SURVEY NO. 242, CHINCH PADA, VASAI EAST-401208	
7	LIGHTING FIXTURES (NON LED)	PHILIPS	9TH FLOOR,DLF 9B, DLF CYBER CITY, DLF PHASE-III,GURGAON-122002	
8	LIGHTING FIXTURES (NON LED)	WIPRO LTD.	WIPRO CONSUMER CARE AND LIGHTING, 5TH FLOOR, GODREJ ETERNIA -C, OLD PUNE-MUMBAI ROAD, SHIVAJINAGAR, PUNE -411005	
9	LIGHTING FIXTURES (NON LED)	M/S HPL ELECTRIC & POWER PVT. LTD	M/S HPL ELECTRIC & POWER PVT. LTD. PLOT NO. 76-B,PHASE-IV, SEC-57, HSIIDC, INDL. AREA , KUNDLI, DIST.- SONEPAT (HARYANA) - 131028	
10	LIGHTING FIXTURES (NON LED)	SURYA ROSHNI LIMITED	PADMA TOWER, RAJENDRA PLACE, RAJENDRA PLACE NEW DELHI	
11	LIGHTING FIXTURES (NON LED)	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	
12	LIGHTING FIXTURES (NON LED)	M/s Halonix Technologies Limited	M/s Halonix Technologies Limited B-31 , Phase –II, Noida Distt. Gautam Budh Nagar (U.P.) Pin- 201305	
1	LIGHTING FIXTURES (LED)	Neev Luminaries	D-115 , OKHLA INDUSTRIAL AREA, PHASE-1 NEW DELHI – 110020	
2	LIGHTING FIXTURES (LED)	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	
3	LIGHTING FIXTURES (LED)	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	
4	LIGHTING FIXTURES (LED)	SURYA ROSHNI LIMITED	1	
5	LIGHTING FIXTURES (LED)	PHILIPS	9TH FLOOR,DLF 9B, DLF CYBER CITY, DLF PHASE-III,GURGAON-122002	
6	LIGHTING FIXTURES (LED)	M/S HPL ELECTRIC & POWER PVT. LTD	M/S HPL ELECTRIC & POWER PVT. LTD. PLOT NO. 76-B,PHASE-IV, SEC-57, HSIIDC, INDL. AREA , KUNDLI, DIST.- SONEPAT (HARYANA) - 131028	
7	LIGHTING FIXTURES (LED)	INSTA POWER	PLOT NO. - 457 PHASE - V, UDYOG VIHAR, GURGAON - 122016	
8	LIGHTING FIXTURES (LED)	Pyrotech Electronics Pvt. Ltd.	M/s Pyrotech Electronics Pvt. Ltd(Unit -1) Led Light, Sensor Division F-16A, Road No.3 Mewar Industrial Area, Madri Udaipur -313003, Rajasthan,	
9	LIGHTING FIXTURES (LED)	M/s Halonix Technologies Limited	M/s Halonix Technologies Limited B-31 , Phase –II, Noida Distt. Gautam Budh Nagar (U.P.) Pin- 201305	
10	LIGHTING FIXTURES (LED)	M/s JAQUAR & COMPANY PVT. LTD.	M/s JAQUAR & COMPANY PVT. LTD. Plot No.3 , Sector M-11, IMT Manesar. Gurgaon· 122050 Haryana	

ANNEXURE-A
2 X 660MW UDANGUDI STPP STAGE-I
LIST OF MAKES (SUB-VENDOR ITEMS)

SL NO.	ITEM DESCRIPTION	VENDOR NAME	ADDRESS	REMARKS
11	LIGHTING FIXTURES (LED)	M/s CROMPTON GREAVES CONSUMER ELECTRICALS LTD.	M/s CROMPTON GREAVES CONSUMER ELECTRICALS LTD.Tower-3, 1st Floor, East Wing Equinox Business Park LBS Marg, Kurla (West), Mumbai-400070	
12	LIGHTING FIXTURES (LED)	M/s WIPRO ENTERPRISES PRIVATE LTD.	M/s WIPRO ENTERPRISES PRIVATE LTD. L-8, MIDC Waluj, Aurangabad-431136, Maharashtra, India	
1	LIGHTING FIXTURES (FLAME PROOF)	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	
2	LIGHTING FIXTURES (FLAME PROOF)	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	
3	LIGHTING FIXTURES (FLAME PROOF)	BALIGA ELECTRICALS	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	
1	LIGHTING LAMP (NON LED)	WIPRO LTD.	WIPRO CONSUMER CARE AND LIGHTING, 5TH FLOOR, GODREJ ETERNIA -C, OLD PUNE-MUMBAI ROAD, SHIVAJINAGAR, PUNE -411005	
2	LIGHTING LAMP (NON LED)	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	
3	LIGHTING LAMP (NON LED)	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	
4	LIGHTING LAMP (NON LED)	INSTA POWER	PLOT NO. - 457 PHASE - V, UDYOG VIHAR, GURGAON - 122016	
5	LIGHTING LAMP (NON LED)	PHILIPS	9TH FLOOR,DLF 9B, DLF CYBER CITY, DLF PHASE-III,GURGAON-122002	
6	LIGHTING LAMP (NON LED)	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	
7	LIGHTING LAMP (NON LED)	HPL	M/S HPL ELECTRIC & POWER PVT. LTD. PLOT NO. 76-B,PHASE-IV, SEC-57, HSIIDC, INDL. AREA , KUNDLI, DIST.- SONEPAT (HARYANA) - 131028	
8	LIGHTING LAMP (NON LED)	SURYA ROSHNI LIMITED	PADMA TOWER, RAJENDRA PLACE, RAJENDRA PLACE NEW DELHI	
9	LIGHTING LAMP (NON LED)	M/s Halonix Technologies Limited	M/s Halonix Technologies Limited B-31 , Phase –II, Noida Distt. Gautam Budh Nagar (U.P.) Pin- 201305	
1	LIGHTING LAMP (LED)	Neev Luminaries	D-115 , OKHLA INDUSTRIAL AREA, PHASE-1 NEW DELHI – 110020	
2	LIGHTING LAMP (LED)	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	
3	LIGHTING LAMP (LED)	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	
4	LIGHTING LAMP (LED)	SURYA ROSHNI LIMITED	PADMA TOWER, RAJENDRA PLACE, RAJENDRA PLACE NEW DELHI	
5	LIGHTING LAMP (LED)	PHILIPS	9TH FLOOR,DLF 9B, DLF CYBER CITY, DLF PHASE-III,GURGAON-122002	
6	LIGHTING LAMP (LED)	M/S HPL ELECTRIC & POWER PVT. LTD	M/S HPL ELECTRIC & POWER PVT. LTD. PLOT NO. 76-B,PHASE-IV, SEC-57, HSIIDC, INDL. AREA , KUNDLI, DIST.- SONEPAT (HARYANA) - 131028	
7	LIGHTING LAMP (LED)	INSTA POWER	PLOT NO. - 457 PHASE - V, UDYOG VIHAR, GURGAON - 122016	
8	LIGHTING LAMP (LED)	Pyrotech Electronics Pvt. Ltd.	M/s Pyrotech Electronics Pvt. Ltd(Unit -1) Led Light, Sensor Division F-16A, Road No.3 Mewar Industrial Area, Madri Udaipur -313003, Rajasthan,	
9	LIGHTING LAMP (LED)	M/s Halonix Technologies Limited	M/s Halonix Technologies Limited B-31 , Phase –II, Noida Distt. Gautam Budh Nagar (U.P.) Pin- 201305	
1	LIGHTING SWITCH , SOCKET & S/F UNIT	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	

ANNEXURE-A
2 X 660MW UDANGUDI STPP STAGE-I
LIST OF MAKES (SUB-VENDOR ITEMS)

SL NO.	ITEM DESCRIPTION	VENDOR NAME	ADDRESS	REMARKS
2	LIGHTING SWITCH , SOCKET & S/F UNIT	ANCHOR	STEEL HOUSE, B WING, PLOT NO. 24, MAHAL INDUSTRIAL ESTATE, MAHAKALI CAVES ROAD, NEAR PAPER BOX, ANDHERI (E), MUMBAI, MAHARASHTRA.- 400093	
3	LIGHTING SWITCH , SOCKET & S/F UNIT	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	
4	LIGHTING SWITCH , SOCKET & S/F UNIT	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	
5	LIGHTING SWITCH , SOCKET & S/F UNIT	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	
6	LIGHTING SWITCH , SOCKET & S/F UNIT	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	
1	RECEPTACLES - DECORATIVE	ANCHOR	STEEL HOUSE, B WING, PLOT NO. 24, MAHAL INDUSTRIAL ESTATE, MAHAKALI CAVES ROAD, NEAR PAPER BOX, ANDHERI (E), MUMBAI, MAHARASHTRA.- 400093	
2	RECEPTACLES - DECORATIVE	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	
3	RECEPTACLES - DECORATIVE	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	
4	RECEPTACLES - DECORATIVE	AJMERA INDUSTRIES & ENGG. WORKS	AJMERA INDL. AND ENGG. WORKS. AJMERA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	
1	SWITCH BOX	ANCHOR	STEEL HOUSE, B WING, PLOT NO. 24, MAHAL INDUSTRIAL ESTATE, MAHAKALI CAVES ROAD, NEAR PAPER BOX, ANDHERI (E), MUMBAI, MAHARASHTRA.- 400093	
2	SWITCH BOX	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	
3	SWITCH BOX	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	
4	SWITCH BOX	AJMERA INDUSTRIES & ENGG. WORKS	AJMERA INDL. AND ENGG. WORKS. AJMERA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	
5	SWITCH BOX	S.B. ELECTRICAL ENGINEERING CORPORATION	03, SARDAR GRIHA BUILDING, LOHAR CHAWAL, MUMBAI-400002	
1	RECEPTACLE (FLAME PROOF)	BALIGA ELECTRICALS	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	
2	RECEPTACLE (FLAME PROOF)	SUDHIR SWITCHGEAR	305/6, APEEJAY HOUSE, 130, BOMBAY SAMACHAR MARG, MUMBAI - 400 023. INDIA	
3	RECEPTACLE (FLAME PROOF)	FCG FLAME PROOF CONTROL GEAR	A1/53, SHAH & NAHAR INDUSTRIAL ESTATE, SITARAM JADHAV ROAD, LOWER PAREL (W), MUMBAI-400 013	
1	RECEPTACLE (NON FLAME PROOF)	AJMERA INDUSTRIES & ENGG. WORKS	AJMERA INDL. AND ENGG. WORKS. AJMERA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	
2	RECEPTACLE (NON FLAME PROOF)	CROMPTON GREAVES	3RD FLOOR, EXPRESS BUILDING,9-10, BAHADUR SHAH ZAFAR MARG, NEAR ITO CROSSING,NEW DELHI-110002, INDIA	
3	RECEPTACLE (NON FLAME PROOF)	CYCLO ELECTRIC DEVICE & SERV.CO.	: A-3, NEAR ANTHEM BIOSCIENCE, KSSIDC INDUSTRIAL AREA, BOMMASANDRA, BOMMASANDRA INDUSTRIAL AREA, BANGALORE, KARNATAKA 560099	
4	RECEPTACLE (NON FLAME PROOF)	BCH	20/4, MATHURA ROAD, FARIDABAD - 121006, HARYANA, INDIA	
5	RECEPTACLE (NON FLAME PROOF)	BEST & CROMPTON	BEST & CROMPTON ENGINEERING LTD 28C, AMBATTUR INDUSTRIAL ESTATE (NORTH) AMBATTUR, CHENNAI - 600 098	
1	EMERGENCY LIGHTING UNIT (FIXED & PORTABLE TYPE)- NON FLAME PROOF	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	

ANNEXURE-A

2 X 660MW UDANGUDI STPP STAGE-I

LIST OF MAKES (SUB-VENDOR ITEMS)

SL NO.	ITEM DESCRIPTION	VENDOR NAME	ADDRESS	REMARKS
2	EMERGENCY LIGHTING UNIT (FIXED & PORTABLE TYPE)- NON FLAME PROOF	PROLITE AUTOGLO LIMITED,	PROLITE AUTOGLO LTD 25 SINGH INDUSTRIAL ESTATE NO. 3, RAM MANDIR ROAD., GOREGAON (W), MUMBAI, MAHARASHTRA 400104, INDIA	
1	EMERGENCY LIGHTING UNIT (FIXED & PORTABLE TYPE)- FLAME PROOF			
1	24V SUPPLY MODULE WITH COMPLETE ACCESSORIES	POWER PACK ENTERPRISES	POWER PACK ENTERPRISES MR. NEHAL SHAH / MR. SHARAD SHAH (PARTNER) NO. 3, JAYSHREE SADAN, 1ST FLOOR, OLD NAGARDAS ROAD, ANDHERI EAST MUMBAI - 400069, MAHARASHTRA, INDIA	
2	24V SUPPLY MODULE WITH COMPLETE ACCESSORIES	INDCOIL	ADDRESS: PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	
3	24V SUPPLY MODULE WITH COMPLETE ACCESSORIES	Ames Impex Electricals Pvt. Ltd	C-1B/1207, PHASE IV, GIDC NARODA, AHMEDABAD, GUJARAT 382330	
1	PEDESTAL FAN & CEILING FAN	REPUTED MAKE		
1	EXIT SIGN (FLAME PROOF)	REPUTED MAKE		
1	EXIT SIGN (NON FLAME PROOF)	REPUTED MAKE		
1	LADDER	REPUTED MAKE		
1	HUME PIPE	REPUTED MAKE		
1	HAND LAMP UNIT	REPUTED MAKE		
1	LIGHTING DESIGNER	AVAIDS TECHNOVATORS PVT. LTD.	4A/58, SHANKAR ROAD, NEW DELHI-110060	
2	LIGHTING DESIGNER	BAJAJ ELECTRICALS LTD.	801 (8th floor), Rustomjee Aspire, Bhanu Shankar Yagnik Marg, Off Eastern Express Highway Sion (E), Mumbai 400022	
3	LIGHTING DESIGNER	KELSATEK SOLUTIONS PVT. LTD.	50/1 4TH FLOOR, CHURCH STREET, BANGALORE-560001	
4	LIGHTING DESIGNER	M/s SUMANAM ENGINEERING SERVICES CONSULTANT	1, ADITHYA, KOWDIAR, TRIVANDRUM 695003	
5	LIGHTING DESIGNER	SPAN MANUFACTURING COMPANY LTD	27 First Floor, Bhiku Building, Murari Ghag Marg, Prabhadevi, Mumbai-400025	Lighting System designer only for FGD, R&M and Hydro projects
6	LIGHTING DESIGNER	CITELUM INDIA PVT. LTD	Y-14A, GREEN PARK MAIN, NEW DELHI-110016	Lighting System designer only for FGD, R&M and Hydro projects
7	LIGHTING DESIGNER	M/s SURYA ROSHNI LTD	Padma Tower 1, Rajendra Place, New Delhi–110008	

NOTE: Make of all the equipment / instrument under this specification shall be subjected to owner's approval in the event of order. Owner reserves the right to accept/ reject any make or sub-vendor and to add new sub-vendors for the project after award of contract. Approval, rejection or addition of makes shall not have any price implication to the owner after award of contract.

ANNEXURE-B

2 X 660MW UDANGUDI STPP STAGE-I

DOCUMENTS REQUIRED AFTER AWARD OF LOI

S. NO.	DRAWING NO.	DRAWING TITLE	PRIMARY/ SECONDARY	REMARKS
1	PE-V0-435-558-E101	GA DRAWING OF JB TYPE- JB-F	PRIMARY	R-0 within 14 days from lot clearance of released items & subsequent revisions within 10 days of comments received from BHEL
2	PE-V0-435-558-E102	GA DRAWING OF JB TYPE- JB-FE	PRIMARY	
3	PE-V0-435-558-E103	MOUNTING ARRANGEMENT OF BULK HEAD FIXTURE	SECONDARY	Along with respective OGA
4	PE-V0-435-558-E104	TYPE TEST REPORTS FOR LIGHTING FIXTURE	SECONDARY	Within 2 months from lot clearance for applicable items
5	PE-V0-435-558-E105	FIELD QUALITY PLAN OF LIGHTING FIXTURE	SECONDARY	Within 3 months from PO
6	PE-V0-435-558-E106	MOUNTING ARRANGEMENT OF LIGHTING FIXTURE IN FALSE CEILING AREA	SECONDARY	Along with respective OGA
7	PE-V0-435-558-E107	MOUNTING ARRANGEMENT OF WELL GLASS FIXTURE	SECONDARY	
8	PE-V0-435-558-E108	MOUNTING ARRANGEMENT OF HIGH/ MEDIUM BAY FIXTURE	SECONDARY	
9	PE-V0-435-558-E109	MOUNTING ARRANGEMENT OF FLOOD LIGHT FIXTURE	SECONDARY	
10	PE-V0-435-558-E110	MOUNTING ARRANGEMENT OF SWITCH/ RECEPTACLE BOXES	SECONDARY	
11	PE-V0-435-558-E111	GA DRAWING OF FIXTURE TYPE (SF63 LED)	PRIMARY	R-0 within 14 days from lot clearance of released items & subsequent revisions within 10 days of comments received from BHEL
12	PE-V0-435-558-E112	GA DRAWING OF FIXTURE TYPE (SF66 LED)	PRIMARY	
13	PE-V0-435-558-E113	GA DRAWING OF FIXTURE TYPE (SB11 LED)	PRIMARY	
14	PE-V0-435-558-E114	GA DRAWING OF FIXTURE TYPE (SB02 LED)	PRIMARY	
15	PE-V0-435-558-E115	GA DRAWING OF FIXTURE TYPE (SB03 LED)	PRIMARY	
16	PE-V0-435-558-E116	GA DRAWING OF FIXTURE TYPE (SF64 LED)	PRIMARY	
17	PE-V0-435-558-E117	GA DRAWING OF FIXTURE TYPE (SS62 LED)	PRIMARY	
18	PE-V0-435-558-E118	GA DRAWING OF FIXTURE TYPE (SS63 LED)	PRIMARY	
19	PE-V0-435-558-E119	GA DRAWING OF FIXTURE TYPE (SW41 LED)	PRIMARY	
20	PE-V0-435-558-E120	GA DRAWING OF FIXTURE TYPE (SW42 LED)	PRIMARY	
21	PE-V0-435-558-E121	GA DRAWING OF FIXTURE TYPE (MW96)	PRIMARY	
22	PE-V0-435-558-E122	GA DRAWING OF FIXTURE TYPE (MW98)	PRIMARY	
23	PE-V0-435-558-E123	GA DRAWING OF FIXTURE TYPE (FC02 LED)	PRIMARY	
24	PE-V0-435-558-E124	GA DRAWING OF FIXTURE TYPE (FC06 LED)	PRIMARY	
25	PE-V0-435-558-E125	GA DRAWING OF FIXTURE TYPE (FC07 LED)	PRIMARY	
26	PE-V0-435-558-E126	GA DRAWING OF FIXTURE TYPE (FC26 LED)	PRIMARY	
27	PE-V0-435-558-E127	GA DRAWING OF FIXTURE TYPE (FC30 LED)	PRIMARY	
28	PE-V0-435-558-E128	GA DRAWING OF FIXTURE TYPE (FC32 LED)	PRIMARY	
29	PE-V0-435-558-E129	GA DRAWING OF FIXTURE TYPE (FC33 LED)	PRIMARY	
30	PE-V0-435-558-E130	GA DRAWING OF FIXTURE TYPE (FC34 LED)	PRIMARY	
31	PE-V0-435-558-E131	GA DRAWING OF FIXTURE TYPE (FC81 LED)	PRIMARY	
32	PE-V0-435-558-E132	GA DRAWING OF SWITCH BOARD-TYPE SWB1	PRIMARY	
33	PE-V0-435-558-E133	GA DRAWING OF SWITCH BOARD-TYPE SWB2	PRIMARY	
34	PE-V0-435-558-E134	GA DRAWING OF SWITCH BOARD-TYPE SWB3	PRIMARY	
35	PE-V0-435-558-E135	GA DRAWING OF SWITCH BOARD-TYPE SWB4	PRIMARY	
36	PE-V0-435-558-E136	GA DRAWING OF SWITCH BOARD-TYPE SWB5	PRIMARY	
37	PE-V0-435-558-E137	GA DRAWING OF RECEPTACLE RA	PRIMARY	
38	PE-V0-435-558-E138	GA OF FLAME PROOF RECEPTACLE TYPE RA	PRIMARY	
39	PE-V0-435-558-E139	GA DRAWING OF RECEPTACLE RB	PRIMARY	
40	PE-V0-435-558-E140	GA DRAWING OF RECEPTACLE RC	PRIMARY	
41	PE-V0-435-558-E141	GA DRAWING OF CEILING FAN 1200MM	PRIMARY	
42	PE-V0-435-558-E142	GA DRAWING OF PEDESTAL FAN	PRIMARY	
43	PE-V0-435-558-E143	GA DRAWING OF EMERGENCY LIGHTING UNIT	PRIMARY	
44	PE-V0-435-558-E144	GA DRAWING OF 24V AC SUPPLY MODULE-FIXED	PRIMARY	
45	PE-V0-435-558-E145	GA DRAWING OF 24V AC SUPPLY MODULE-PORTABLE	PRIMARY	
46	PE-V0-435-558-E146	GA DRAWING OF HAND LAMP	PRIMARY	
47	PE-V0-435-558-E147	GA DRAWING OF 5A,24V SWITCHED PLUG	PRIMARY	
48	PE-V0-435-558-E148	GA DRAWING OF EMERGENCY EXIT LAMP	PRIMARY	
49	PE-V0-435-558-E149	GA DRAWING OF WHEEL MOUNTED LADDER	PRIMARY	
50	PE-V0-435-558-E150	GA DRAWING OF FREE STANDING LADDER	PRIMARY	
51	PE-V0-435-558-E151	GA DRAWING OF STEP LADDER	PRIMARY	
52	PE-V0-435-558-E153	GA DRAWING OF SEARCH LIGHT	PRIMARY	

ANNEXURE-B

2 X 660MW UDANGUDI STPP STAGE-I

DOCUMENTS REQUIRED AFTER AWARD OF LOI

S. NO.	DRAWING NO.	DRAWING TITLE	PRIMARY/ SECONDARY	REMARKS
53	PE-V0-435-558-E201	LDC MV SWITCHGEAR ROOM	SECONDARY	
54	PE-V0-435-558-E202	LDC LV SWITCHGEAR ROOM	SECONDARY	
55	PE-V0-435-558-E203	LDC MAIN SWITCHGEAR ROOM	SECONDARY	
56	PE-V0-435-558-E204	LDC TURBINE SWITCHGEAR ROOM	SECONDARY	
57	PE-V0-435-558-E205	LDC BOILER SWITCHGEAR ROOM	SECONDARY	
58	PE-V0-435-558-E206	LDC BELOW MV SWGR ROOM	SECONDARY	
59	PE-V0-435-558-E207	LDC BELOW LV SWGR ROOM	SECONDARY	
60	PE-V0-435-558-E208	LDC BELOW MAIN SWITCHGEAR ROOM	SECONDARY	
61	PE-V0-435-558-E209	LDC BELOW TURBINE SWITCHGEAR ROOM	SECONDARY	
62	PE-V0-435-558-E210	LDC BELOW BOILER SWITCHGEAR ROOM	SECONDARY	
63	PE-V0-435-558-E211	LDC BELOW DC BATTERY ROOM	SECONDARY	
64	PE-V0-435-558-E212	LDC 220V DC BATTERY ROOM	SECONDARY	
65	PE-V0-435-558-E213	LDC 220V DC BATTERY CHARGER ROOM	SECONDARY	
66	PE-V0-435-558-E214	LDC TG HALL OPERATING FLOOR	SECONDARY	
67	PE-V0-435-558-E215	LDC MAIN / COMMON CONTROL ROOM	SECONDARY	
68	PE-V0-435-558-E216	LDC SWAS ROOM	SECONDARY	
69	PE-V0-435-558-E217	LDC AHU ROOM	SECONDARY	
70	PE-V0-435-558-E218	LDC EER ROOM	SECONDARY	
71	PE-V0-435-558-E219	LDC TG HALL GROUND FLOOR	SECONDARY	
72	PE-V0-435-558-E220	LDC TG HALL MEZZANINE FLOOR	SECONDARY	
73	PE-V0-435-558-E221	LDC TG HALL OPRTAING FLOOR	SECONDARY	
74	PE-V0-435-558-E222	LDC DEARATOR FLOOR	SECONDARY	
75	PE-V0-435-558-E223	LDC ESP CONTROL ROOM	SECONDARY	
76	PE-V0-435-558-E224	LDC ESP PLATFORMS	SECONDARY	
77	PE-V0-435-558-E225	LDC BOILER EL0.0M & MILL AREA	SECONDARY	
78	PE-V0-435-558-E226	LDC ID & PA FAN AREA	SECONDARY	
79	PE-V0-435-558-E227	LDC BOILER PLATFORMS	SECONDARY	
80	PE-V0-435-558-E228	LDC TRANSFORMER YARD	SECONDARY	
81	PE-V0-435-558-E229	LDC ROADS	SECONDARY	
82	PE-V0-435-558-E230	LDC DG BUILDING	SECONDARY	
83	PE-V0-435-558-E231	LDC COMPRESSOR HOUSE	SECONDARY	
84	PE-V0-435-558-E232	LDC SERVICE BUILDING	SECONDARY	
85	PE-V0-435-558-E233	LDC ADMIN BUILDING	SECONDARY	R-0 within 3 weeks from the date of BHEL input drawing & re -submission within 10 days of BHEL comments incorporating all comments
86	PE-V0-435-558-E234	LDC MAIN GATE & TIME OFFICE	SECONDARY	
87	PE-V0-435-558-E235	LDC FUEL OIL PUMP HOUSE	SECONDARY	
88	PE-V0-435-558-E236	LDC CT SWITCHGEAR ROOM	SECONDARY	
89	PE-V0-435-558-E237	LDC DM TANK & PUMP HOUSE	SECONDARY	
90	PE-V0-435-558-E238	LDC HYDROGEN PLANT BUILDING	SECONDARY	
91	PE-V0-435-558-E239	LDC CPU REGEN. BUILDING	SECONDARY	
92	PE-V0-435-558-E240	LDC FOAM PUMP HOUSE	SECONDARY	
93	PE-V0-435-558-E241	LDC WORKSHOP BILDING	SECONDARY	
94	PE-V0-435-558-E242	LDC FIRE WATER PUMP HOUSE	SECONDARY	
95	PE-V0-435-558-E243	LDC FIRE WATER BOOSTER PUMP HOUSE	SECONDARY	
96	PE-V0-435-558-E244	LDC DESALINATED WATER PUMP HOUSE	SECONDARY	
97	PE-V0-435-558-E245	LDC VACUUM PUMP HOUSE	SECONDARY	
98	PE-V0-435-558-E246	LDC AUX. BOILER BUILDING	SECONDARY	
99	PE-V0-435-558-E247	LDC PERMANENT STORE	SECONDARY	
100	PE-V0-435-558-E248	LDC CANTEEN BUILDING 1	SECONDARY	
101	PE-V0-435-558-E249	LDC ELECTRO-CHLORINATION PLANT	SECONDARY	
102	PE-V0-435-558-E250	LDC AIR WASHER BUILDING	SECONDARY	
103	PE-V0-435-558-E251	LDC SECURITY OFFICE	SECONDARY	
104	PE-V0-435-558-E252	LDC FUEL OIL TRANSFER PUMP HOUSE	SECONDARY	
105	PE-V0-435-558-E253	LDC CLARIFIED WATER PUMP HOUSE	SECONDARY	
106	PE-V0-435-558-E254	LDC CONDENSATE TRANSFER PUMP HOUSE	SECONDARY	
107	PE-V0-435-558-E255	LDC FIRE STATION	SECONDARY	
108	PE-V0-435-558-E256	LDC HYDROGEN GEN. PLANT	SECONDARY	
109	PE-V0-435-558-E257	LDC CANTEEN BUILDING 2	SECONDARY	
110	PE-V0-435-558-E258	LDC CANTEEN BUILDING 3	SECONDARY	
111	PE-V0-435-558-E259	LDC SECURITY BUILDING	SECONDARY	
112	PE-V0-435-558-E260	LDC ETP BUILDING	SECONDARY	
113	PE-V0-435-558-E261	LDC CW TREATMENT BUILDING	SECONDARY	
114	PE-V0-435-558-E262	LDC CHLORINATION (SW INTAKE)	SECONDARY	
115	PE-V0-435-558-E263	LDC SW INTAKE PH	SECONDARY	
116	PE-V0-435-558-E264	LDC SW OUTFALL PH	SECONDARY	
117	PE-V0-435-558-E265	LDC AUX. BOILER	SECONDARY	
118	PE-V0-435-558-E266	LDC WATCH TOWER	SECONDARY	
119	PE-V0-435-558-E267	LDC DISPENSARY	SECONDARY	
120	PE-V0-435-558-E268	LDC POST OFFICE & BANK EXTENSION	SECONDARY	
121	PE-V0-435-558-E269	LDC BANK EXTN. COUNTER	SECONDARY	

ANNEXURE-B

2 X 660MW UDANGUDI STPP STAGE-I

DOCUMENTS REQUIRED AFTER AWARD OF LOI

S. NO.	DRAWING NO.	DRAWING TITLE	PRIMARY/ SECONDARY	REMARKS
122	PE-V0-435-558-E301	LLO MV SWITCHGEAR ROOM	SECONDARY	R-0 within 3 weeks from the date of BHEL input drawing & re -submission within 10 days of BHEL comments incorporating all comments
123	PE-V0-435-558-E302	LLO LV SWITCHGEAR ROOM	SECONDARY	
124	PE-V0-435-558-E303	LLO MAIN SWITCHGEAR ROOM	SECONDARY	
125	PE-V0-435-558-E304	LLO TURBINE SWITCHGEAR ROOM	SECONDARY	
126	PE-V0-435-558-E305	LLO BOILER SWITCHGEAR ROOM	SECONDARY	
127	PE-V0-435-558-E306	LLO BELOW MV SWGR ROOM	SECONDARY	
128	PE-V0-435-558-E307	LLO BELOW LV SWGR ROOM	SECONDARY	
129	PE-V0-435-558-E308	LLO BELOW MAIN SWITCHGEAR ROOM	SECONDARY	
130	PE-V0-435-558-E309	LLO BELOW TURBINE SWITCHGEAR ROOM	SECONDARY	
131	PE-V0-435-558-E310	LLO BELOW BOILER SWITCHGEAR ROOM	SECONDARY	
132	PE-V0-435-558-E311	LLO BELOW DC BATTERY ROOM	SECONDARY	
133	PE-V0-435-558-E312	LLO 220V DC BATTERY ROOM	SECONDARY	
134	PE-V0-435-558-E313	LLO 220V DC BATTERY CHARGER ROOM	SECONDARY	
135	PE-V0-435-558-E314	LLO TG HALL OPERATING FLOOR	SECONDARY	
136	PE-V0-435-558-E315	LLO MAIN / COMMON CONTROL ROOM	SECONDARY	
137	PE-V0-435-558-E316	LLO SWAS ROOM	SECONDARY	
138	PE-V0-435-558-E317	LLO AHU ROOM	SECONDARY	
139	PE-V0-435-558-E318	LLO EER ROOM	SECONDARY	
140	PE-V0-435-558-E319	LLO TG HALL GROUND FLOOR	SECONDARY	
141	PE-V0-435-558-E320	LLO TG HALL MEZZANINE FLOOR	SECONDARY	
142	PE-V0-435-558-E321	LLO TG HALL OPRTAING FLOOR	SECONDARY	
143	PE-V0-435-558-E322	LLO DEARATOR FLOOR	SECONDARY	
144	PE-V0-435-558-E323	LLO ESP CONTROL ROOM	SECONDARY	
145	PE-V0-435-558-E324	LLO ESP PLATFORMS	SECONDARY	
146	PE-V0-435-558-E325	LLO BOILER EL0.0M & MILL AREA	SECONDARY	
147	PE-V0-435-558-E326	LLO ID & PA FAN AREA	SECONDARY	
148	PE-V0-435-558-E327	LLO BOILER PLATFORMS	SECONDARY	
149	PE-V0-435-558-E328	LLO TRANSFORMER YARD	SECONDARY	
150	PE-V0-435-558-E329	LLO ROADS	SECONDARY	
151	PE-V0-435-558-E330	LLO DG BUILDING	SECONDARY	
152	PE-V0-435-558-E331	LLO COMPRESSOR HOUSE	SECONDARY	
153	PE-V0-435-558-E332	LLO SERVICE BUILDING	SECONDARY	
154	PE-V0-435-558-E333	LLO ADMIN BUILDING	SECONDARY	
155	PE-V0-435-558-E334	LLO MAIN GATE & TIME OFFICE	SECONDARY	
156	PE-V0-435-558-E335	LLO FUEL OIL PUMP HOUSE	SECONDARY	
157	PE-V0-435-558-E336	LLO CT SWITCHGEAR ROOM	SECONDARY	
158	PE-V0-435-558-E337	LLO DM TANK & PUMP HOUSE	SECONDARY	
159	PE-V0-435-558-E338	LLO HYDROGEN PLANT BUILDING	SECONDARY	
160	PE-V0-435-558-E339	LLO CPU REGEN. BUILDING	SECONDARY	
161	PE-V0-435-558-E340	LLO FOAM PUMP HOUSE	SECONDARY	
162	PE-V0-435-558-E341	LLO WORKSHOP BILDING	SECONDARY	
163	PE-V0-435-558-E342	LLO FIRE WATER PUMP HOUSE	SECONDARY	
164	PE-V0-435-558-E343	LLO FIRE WATER BOOSTER PUMP HOUSE	SECONDARY	
165	PE-V0-435-558-E344	LLO DESALINATED WATER PUMP HOUSE	SECONDARY	
166	PE-V0-435-558-E345	LLO VACUUM PUMP HOUSE	SECONDARY	
167	PE-V0-435-558-E346	LLO AUX. BOILER BUILDING	SECONDARY	
168	PE-V0-435-558-E347	LLO PERMANENT STORE	SECONDARY	
169	PE-V0-435-558-E348	LLO CANTEEN BUILDING 1	SECONDARY	
170	PE-V0-435-558-E349	LLO ELECTRO-CHLORINATION PLANT	SECONDARY	
171	PE-V0-435-558-E350	LLO AIR WASHER BUILDING	SECONDARY	
172	PE-V0-435-558-E351	LLO SECURITY OFFICE	SECONDARY	
173	PE-V0-435-558-E352	LLO FUEL OIL TRANSFER PUMP HOUSE	SECONDARY	
174	PE-V0-435-558-E353	LLO CLARIFIED WATER PUMP HOUSE	SECONDARY	
175	PE-V0-435-558-E354	LLO CONDENSATE TRANSFER PUMP HOUSE	SECONDARY	
176	PE-V0-435-558-E355	LLO FIRE STATION	SECONDARY	
177	PE-V0-435-558-E356	LLO HYDROGEN GEN. PLANT	SECONDARY	
178	PE-V0-435-558-E357	LLO CANTEEN BUILDING 2	SECONDARY	
179	PE-V0-435-558-E358	LLO CANTEEN BUILDING 3	SECONDARY	
180	PE-V0-435-558-E359	LLO SECURITY BUILDING	SECONDARY	
181	PE-V0-435-558-E360	LLO ETP BUILDING	SECONDARY	
182	PE-V0-435-558-E361	LLO CW TREATMENT BUILDING	SECONDARY	
183	PE-V0-435-558-E362	LLO CHLORINATION (SW INTAKE)	SECONDARY	
184	PE-V0-435-558-E363	LLO SW INTAKE PH	SECONDARY	
185	PE-V0-435-558-E364	LLO SW OUTFALL PH	SECONDARY	
186	PE-V0-435-558-E365	LLO AUX. BOILER	SECONDARY	
187	PE-V0-435-558-E366	LLO WATCH TOWER	SECONDARY	
188	PE-V0-435-558-E367	LLO DISPENSARY	SECONDARY	
189	PE-V0-435-558-E368	LLO POST OFFICE & BANK EXTENSION	SECONDARY	
190	PE-V0-435-558-E369	LLO BANK EXTN. COUNTER	SECONDARY	

ANNEXURE-B

2 X 660MW UDANGUDI STPP STAGE-I

DOCUMENTS REQUIRED AFTER AWARD OF LOI

S. NO.	DRAWING NO.	DRAWING TITLE	PRIMARY/ SECONDARY	REMARKS
191	PE-V0-435-558-E401	CLO MV SWITCHGEAR ROOM	SECONDARY	Within 10 days from the approvel of respective LLOs
192	PE-V0-435-558-E402	CLO LV SWITCHGEAR ROOM	SECONDARY	
193	PE-V0-435-558-E403	CLO MAIN SWITCHGEAR ROOM	SECONDARY	
194	PE-V0-435-558-E404	CLO TURBINE SWITCHGEAR ROOM	SECONDARY	
195	PE-V0-435-558-E405	CLO BOILER SWITCHGEAR ROOM	SECONDARY	
196	PE-V0-435-558-E406	CLO BELOW MV SWGR ROOM	SECONDARY	
197	PE-V0-435-558-E407	CLO BELOW LV SWGR ROOM	SECONDARY	
198	PE-V0-435-558-E408	CLO BELOW MAIN SWITCHGEAR ROOM	SECONDARY	
199	PE-V0-435-558-E409	CLO BELOW TURBINE SWITCHGEAR ROOM	SECONDARY	
200	PE-V0-435-558-E410	CLO BELOW BOILER SWITCHGEAR ROOM	SECONDARY	
201	PE-V0-435-558-E411	CLO BELOW DC BATTERY ROOM	SECONDARY	
202	PE-V0-435-558-E412	CLO 220V DC BATTERY ROOM	SECONDARY	
203	PE-V0-435-558-E413	CLO 220V DC BATTERY CHARGER ROOM	SECONDARY	
204	PE-V0-435-558-E414	CLO TG HALL OPERATING FLOOR	SECONDARY	
205	PE-V0-435-558-E415	CLO MAIN / COMMON CONTROL ROOM	SECONDARY	
206	PE-V0-435-558-E416	CLO SWAS ROOM	SECONDARY	
207	PE-V0-435-558-E417	CLO AHU ROOM	SECONDARY	
208	PE-V0-435-558-E418	CLO EER ROOM	SECONDARY	
209	PE-V0-435-558-E419	CLO TG HALL GROUND FLOOR	SECONDARY	
210	PE-V0-435-558-E420	CLO TG HALL MEZZANINE FLOOR	SECONDARY	
211	PE-V0-435-558-E421	CLO TG HALL OPRTAING FLOOR	SECONDARY	
212	PE-V0-435-558-E422	CLO DEARATOR FLOOR	SECONDARY	
213	PE-V0-435-558-E423	CLO ESP CONTROL ROOM	SECONDARY	
214	PE-V0-435-558-E424	CLO ESP PLATFORMS	SECONDARY	
215	PE-V0-435-558-E425	CLO BOILER EL0.0M & MILL AREA	SECONDARY	
216	PE-V0-435-558-E426	CLO ID & PA FAN AREA	SECONDARY	
217	PE-V0-435-558-E427	CLO BOILER PLATFORMS	SECONDARY	
218	PE-V0-435-558-E428	CLO TRANSFORMER YARD	SECONDARY	
219	PE-V0-435-558-E429	CLO ROADS	SECONDARY	
220	PE-V0-435-558-E430	CLO DG BUILDING	SECONDARY	
221	PE-V0-435-558-E431	CLO COMPRESSOR HOUSE	SECONDARY	
222	PE-V0-435-558-E432	CLO SERVICE BUILDING	SECONDARY	
223	PE-V0-435-558-E433	CLO ADMIN BUILDING	SECONDARY	
224	PE-V0-435-558-E434	CLO MAIN GATE & TIME OFFICE	SECONDARY	
225	PE-V0-435-558-E435	CLO FUEL OIL PUMP HOUSE	SECONDARY	
226	PE-V0-435-558-E436	CLO CT SWITCHGEAR ROOM	SECONDARY	
227	PE-V0-435-558-E437	CLO DM TANK & PUMP HOUSE	SECONDARY	
228	PE-V0-435-558-E438	CLO HYDROGEN PLANT BUILDING	SECONDARY	
229	PE-V0-435-558-E439	CLO CPU REGEN. BUILDING	SECONDARY	
230	PE-V0-435-558-E440	CLO FOAM PUMP HOUSE	SECONDARY	
231	PE-V0-435-558-E441	CLO WORKSHOP BILDING	SECONDARY	
232	PE-V0-435-558-E442	CLO FIRE WATER PUMP HOUSE	SECONDARY	
233	PE-V0-435-558-E443	CLO FIRE WATER BOOSTER PUMP HOUSE	SECONDARY	
234	PE-V0-435-558-E444	CLO DESALINATED WATER PUMP HOUSE	SECONDARY	
235	PE-V0-435-558-E445	CLO VACUUM PUMP HOUSE	SECONDARY	
236	PE-V0-435-558-E446	CLO AUX. BOILER BUILDING	SECONDARY	
237	PE-V0-435-558-E447	CLO PERMANENT STORE	SECONDARY	
238	PE-V0-435-558-E448	CLO CANTEEN BUILDING 1	SECONDARY	
239	PE-V0-435-558-E449	CLO ELECTRO-CHLORINATION PLANT	SECONDARY	
240	PE-V0-435-558-E450	CLO AIR WASHER BUILDING	SECONDARY	
241	PE-V0-435-558-E451	CLO SECURITY OFFICE	SECONDARY	
242	PE-V0-435-558-E452	CLO FUEL OIL TRANSFER PUMP HOUSE	SECONDARY	
243	PE-V0-435-558-E453	CLO CLARIFIED WATER PUMP HOUSE	SECONDARY	
244	PE-V0-435-558-E454	CLO CONDENSATE TRANSFER PUMP HOUSE	SECONDARY	
245	PE-V0-435-558-E455	CLO FIRE STATION	SECONDARY	
246	PE-V0-435-558-E456	CLO HYDROGEN GEN. PLANT	SECONDARY	
247	PE-V0-435-558-E457	CLO CANTEEN BUILDING 2	SECONDARY	
248	PE-V0-435-558-E458	CLO CANTEEN BUILDING 3	SECONDARY	
249	PE-V0-435-558-E459	CLO SECURITY BUILDING	SECONDARY	
250	PE-V0-435-558-E460	CLO ETP BUILDING	SECONDARY	
251	PE-V0-435-558-E461	CLO CW TREATMENT BUILDING	SECONDARY	
252	PE-V0-435-558-E462	CLO CHLORINATION (SW INTAKE)	SECONDARY	
253	PE-V0-435-558-E463	CLO SW INTAKE PH	SECONDARY	
254	PE-V0-435-558-E464	CLO SW OUTFALL PH	SECONDARY	
255	PE-V0-435-558-E465	CLO AUX. BOILER	SECONDARY	
256	PE-V0-435-558-E466	CLO WATCH TOWER	SECONDARY	
257	PE-V0-435-558-E467	CLO DISPENSARY	SECONDARY	
258	PE-V0-435-558-E468	CLO POST OFFICE & BANK EXTENSION	SECONDARY	
259	PE-V0-435-558-E469	CLO BANK EXTN. COUNTER	SECONDARY	

ANNEXURE-B

2 X 660MW UDANGUDI STPP STAGE-I

DOCUMENTS REQUIRED AFTER AWARD OF LOI

S. NO.	DRAWING NO.	DRAWING TITLE	PRIMARY/ SECONDARY	REMARKS
260	PE-V0-435-558-E901	MQP FOR LUMINARIES	PRIMARY	R-0 within 14 days from lot clearance of released items & subsequent revisions within 10 days of comments received from BHEL
261	PE-V0-435-558-E905	MQP FOR MISCELLANEOUS ITEMS	PRIMARY	

Note: The above list of drawings and documents is indicative. Number of drawings may vary as per project requirements.

	TECHNICAL SPECIFICATION FOR LIGHTING FIXTURES, LAMPS AND MISCELLANEOUS ITEMS	SPECIFICATION NO. PE-SS-999-558-E006
		VOLUME II
		SECTION II
		REVISION: 0 DATE: 08.09.2016

SECTION – II

STANDARD TECHNICAL REQUIREMENTS

TECHNICAL SPECIFICATION FOR

LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS

CONTENTS

1.0 INTENT OF SPECIFICATION

1.1 The requirements given in specification for supply of equipment and system design engineering shall be fully complied with.

1.2 For the equipment of supply in vendor's scope, the "design" shall broadly cover the selection of components, materials, sizes etc. and complete responsibility of establishing the correctness of equipment design rests with the vendor.

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

1.4 Make of all equipment and components shall be to the approval of Purchaser. Bidder to comply to Sub-vendor list enclosed as Annexure to Section I, however same shall be subjected to end client approval without any commercial implication.

2.0 CODES & STANDARDS

2.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.

2.2 The material, construction, manufacture, inspection and testing shall conform to the latest revisions of standards as specified in Data Sheet-A.

2.3 In case of conflict between the applicable reference standard and this specification, stringent requirement shall govern.

3.0 LIGHTING SYSTEM DESCRIPTION (CONCEPTUAL VIEW)

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

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

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

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

4.0 SYSTEM DESIGN ENGINEERING

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

4.1 **ENGINEERING INPUTS** : Complete engineering shall be done by the vendor on the basis of documents listed below. The engineering inputs shall be furnished by purchaser. However, furnishing of these inputs shall not absolve the vendor of responsibility to visit site and get acquainted with actual site conditions.

4.1.1 Indoor Areas

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

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

i. Required average illumination level

ii. Reflection factors for walls, ceiling and floor

iii. Maintenance factor

iv. Type of luminaire

v. Mounting height of luminaire

vi. Height of working plane

c) AC Emergency lighting requirements

d) DC lighting requirements

e) Requirement of sockets

f) Requirement of exhaust fans and fan points

4.1.2 Outdoor Areas

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

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

i. Average illumination level

ii. Type of luminaire

iii. Pole heights / mounting height

iv. AC Emergency lighting requirement

v. DC lighting requirements

vi. Maintenance factor

c) Requirement of sockets

4.1.3 Other inputs

a) Plot plan, Main equipment plan and TG hall floor plans (to assess quantum of area lighting drawings)

b) Suggestive location of LDBs

c) Suggestive power distribution scheme (SLDs)

d) Control schemes

e) Single phase feeder details

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

g) LDB/WDB details

h) LP details

i) Poles & Masts details

j) Conduit sizes

k) Wire sizes

l) Earthing material sizes

4.2 DESIGN CRITERIA:

4.2.1 General Requirements of Design

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

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

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

d) Complete power distribution system shall be designed keeping following criteria in view :
   - Simplicity
   - Controlled voltage drop
   - Cost effectiveness

4.2.2 Sources of Power Supply

a) The illumination of various indoor and outdoor areas in the main plant and off site areas shall comprise of one or more of the following systems:
   - Normal AC Lighting System
   - Emergency AC Lighting System
   - DC Lighting System

b) Arrangement and distribution of power shall depend upon the functional requirements of areas and therefore supply from all types of power sources shall not be made available to all areas. Lighting & LV power services in different areas shall be provided as per Annexure-B enclosed.

c) 24V AC lighting for maintenance purposes (for hand lamps and/or hand operated tools) shall be supplied from 240/24V fixed/ portable lighting module.

4.2.3 Lighting philosophy

a) Normal AC Lighting System

Normal AC lighting system 415V, 3 phase, 4 wire, will be fed from lighting panels (LPs) which in turn will be fed from the lighting distribution boards (LDBs). Street lights/ flood lights shall be fed from Street Lighting Panel (SLP), Welding receptacles shall be fed from Welding DB/ MCC in offsite areas.

b) Emergency AC Lighting System

This system shall be provided for certain important areas in the main plant. The lighting fixtures connected to this system shall be normally "ON" along with the normal AC system. These will be fed from emergency lighting panels (ELPs) which in turn will be fed from 3-phase, 4-wire supply from the emergency lighting distribution boards (ELDB'S). These lights will go off for a few seconds in case of AC supply failure at Emergency Switchgear, but shall be automatically restored when Emergency Switchgear is energized by Diesel generator set.

c) DC Lighting System

At strategic locations in the main plant, a few lighting fixtures fed from 220V DC supply, shall be provided to enable safe movement of operating personnel and access to important control points during an emergency, when both the normal AC and Emergency Lighting system fail. These lighting fixtures will be fed from 220V DC LPs which in turn will be fed from DC LDBs.

The supply to the DC lighting panels shall be automatically switched ON in case of loss of AC supply at station service switchgear as well as Emergency switch-gear. 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.

In auxiliary /off site buildings, emergency DC lighting is to be provided through self contained DC emergency fixture at strategic locations. The fixtures shall be switched 'ON' automatically in case of failure of AC supply.

d) Street Lighting/ Flood Lighting

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

i. Manual
ii. Automatic through 00 - 24 hrs time switch
iii. Automatic through combination of 00 - 24 hrs time switch and a remote sensing device for monitoring external illumination level. Each SLP shall be provided with a time switch and a remote light sensing device.

4.2.4 Number of Luminaires

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

b) Total AC luminaires

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

For AC emergency lighting, a specified percentage of total AC luminaires shall be considered as AC emergency luminaires. The percentage shall be informed during detail engineering.

4.2.5 Layout Considerations

a) General Layout Considerations

i. Layout of equipment such as LDBs and LPs shall be on the basis of following criteria :
   - Ease of operation
   - Maintainability
   - Aesthetics

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

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

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

v. The poles shall be located 1.5m away from the road edge. The buried cable shall run in hume pipe / duct bank wherever it is crossing the roads.

vi. 240V AC, 5/15A universal socket (at least two number) shall be provided in office, store, cabin etc. The receptacles shall be provided at interval of 20m or part thereof for hand tools etc. One no. 20A, 240V AC industrial type receptacle shall be provided at suitable location in all other area as required. The receptacles shall be controlled through switch/MCBs. In hazardous area, receptacles shall be flame proof.

vii. Suitable nos. of 63A/125A, 3 phase, 415V industrial receptacle with switch shall be provided at specific points in power plant area for welding purposes. At least one 63A/125A receptacle shall be provided in each off-site building.

viii. 1200mm/ 1400mm sweep ceiling fans with stepped electronic regulator shall be provided for office room, store rooms and social buildings which are not covered by air-conditioned and ventilation system.

ix. All fans including pedestal fans shall comply to relevant IS.

b) Conduit System

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

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

iii. Unnecessary bends and crossings shall be avoided.

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

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

c) Wiring

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

ii. Wiring of AC normal, AC emergency & DC emergency lighting system shall be carried out in separate conduits.

iii. Receptacle wiring shall be distinct from lighting conduits. No two phase circuits shall be run in the same conduit. However different circuits of same phase may be laid in the same conduit.

iv. Maximum three nos. of receptacles shall be loop-in & loop-out in a circuit.

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

vi. Wiring shall be done with following conductor sizes:

- Luminaires – 2.5 sq. mm
- 5A plug & socket – 2.5 sq. mm
- 5/15A and 20A plug & socket – 4 sq.mm

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

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

d) Cabling

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

ii. Cable Schedule shall be prepared for all cable connections.

4.3 ENGINEERING OUTPUTS:

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

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

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

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

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

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

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

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

h) Wiring and load distribution details for outdoor areas.

i) Master Bill of Material (to be submitted at regular intervals of engineering progress) including all items required for the complete lighting system viz. lighting fixtures, lamps, Lighting DBs, Welding DBs, lighting panels, conduits, PVC wires etc.

j) In case of revised inputs or site feedback, preparation and submission of revised engineering outputs shall also be in the scope of vendor.

k) Calculation for selection of number and size of containers

l) Packing procedures and drawings.

5.0 LUMINAIRES, ACCESSORIES AND LAMPS

5.1 GENERAL REQUIREMENTS OF LUMINAIRES

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

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

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

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

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

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

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

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

i) Surface Treatment:

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

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

j) All metal parts of the luminaires shall be bonded and connected to the earthing terminal. Earthing terminal shall be suitable for connecting 14 SWG GI wire.

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

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

5.2 LUMINAIRE TYPES & OTHER ITEMS

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

a) Channel Mounted Luminaires (Fluorescent Luminaires)

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

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

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

b) Decorative Fluorescent Luminaires

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

  i. Perspex acrylic diffuser.

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

  iii. Opal polystyrene louvers and sheet steel side panels.

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

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

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

- Recessed type decorative luminaires shall be suitable for mounting with gypsum boards / luxalon / plaster of Paris/aluminium frame false ceiling of standard size as per Data Sheet A and "Luminaire details".

c) Industrial Fluorescent Luminaires (General Purpose)

- Additional reflectors, wherever provided, shall be easily removable type.

d) Industrial Fluorescent Luminaires (Special Purpose)

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

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

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

- Luminaires for drip proof environment such as street lighting fluorescent luminaire shall have sheet aluminium canopy, a detachable reflector-cum-controlgear housing, clear ribbed acrylic cover held in aluminium frame. Luminaire shall have the degree of protection IP:55 unless mentioned otherwise in Data Sheet A. Luminaire shall be suitable for side entry mounting with the pole bracket arm.

e) Bay Type Luminaires

- Luminaires shall be designed for following indoor applications:

  i) High bay

  ii) Medium bay

  iii) Low bay

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

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

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

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

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

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

f) Well Glass Luminaires

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

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

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

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

- Separate side mounted and top connected control gear box shall be provided for use with HPMV & HPSV lamps.

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

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

g) Flame Proof Well Glass Luminaires

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

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

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

- A detachable terminal box at the top shall be provided.

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

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

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

h) Street Lighting Luminaires (Other than Fluorescent Luminaire)

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

- Luminaire housing shall be one piece cast aluminium alloy to accommodate lamp housing and controlgear for lamp wattage upto 150 watts. For lamp wattage above 150 watts, controlgear housing shall be of cast aluminium alloy whereas lamp housing shall be of deep drawn aluminium.

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

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

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

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

i) Flood Lighting Luminaires

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

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

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

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

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

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

j) Halogen Flood Lighting Luminaire

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

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

- Lamp replacement from the front is also acceptable.

k) Post Top Lanterns

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

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

- Luminaire shall be supplied without mounting pole.

l) **Bulk Head (Flame Proof)**

- Bulk head luminaires shall be used for the locations where explosion or fire hazard exists.
- Luminaire shall be made of cast iron housing with integral terminal box.
- Front of the luminaire shall be covered with flat toughened glass cemented into a retaining ring.
- Lamp replacement shall be from the front.
- Controlgear box for HPMV lamps shall be integral to the housing.
- MS fixing straps shall be provided for mounting.
- Luminaire shall be stove enameled grey outside and white inside.
- Terminal box shall be provided with 20 mm ET conduit entry.
- Complete luminaire shall be suitable for the hazardous area as classified in Data Sheet A. Type test certificate for flame proofness test from government or government approved independent laboratory shall be submitted.

m) Bulk Head (Weather Proof)

- Luminaire shall be suitable for indoor / outdoor applications having weather proof features.
- The luminaire shall comprise of die cast aluminium alloy body of dish shape.
- Luminaire shall have a heat resistant prismatic cover held in a weather proof gasket.
- Luminaire shall be stove enamelled grey outside and white inside.
- Glass cover shall have a galvanised wire protection.
- Luminaire shall be provided with locking arrangement with Allen key to prevent pilferage.
- Luminaire shall be suitable for use with incandescent lamp upto 100W.
- Provision for 20 mm ET conduit entry shall be provided at the bottom.

n) LED type Luminaires:

- LED Luminaires shall be used for the lighting if specified in BOQ as part of NIT.
- In false ceiling area LED luminaires shall be recessed mounting type & in non-false ceiling area the LED luminaires shall be surface mounting type.
- The individual lamp wattage for LED shall be upto 3 watt.
- The LED chip efficacy shall be min 120 Lm/W. The luminaire efficacy shall be not less than 70Lm/W.
- The LED used in the luminaires shall have colour rendering index (CRI) of Min 65. Colour designation of LED shall be “cool day light” (min 5700K) type.
- The LED luminaire shall have minimum life of 25,000 burning hours with 80% of lumen maintenance at the end of the life.
- The beam angle for LED chip shall be 120 degrees.
- The max. junction temperature of LED shall be 85 deg C, further the lumen maintenance at this temperature shall be min 90%.
- The THD of LED Luminaires shall be less than 10%. Further the EMC shall be as per IS 14700. The power factor of the luminaire shall not be less than 0.9.
- The marking on luminaire & safety requirements of luminaire shall be as per IS standards.
- Suitable heat sink with proper thermal management shall be designed & provided in the luminaire.
- The connecting wires used inside the system, shall be low smoke halogen free, fire retardant PTFE cable.
- Fuse protection shall be provided in input side specifically for LED luminaires.
- Care shall be taken in the design that there is no water stagnation anywhere. The entire housing shall be dust and water proof protection as per IS 12063.
- Driver Circuit: LED modules and drivers shall be compatible to each other. The LED module driver’s ratings and makes shall be as recommended by corresponding LED manufacturer. LED Drivers may have following control & protections:
  - Suitable precision current control of LED.
  - Open Circuit Protection

- Short Circuit Protection
- Over Temperature Protection
- Overload Protection

o) **Emergency Lighting Luminaires**

- The luminaire shall be automatic having in-built battery.
- Battery shall have integral charging unit.
- Charger shall be suitable for operation as per system design data.
- The battery enclosure shall be suitably painted and ventilated for the performance with sealed lead acid battery, as applicable.

5.3 CONTROLGEAR BOX (NON-INTEGRAL TYPE)

a) Boxes shall have weatherproof construction and shall be provided with one piece neoprene gasket.

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

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

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

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

5.4 REFLECTORS

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

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

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

5.5 LAMP HOLDERS

a) Holders shall be resistant to wear and shall be smooth in operation.

b) Contacts shall be of durable quality.

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

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

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

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

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

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

5.6 STARTER HOLDERS

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

5.7 BALLASTS

a) Fluorescent fixtures shall have electronic ballasts. Ballasts shall be totally enclosed type.

b) Ballasts shall be easily removable type.

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

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

e) Ballasts shall be free from humming.

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

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

5.8 STARTERS

a) Starters shall be made of aluminium material. Plastic or any other material if used shall be subject to purchaser’s approval.

b) Starters shall have bi-metal electrodes.

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

d) Starters shall have high mechanical strength.

e) Starters shall be provided with radio interference suppressing capacitors.

f) Starters shall have brass contacts.

5.9 CAPACITORS

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

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

5.10 LAMPS

a) Lamps shall be suitable for use in any position.

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

5.10.1 Type of Lamps

a) Fluorescent Lamp

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

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

b) Incandescent (GLS) Lamps

i. Incandescent lamps shall be “clear” type.

c) Mercury Vapour Lamps

i. Lamp caps shall be screw type.

d) Sodium Vapour Lamps

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

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

iii. Lamp caps shall be screw type.

e) Halogen Lamps

i. Lamps shall be double ended linear type.

ii. Lamps shall be of immediate start type.

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

5.11 JUNCTION BOXES

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

b) Construction Features

i. The junction boxes shall be fabricated out of material & thickness as specified in Datasheet-A and shall be of rectangular shape. The cover shall be hinged or bolted with captive nuts and bolts and shall be provided with neoprene gasket lining all over.

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

iii. The junction boxes shall be weather proof type conforming to IP-55..

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

v. The junction boxes shall be suitable for mounting on wall, columns, etc. The brackets, bolts, nuts, screws and any other erection accessories required for erection shall be included.

c) Terminals

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

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

d) The junction boxes shall be of following types:

Type	Description
JB-F	Provided with four (4) way stud type terminals for terminating upto 2 nos. 10 mm^2 stranded aluminium conductors on each terminal, suitable for outdoor installations.
JB-FE	Same as above but with an additional epoxy coating of 50 micron thickness.
JB-S	Provided with four (4) way stud type terminals, each terminal suitable for terminating upto two nos. of 3.5Cx50 mm^2 stranded aluminium conductors & with one no.6A HRC fuse and link.

5.12 RECEPTACLES

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

b) Receptacle boxes shall be fabricated from material with thickness mentioned in Data Sheet A.

c) Steel boxes shall be hot dip galvanised/ painted as specified in Datasheet-A and as per the requirements of applicable standard corresponding to the sheet thickness.

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

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

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

g) The receptacle units shall be of the following types:

I. Type RA: It shall have the following:

i. 20A, 240V, 1-phase, 2 pole, 3-pin (third pin scrapping earth) porcelain, metal clad socket with a metallic cover tied to it.

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

iii. Shrouded, die-cast aluminium plug.

iv. It shall be combined interlocked weather proof industrial unit.

v. Mechanical interlock shall be provided as follows :

- Switch can be put ON only when plug is fully engaged.
- Plug can be withdrawn only when switch is in OFF position.
- Cover can be opened only when switch is in OFF position.

vi. The arrangement should ensure that water does not enter the plug when socket is ON.

vii. Loop-in loop-out terminals shall be provided inside the box suitable for 10 mm^2 Al conductor.

II. Type RB: It shall have the following:

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

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

III. Type RC: It shall have the following:

i. 63A, 415V, 3-phase-neutral earth, metal clad socket with cover

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

iii. Shrouded, die-cast aluminium plug

iv. It shall be combined, interlocked weather proof industrial unit.

v. Mechanical interlock shall be same as that are applicable for RA type receptacles

vi. The receptacle boxes shall be suitable for entry and exit of 3.5CX70 mm2 Al conductor PVC cable and loop-in loop-out terminals for the same shall be provided such that not more than one core is terminated at one terminal. Removable, undrilled cable gland plate shall be provided. Tinned copper lugs and double compression cable glands shall also be supplied by the bidder.

IV. Type RD: It shall have the following:

i. 125A, 415V, 3-phase-neutral earth, metal clad socket with cover.

ii. Rotary, heavy duty 125A switch conforming to applicable standard.

iii. Shrouded, die-cast aluminium plug

iv. It shall be combined, interlocked weather proof industrial unit.

v. Mechanical interlock shall be same as that are applicable for RC type receptacles

vi. The receptacle boxes shall be suitable for entry and exit of 3.5CX95 mm2 Al conductor PVC cable and loop-in loop-out terminals for the same shall be provided such that not more than one core is terminated at one terminal. Removable, undrilled cable gland plate shall be provided. Tinned copper lugs and double compression cable glands shall also be supplied by the bidder.

V. Type RE: It shall have the following:

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

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

5.13 CEILING FAN & REGULATORS

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

i. 1200 mm sweep

ii. 1400 mm sweep

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

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

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

5.14 LIGHTING CONTROL SWITCH-BOXES

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

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

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

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

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

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

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

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

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

iv. Type SWB4 - 4 nos. 5A switches, JB type SW2.

v. Type SWB5 - 8 nos. 5A switches, JB type SW3.

JB details for lighting control switch boxes are as below:

JB-SW1 Provided with four (4) way stud type terminals, each terminal suitable for terminating upto two nos. of 10 mm^2 stranded aluminium conductor.

JB-SW2 Similar to the JB-SW1 but provided with ten (10) way terminals.

JB-SW3 Similar to the JB-SW1 but provided with eighteen (18) way terminals.

5.15 CABLE GLANDS

a) Whether specifically mentioned or not, cable glands of suitable sizes shall be supplied along with each equipment for power and control cables.

b) Rubber components used in the gland shall be of neoprene.

c) Name / trade name of manufacturer, type no. and applicable range of outer diameter of cable shall be engraved / indelibly printed on the cable gland.

5.16 CABLE LUGS

a) All equipment shall be supplied with the power and control cable lugs of suitable size, whether specifically mentioned or not.

b) Name / trade name and size of lug shall be engraved/ indelibly printed on each cable lug.

5.17 FLEXIBLE METALLIC CONDUITS AND FITTINGS

a) Flexible metallic conduits shall generally conform to the requirements of IS:3480.

b) Flexible conduits shall be made of strip steel, which shall be of cold rolled mild steel. The strip shall be of uniform width and thickness throughout.

c) The strip for making flexible conduit shall be wound tightly and so overlapped in subsequent helicals that no openings are seen in normal position.

d) The surface of the strip shall be thoroughly cleaned before application of protective coating. Pre-treatment, before galvanization, shall conform to IS:6005.

e) The strip shall be electro-galvanized to a minimum thickness of 25 microns as per IS 3480.

f) Flexible conduits shall be lead coated for application in high temperature zones if specifically mentioned in Data Sheet A.

g) The conduit shall have uniform diameter throughout its length. The internal surface of all conduits shall be free from burrs and sharp edges and suitable for pulling insulated cables and wires without damage.

5.18 PVC CONDUITS

a) PVC conduits shall generally conform to the requirements of IS: 9537(Part I & Part III).

6.0 SURFACE TREATMENT

6.1 All metal parts and the surfaces (exterior & interior) of equipment, unless stated otherwise in case of reflectors, shall be degreased by dipping in hot alkaline solution and rubbed with wire brush to remove oil & scale from them & then rinsed in water. Alternatively, they may be shot / sand blasted.

6.2 Parts shall be pickled by dipping in hydrochloric acid tank to remove the rust from the surfaces formed during storage of sheets & then rinsed to remove traces of the acid. The cleaning and pretreatment of all metal parts shall be as per applicable standard.

6.3 The surfaces to be painted shall then be prepared by phosphatizing to protect them from further rusting & to create a good bond with the paint. The pretreatment shall conform to the applicable standard.

6.4 All parts shall then be subjected to a coat of red oxide primer paint.

6.5 All inside and outside surfaces of panel shall be spray painted with synthetic enamel of the shade as per Data Sheet A.

6.6 Electrostatic or powder painting shall be acceptable subject to purchaser's approval.

6.7 Wherever possible, finished parts shall be coated with peelable compound by spraying method to protect the finished product from scratches, grease, dirty and oily spots during handling and transportation.

7.0 PACKING

7.1 Vendor shall furnish packing procedure along with packing drawing at contract stage for applicable items for purchaser approval.

7.2 Containers adequate for storing 70% of P.O. quantity material at site are to be supplied. Vendor shall furnish suitable justification to purchaser during detailed engineering for the number and size of containers being supplied.

7.3 Specification for the sea worthy packing, if enclosed, for the export jobs shall form part of the specification.

8.0 GUARANTEED PERFORMANCE REQUIREMENTS

8.1 The vendor shall guarantee satisfactory performance of the equipment supplied under all conditions and requirement as laid down by this specification.

8.2 Vendor shall ensure satisfactory performance for lighting system designed by them at site.

9.0 INSPECTION & TESTING

9.1 Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-558-E006) without any deviations. The equipment which are not covered in the Quality Plan shall be tested as per the QP to be submitted by bidder. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ ultimate customer's approval. There shall be no commercial implication to BHEL on account of any changes in QP during contract stage.

9.2 All the components and completely assembled equipment shall be tested as per the latest edition of standards. Charges for these tests shall be deemed to be included in equipment price.

9.3 All the specified type and routine tests shall be carried out to verify the rating and performance of the equipment. Where valid type test certificates in evidence of equipment performance claimed are available & approved by purchaser, the requirements for conducting type tests may be waived. The general arrangement of object under test shall be to purchaser's approval.

9.4 All manufacturing processes viz. machining, sheet forming, electroplating, wire routing, cleating & crimping, assembly, surface preparation shall conform to good manufacturing practices.

9.5 Inspection for dimensional & visual checks especially of the following, with respect to contract drawings, documents & standards shall be conducted:

a) General sturdiness & rigidity of equipment

b) Surface finishing

c) Gasketting

d) Inter-changeability

e) Constructional features viz. location, accessibility & marking of components, segregation, accessibility to live parts (shrouding) etc.

f) Completeness of scope

9.6 Equipment shall be liable for rejection if tolerances on the values of dimensions, power consumption, impedances, temperature rise etc. exceed the specified values by purchaser and / or standards.

10.0 SPARES

10.1 Mandatory spares (if applicable) are indicated in BOQ-cum-price schedule.

10.2 Erection & commissioning spares are included in the bidder's scope of supply. BE&C spares are indicated in BOQ-cum-price schedule.

10.3 A list of recommended O&M spares quantities for a duration of 3 years A shall be filled up in the applicable schedule / format and submitted by bidder along with offer. However, the acceptance of the same shall not be binding on purchaser.

11.0 TOOLS AND TACKLE

11.1 Tools & tackle which are essential to facilitate assembly, adjustments, erection, maintenance & dismantling of equipment shall be provided as part of equipment supplied.

11.2 The above tools shall be supplied along with the initial consignment of equipment so as to be available prior to erection but may not be used for erection purposes.

11.3 Vendor shall also submit a list of recommended tools and tackle. Acceptance of these tools and tackle shall not be a binding on the purchaser.

11.4 Schedule of tools & tackle shall be filled up by bidder.

12.0 DOCUMENTATION

12.1 Documents to be submitted by the vendor immediately after award of contract

a) Bar chart of activities of manufacture, testing, inspection and despatch.

12.2 Documents to be submitted during detailed engineering of contract

12.2.1 Engineering documents (refer clause 4.3) to be generated by the vendor, if applicable.

a) Lighting calculations for indoor areas.
b) Lighting calculations for outdoor areas.
c) SLD of power distribution upto LPs.
d) Power load on each LP & LDB
e) Layout drawings for indoor areas
f) Layout drawings for outdoor areas.
g) Conduit layout drawings.
h) Wiring and load distribution details for outdoor areas.
i) Master Bill of Material.
j) Packing Procedure & drawing.
k) Calculation for selection of no. & size of container.

12.2.2 **Other documents :**

a) Final Quality Plans
b) Technical data sheet
c) Polar curves, zonal flux diagram and CoU charts of luminaires.
d) Complete design calculations for arriving at number of luminaires.
e) Fixing / mounting details of luminaires and other items.
f) General arrangement drawings of following:
   i. Luminaires
   ii. Receptacles
   iii. 24 V Supply module
g) Field Quality Plan as per General Technical Conditions.
h) Control Scheme for fluorescent, HPMV and HPSV luminaires.
i) Schematic drawings for LDBs / LPs.
j) Type test certificates.
k) Catalogues / leaflets

12.3 Operation and Maintenance (O&M) manual :

The document shall comprise of installation, operating and maintenance instructions for various items / components. The O&M manual shall include the following :

a) Write ups / instructions / procedures for
   i. Storage at site.
   ii. Unpacking.
   iii. Handling at site.

iv. Erection.
v. Pre-commissioning / commissioning tests.
vi. Operating procedures.
vii. Maintenance procedures.
viii. Precautions to be taken during operation and maintenance work.
ix. Trouble shooting charts covering problems, cause and solution.

b) Approved Technical Data Sheets.
c) Technical leaflet of various items / components.
d) Copies of the type, acceptance and routine test certificates in bound volume.
e) Details of all components liable to be replaced during the life of the equipment.
f) List of maintenance tools required.
g) List of testing equipment required.

12.4 AS BUILT DRAWINGS

a) Preparation of as-built drawings shall be in the scope of vendor.

b) The as-built drawings shall be prepared on the basis of marked up copies received from the erection contractor.

c) Entire work of as-built drawings shall be to the satisfaction of purchaser.

ANNEXURE-I

LUMINAIRE DETAILS

LUMINAIRE CODING SCHEME

1.0 Code Structure

A A NN (no. x W) — Number of lamps x Wattage of each lamp
| | Classified Serial Number (Numeric)
| Luminaire type (Alpha)
Lamp type (Alpha)

2.0 Lamp types

a) F - Fluorescent
b) M - Mercury Vapour
c) S - Sodium Vapour
d) T - Tungsten
e) H - Halogen

3.0 Luminaire types

a) C - Channel Mounted (Fluorescent)
b) B - Bay Mounted
c) W -Well Glass
d) S - Street Lighting
e) F - Flood Lighting
f) H - Bulk Head
g) P - Post Top Lantern
h) E - Emergency Lighting
i) X - Others

4.0 Serial Numbers

a) 01 - 20 General Purpose (Industrial)
b) 21 - 40 Decorative
c) 41 - 50 Vapour Proof
d) 51 - 60 Dust Proof
e) 61 - 70 Drip Proof
f) 81 - 90 Corrosion Proof
g) 91 - 99 Flame Proof

NOTES :

1. Flood lighting luminaires to have non-integral control gearbox.
2. All other luminaires shall have integral control gearbox, unless specifically mentioned otherwise in enclosed sheets.
3. For more details of each luminaire, refer specification.

1.0 Fluorescent Lamp Luminaires

1.1	FC01	1 x 28	Fluorescent, industrial box type base without any cover.
1.2	FC02	2 x 28	Fluorescent, industrial box type base without any cover.
1.3	FC03	1 x 28	Fluorescent, industrial box type base and stove enamelled side reflectors.
1.4	FC04	2 x 28	Fluorescent, industrial box type base and stove enamelled side reflectors.
1.5	FC05	1 x 28	Fluorescent, industrial box type base and vitreous enamelled side reflectors.
1.6	FC06	2 x 28	Fluorescent, industrial box type base and vitreous enamelled/ anodized glossy side reflectors.
1.7	FC07	1 x 18	Fluorescent, industrial box type base and vitreous enamelled side reflectors operating on 220V DC input supply.
1.8	FC21	1 x 28	Fluorescent, decorative with 3 side perspex acrylic diffuser.
1.9	FC22	2 x 28	Fluorescent, decorative with 3 side perspex acrylic diffuser.
1.10	FC23	1 x 28	Fluorescent, decorative, recessed type with perspex acrylic diffuser.
1.11	FC24	2 x 28	Fluorescent, decorative, recessed type with perspex acrylic diffuser.
1.12	FC25	1 x 28	Fluorescent, decorative, recessed type with mirror optic reflector.
1.13	FC26	2 x 28	Fluorescent, decorative, recessed type with mirror optic reflector.
1.14	FC27	2 x 28	Fluorescent, decorative with opal polystyrene louvers.
1.15	FC28	2 x 28	Fluorescent, decorative, recessed type with opal polystyrene louvers.
1.16	FC29	2 x 28	Fluorescent, decorative with vertical metallic louvers.
1.17	FC30	4 x 14	Fluorescent, decorative, recessed type, 600 x 600 size with perspex acrylic diffuser.
1.18	FC31	4 x 20	Fluorescent, decorative, recessed type, 600 x 600 size with opal polystyrene louvers.

1.19	FC32	2 x 28	Fluorescent, decorative, surface mounted with mirror optic reflector.
1.20	FC33	1 x 18	Fluorescent, decorative, recessed type with mirror optic reflector operating on 220V DC input supply.
1.21	FC34	1 x 18	Fluorescent, dust proof, totally enclosed type with sheet steel housing operating on 220V DC input supply
1.22	FC41	2 x 28	Fluorescent, vapour proof with end boxes and controlgear box of cast Al.
1.23	FC51	2 x 28	Fluorescent, dust proof, totally enclosed type with sheet steel housing.
1.24	FC61	1 x 28	Fluorescent, street light with sheet aluminium canopy and ribbed acrylic cover.
1.25	FC62	2 x 28	Fluorescent, street light with sheet aluminium canopy and ribbed acrylic cover.
1.26	FC81	2 x 28	Fluorescent, corrosion proof, totally enclosed type with sheet aluminium/ polycarbonate housing.

2.0 **High Pressure Mercury Vapour (HPMV) Lamp Luminaire**

2.1	MB01	1 x 250	Mercury, high bay, industrial type.
2.2	MB02	1 x 400	Mercury, high bay, industrial type.
2.3	MB03	1 x 1000	Mercury, high bay, industrial type.
2.4	MB04	1 x 250	Mercury, high bay, totally enclosed industrial type.
2.5	MB05	1 x 400	Mercury, high bay, totally enclosed industrial type.
2.6	MB06	1 x 250	Mercury, high bay with non-integral controlgear box.
2.7	MB07	1 x 400	Mercury, high bay with non-integral controlgear box.
2.8	MB11	1 x 250	Mercury, medium bay, industrial type.
2.9	MB12	1 x 400	Mercury, medium bay, industrial type.
2.10	MB13	1 x 250	Mercury, medium bay, totally enclosed industrial type.
2.11	MB14	1 x 400	Mercury, medium bay, totally enclosed industrial type.

2.12	MB17	1 x 80	Mercury, low bay, industrial type.
2.13	MB18	1 x 125	Mercury, low bay, industrial type.
2.14	MB19	1 x 80	Mercury, low bay, totally enclosed industrial type.
2.15	MB20	1 x 125	Mercury, low bay, totally enclosed industrial type.
2.16	MW41	1 x 80	Mercury, well glass, vapour proof with vitreous enamelled reflector.
2.17	MW42	1 x 125	Mercury, well glass, vapour proof with vitreous enamelled reflector.
2.18	MW51	1 x 80	Mercury, well glass, dust proof with vitreous enamelled reflector.
2.19	MW52	1 x 125	Mercury, well glass, dust proof with vitreous enamelled reflector.
2.20	MW91	1 x 80	Mercury, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
2.21	MW92	1 x 125	Mercury, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
2.22	MW93	1 x 80	Mercury, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing
2.23	MW94	1 x 125	Mercury, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
2.24	MW95	1 x 80	Mercury, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing for Div.-2 areas.
2.25	MW96	1 x 125	Mercury, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing for Div. 2 areas.
2.26	MW98	1 x 125	Mercury, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing
2.27	MS61	1 x 125	Mercury, street light with one piece cast aluminium body.
2.28	MS62	1 x 250	Mercury, street light with two piece cast aluminium body.
2.29	MS63	1 x 400	Mercury, street light with two piece cast aluminium body.

2.30	MF61	1 x 250	Mercury, flood light, general purpose.
2.31	MF62	1 x 400	Mercury, flood light, heavy duty type.
2.32	MF63	2 x 400	Mercury, flood light, heavy duty type.
2.33	MP21	1 x 80	Mercury, post top lantern
2.34	MP22	1 x 125	Mercury, post top lantern

3.0 **High Pressure Sodium Vapour (HPSV) Lamp Luminaire**

3.1	SB01	1 x 150	Sodium, high bay, industrial type.
3.2	SB02	1 x 250	Sodium, high bay, industrial type.
3.3	SB03	1 x 400	Sodium, high bay, industrial type.
3.4	SB04	1 x 150	Sodium, high bay, totally enclosed industrial type.
3.5	SB05	1 x 250	Sodium, high bay, totally enclosed industrial type.
3.6	SB06	1 x 400	Sodium, high bay, totally enclosed industrial type.
3.7	SB07	1 x 150	Sodium, high bay with non-integral controlgear box.
3.8	SB08	1 x 250	Sodium, high bay with non-integral controlgear box.
3.9	SB09	1 x 400	Sodium, high bay with non-integral controlgear box.
3.10	SB11	1 x 150	Sodium, medium bay, industrial type.
3.11	SB12	1 x 250	Sodium, medium bay, industrial type.
3.12	SB13	1 x 150	Sodium, medium bay, totally enclosed industrial type.
3.13	SB14	1 x 250	Sodium, medium bay, totally enclosed industrial type.
3.14	SB17	1 x 70	Sodium, low bay, industrial type.
3.15	SB18	1 x 150	Sodium, low bay, industrial type.
3.16	SB19	1 x 70	Sodium, low bay, totally enclosed industrial type.
3.17	SB20	1 x 150	Sodium, low bay, totally enclosed industrial type.
3.18	SW41	1 x 70	Sodium, well glass, vapour proof with vitreous enamelled/ powder coated type reflector.

3.19	SW42	1 x 150	Sodium, well glass, vapour proof with vitreous enamelled/ powder coated type reflector.
3.20	SW51	1 x 70	Sodium, well glass, dust proof with vitreous enamelled reflector.
3.21	SW52	1 x 150	Sodium, well glass, dust proof with vitreous enamelled reflector.
3.22	SW91	1 x 70	Sodium, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
3.23	SW92	1 x 150	Sodium, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
3.24	SW93	1 x 70	Sodium, well glass, flame proof with vitreous enamelled reflector and cast aluminium alloy LM6 housing.
3.26	SW95	1 x 70	Sodium, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing for Div. 2 areas.
3.27	SW96	1 x 150	Sodium, well glass, flame proof increased safety luminaire with vitreous enamelled reflector and cast aluminium alloy LM6 housing for Div. 2 areas.
3.28	SS61	1 x 70	Sodium, street light with one piece cast aluminium body.
3.29	SS62	1 x 150	Sodium, street light with one piece cast aluminium body.
3.30	SS63	1 x 250	Sodium, street light with two piece cast aluminium body.
3.31	SS64	1 x 400	Sodium, street light with two piece cast aluminium body.
3.32	SF61	1 x 250	Sodium, flood light, general purpose.
3.33	SF62	1 x 400	Sodium, flood light, general purpose.
3.34	SF63	1 x 250	Sodium, flood light, heavy duty type.
3.35	SF64	1 x 400	Sodium, flood light, heavy duty type.
3.36	SF65	2 x 250	Sodium, flood light, heavy duty type.
3.37	SF66	2 x 400	Sodium, flood light, heavy duty type.
3.38	SP21	1 x 70	Sodium, post top lantern.

4.0 **Tungsten Lamp Luminaires**

4.1	TW41	1 x 100	Tungsten, well glass, vapour proof with vitreous enamelled reflector.
4.2	TW42	1 x 200	Tungsten, well glass, vapour proof with vitreous enamelled reflector.
4.3	TW51	1 x 100	Tungsten, well glass, dust proof with vitreous enamelled reflector.
4.4	TW52	1 x 200	Tungsten, well glass, dust proof with vitreous enamelled reflector.
4.5	TW91	1 x 100	Tungsten, well glass, flame proof with vitreous enamelled reflector.
4.6	TW92	1 x 200	Tungsten, well glass, flame proof with vitreous enamelled reflector.
4.7	TW95	1 x 100	Tungsten, well glass, increased safety (Div. 2) with vitreous enamelled reflector.
4.8	TW96	1 x 200	Tungsten, well glass, increased safety (Div. 2) with vitreous enamelled reflector.
4.9	TB21	1 x 60	Tungsten, bulk head, weather proof.
4.10	TB22	1 x 100	Tungsten, bulk head, weather proof.
4.11	TB91	1 x 100	Tungsten, bulk head, flame proof.
4.12	TB92	1 x 200	Tungsten, bulk head, flame proof.
4.13	TP21	1 x 200	Tungsten, post top lantern.
4.14	TE02	1 x 20	Tungsten, portable emergency unit with rechargeable battery.
4.15	TE02	1 x 40	Tungsten, portable emergency unit with rechargeable battery.
4.16	TX01	1 x 60	Tungsten, dispersive vitreous enamelled reflector.
4.17	TX02	1 x 100	Tungsten, dispersive vitreous enamelled reflector.
4.18	TX03	1 x 75	Decorative recessed mounting luminaire suitable for comptalux lamp.
4.19	TX04	1 x 100	Decorative recessed mounting luminaire suitable for comptalux lamp.

4.20	TX05	2 x 100	Double obstruction aviation light of cast Al. alloy with red glass.

5.0 **Halogen**

5.1	HF61	1 x 300	Halogen, flood light, drip proof.
5.2	HF62	1 x 500	Halogen, flood light, drip proof.
5.3	HF63	1 x 750	Halogen, flood light, drip proof.
5.4	HF64	1 x 1000	Halogen, flood light, drip proof.

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.:PE-QP-999-558-E001, R04	DATE: 23.06.2020
	PROJECT:		PO NO.:	DATE:
	ITEM: LIGHTING FIXTURES, LAMPS & MISC. ITEMS	SYSTEM:STATION LIGHTING SYSTEM	SECTION: II	SHEET 1 OF 10

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D	**			
					M	C/ N					M	C	N	
1.0 CONVENTIONAL TYPE LIGHTING FIXTURES														
A	**Bought out items / in-process checks**													
1.1	Lamps	Make rating & type	Major	Visual	1 sample per type	-	Approved Data Sheet for rating & type , Make to be BIS approved with CML number	Approved Data Sheet for rating & type , Make to be BIS approved with CML number			P/ V *	-	-	Refer note No. 1
1.2	Electronic Ballast (if applicable)	Certificate of compliance	Major	Visual	Mnfr std.	-	Approved Data Sheet	Certificate of compliance by ballast manufacturer /lighting fixture that supplier that ballast meets all Approved Data Sheet requirements.	Certificate of compliance		P/ V *	-	-	Refer note No. 1
		THD and pf check	Major	Electrical	Mnfr std.	-	Approved Data Sheet	THD<=10% , pf>=0.9 for FH type and pf>=0.95 for other type of florescent lighting fixtures	Inspection report		P/ V *	-	-	Refer note No. 1

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	PROJECT:		PO NO.:	DATE:
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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
1.3	Castings	Freedom from defects	Major	Visual	Mnfr std.	-	Approved Data Sheet	Casting shall be free from any defects such as blow holes , surface blisters , cracks and cavities etc.	Inspection report		P/ V *	-	-	Refer note No. 1
1.4	Sheet metal forming and fabrication	Freedom from defects	Major	Visual	Mnfr std.	-	Approved Data Sheet	Sheet metal fabrication / forming etc should be as per manufacturer drgs.	Inspection report		P/ V *	-	-	Refer note No. 1
1.5	Pre-treatment and powder coating	Pre-treatment process checks, Powder Coating finish, thickness , uniformity of coating and adhesion	Major	Visual, chemical & mech	Mnfr std.	-	Mnfr standard , Approved Data Sheet	Nominal coating thickness 50 microns or more	Inspection report		P/ V *	-	-	Refer note No. 1
B.	ACCEPTANCE TEST													

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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
	CONVENTIONAL TYPE LIGHTING FIXTURES	a) VISUAL	MA	VISUAL	IS 10322 (PART5 SEC1	IS 10322 (PART 5 SEC1)	IS 10322 / APPD GA	IS 10322 / APPD GA	Inspection report	√	P	W	W	
		b) IR (Dry)	CR	Electrical	IS 10322	IS 10322	IS 10322	IS 10322	Inspection report	√	P	W	W	
		c) HIGH VOLTAGE	CR	Electrical	IS 10322	IS 10322	IS 10322	IS 10322	Inspection report	√	P	W	W	
		d) DUST PROOF	CR	Electrical	IS 10322	IS 10322	IS 10322	IS 10322	Inspection report	√	P	W	W	
		e) PHOTOMETRIC	CR	Electrical	IS-10322	*	IS 10322	IS 10322	Inspection report	√	P	W	W	*: One no.Luminaire of each type to be witnessed by BHEL/ Customer
		2. ROUTINE TEST												
		a) VISUAL	MA	Visual	IS 10322 (PART5 SEC1)	IS 10322 (PART 5 SEC1)	IS 10322 / APPD GA	IS 10322 / APPD GA	Test cert	√	P	V	-	
		b) IR (Dry)	CR	Electrical	IS 10322	IS 10322	IS 10322	IS 10322	Test cert	√	P	V	-	
		c) HIGH VOLTAGE	CR	Electrical	IS 10322	IS 10322	IS 10322	IS 10322	Test cert	√	P	V	-	

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	PROJECT:		PO NO.:	DATE:
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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
2.0 LED TYPE LIGHTING FIXTURES														
A	**Bought out items / in-process checks**													
1.1	LED chip	LED chip efficacy	Major	Visual	Mnfr. Std.	-	LM 80 report	Appd Data Sheet	LM 80 report	√	P/ V	V	V	At the time of final Inspection
		LED chip CRI & CCT	Major	Visual	Mnfr. Std.	-	LM 80 report	Appd Data Sheet	LM 80 report	√	P/ V	V	V	At the time of final Inspection
		Reported TM21 (L80) lifetime of LED chip	Major	Visual	Mnfr. Std.	-	LM 80 report	Appd Data Sheet	LM 80 report	√	P/ V	V	V	At the time of final Inspection
1.2	LED Driver	Compatibility with LED module / chip, controls & protection features	Major	Visual	Mnfr. Std.	-	Appd Data Sheet	Appd Data Sheet	Certificate of Compliance	√	P/ V	V	V	Certificate of Compliance by LED driver manufacturer / lighting fixture supplier that driver meets all specifications requirement
		THD & pf check	Major	Electrical	Mnfr. Std.	-	Appd Data Sheet	THD <10% and pf >=0.9	Inspection report	√	P/ V *	-	-	Refer note No. 1

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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
1.3	Castings	Freedom from defects	Major	Visual	Mnfr. Std.	-	Mnfr. Std.	Casting shall be free from any defects such as blow holes , surface blisters , cracks and cravities etc.	Inspection report		P/ V *	-	-	Refer note No. 1
1.4	Sheet metal forming and fabrication	Freedom from defects	Major	Visual	Mnfr. Std.	-	Mnfr. Std.	Mnfr. Std.	Inspection report		P/ V *	-	-	Refer note No. 1
1.5	Pre-treatment and powder coating	Pre-treatment process checks, Powder Coating finish, thickness , uniformity of coating and adhesion	Major	Visual, chemical & mech	Mnfr. Std.	-	Mnfr. Std.	Nominal coating thickness 50 microns or more	Inspection report	√	P/ V *	V	V	Refer note No. 1

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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D	**			
					M	C/ N					M	C	N	
B	Acceptance Tests on LED Lighting fixtures													
1	LED Lighting fixture	Details of lot offered and Certificate of Compliance that lighting fixture supplier has inspected the offered lot as per their own standard.	Major	Visual	-	-	Lighting fixtures supplier to submit the details of lot offered for inspection (Type of lighting fixtures, their batch number, sub-vendor , name, quantity)	-	List	√	P	V	V	The list may be used for sample selection.
2		LED chip make	Major	Visual	-		Accepted type test reports (LM80/LM79) report	Certificate of compliance	Certificate of compliance	√	V	V	V	
3		Constructional features including: Internal writing , terminal block, earthing terminal, safety chain (if applicable)	Major	Visual	1 Sample per type	1 Sample per type	Approved data sheet/drg.	Approved data sheet/drg.	Inspection report	√	P	W	W	
4		Resistance to moisture test in	Major	Mechanical	1 Sampl	1 Sampl	IS 10322 / Approved data	Approved data sheet	Inspection report	√	P	W	W	

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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
		case of lighting fixtures having IP X4 and above rating.			e per type	e per type	sheet/drg							
5		Resistance to dust (applicable if IP5X and above)	Major	Optical	Mnfr. Std.	-	IS 10322 / Approved data sheet/drg.	Approved data sheet/drg	Certificate of compliance	√	P/ V *	V	V	Refer note No. 1
6		Photometry check	Major	Optical	Mnfr. Std.	-	LM79, IS 16106, IS 16107	Certificate of compliance for the batch: that offered lighting fixture LOR and lighting fixtures efficacy is not be less than 90% (refer IS 16107) with reference to type test reports.	Certificate of compliance	√	P/ V *	V	V	Refer note No. 1
7		Dimensions	Major	Visual	1 Sample per type	1 Sample per type	Approved data sheet/drg.	Approved data sheet/drg.	Inspection report	√	P	W	W	
8		LED driver: THD and pf check	Major	Visual	1 Sampl	1 Sampl	Approved data sheet	THD<10% and pf >= 0.9	Certificate of	√	P	W	W	At lighting fixtures supplier test lab.

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Prepared by:	09.07.2020	MEET SAGAR SINGH RAJPAL	Checked by:	09.07.20	KUNAL GANDHI			Reviewed by:			
Reviewed by:		PRAVEEN DUTTA	Reviewed by:	Digitally signed by RITESH KUMAR JAISWAL Date: 2020.07.10 20:31:04 +05'30'				Approved by:			

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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D	**			
					M	C/ N					M	C	N	
					e per type	e per type			compliance					
9		LED driver: Precision current control check	Major	Electrical	1 Sample per type	1 Sample per type	Approved data sheet	Approved data sheet	Inspection report	√	P	W	W	
10		LED driver: Open circuit protection simulation check	Major	Electrical	1 Sample per type	1 Sample per type	Approved data sheet	Approved data sheet	Inspection report	√	P	W	W	
11		LED driver: short circuit protection simulation check	Major	Electrical	1 Sample per type	1 Sample per type	Approved data sheet	Approved data sheet	Inspection report	√	P	W	W	
12		LED driver: over temperature protection simulation check	Major	Electrical	1 Sample per type	1 Sample per type	Approved data sheet	Approved data sheet	Inspection report	√	P	W	W	
13		LED driver: overload protection simulation check	Major	Electrical	1 Sample per type	1 Sample per type	Approved data sheet	Approved data sheet	Inspection report	√	P	W	W	
14		LED driver: surge protection compliance check	Major	Electrical	-	-	Approved data sheet	Certificate of compliance that surge protection is provided.	Certificate of compliance	√	V	V	V	

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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D	**			
					M	C/ N					M	C	N	
3.0 JUNCTION BOXES & RECEPTACLES														
A	**Acceptance Tests**													
1		Dimensions	Major	MEASUREMENT	100%	-	Appd Drawing	Appd Drawing	Inspection report		P	V	-	Components shall be of approved Make
2		Paint Shade/ Thickness	Major	VISUAL/MEAS.	SAMPLE	-	Appd Drawing	Appd Drawing	Inspection report		P	V	-	At the time of final Inspection
3		HV/ IR	Major	ELECT.TESTS	100%	-	2KV AC FOR 1 MINUTE	2KV AC FOR 1 MINUTE	Inspection report		P	V	-	
4	**Acceptance Tests**	Degree Of Protection	Major	TEST	1/SIZE	-	IS:2147	IS:2147	TEST CERT.	√	P	V	V	
5		Special tests if any, explosion proof etc.	Major	TEST	1/SIZE	-	IS:2148	IS:2148	TEST CERT.	√	P	V	V	
6		Operation Check	Major	TEST	10%	-	Appd Drawing	Appd Drawing	Inspection report		P	V	-	
7		Mechanical Interlock	Major	TEST	10%	-	Appd Drawing	Appd Drawing	Inspection report		P	V	-	
4.0 PACKING														
	PACKING	Soundness of Packing against transit damage	Major	Visual	100%	100%	BHEL approved document	BHEL approved document	Inspection report	√	P	W	-	

BHEL						BIDDER/ SUPPLIER	
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	Sign & Date	Name		Sign & Date	Name	Seal	
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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	

NOTES:

1. P/V*- means test will be performed either by lighting fixture supplier or their sub-vendor and verified by lighting fixture supplier.
2. Project specific QP shall be based on customer requirement. In case, any changes in QP commented by customer at contract stage shall be carried out by bidder without any implication to BHEL/ Customer.
3. For export jobs, BHEL technical specification for seaworthy packing for export jobs is to be followed.
4. Packing shall be suitable for storage at site in tropical climatic conditions.
5. Latest revision/ year of issue of all the standards (IS/ ASME/ IEC etc.) Indicated in QP shall be referred.
6. BHEL reserves the right for conducting repeat test if required.
7. Items like ceiling fans, emergency lighting unit, flexible conduit, 24V supply module, ladders, hume pipe, switchboxes, exit signs etc. Will be cleared based on COC (certificate of compliance).
8. After packing and prior to issue MDCC, photographs of items to be dispatched shall be sent to BHEL purchase group for review.

LEGENDS:

*Records, identified with "Tick"(√) shall be essentially included by supplier in QA Documentation,
** **M**: Supplier/ Manufacturer/ Sub-Supplier, **C**: Main supplier/ BHEL/ Third Party Inspection Agency, **N**: Customer,
P: Perform, **W**: Witness, **V:** Verification, as appropriate
MA: Major, **MI**: Minor**, CR:** Critical, **D**: Documentation

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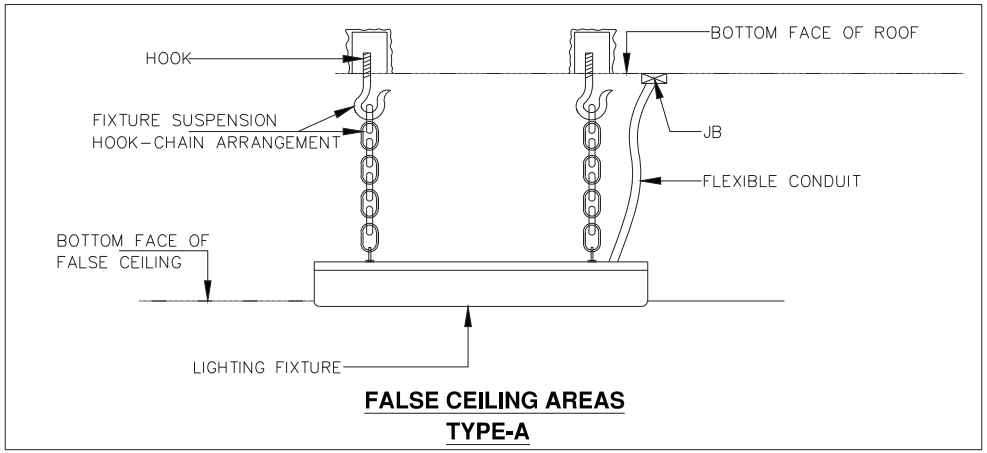
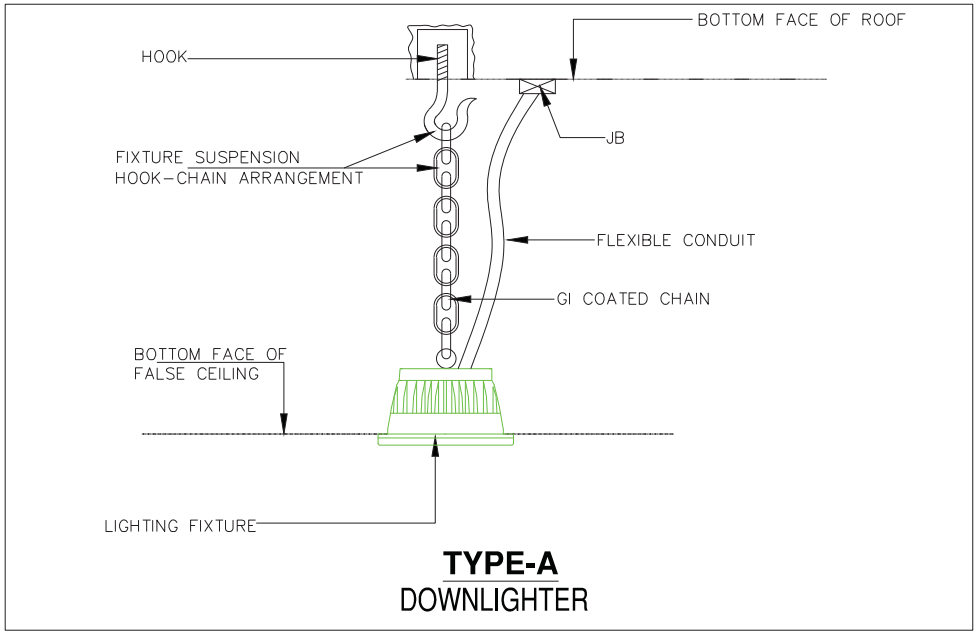
Approved by:			

ANNEXURE-II



FALSE CEILING AREAS
TYPE-A

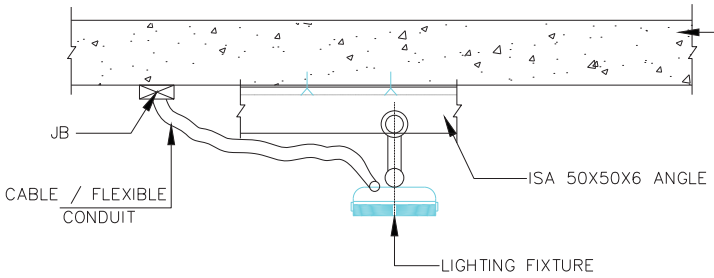


TYPE-A
DOWNLIGHTER

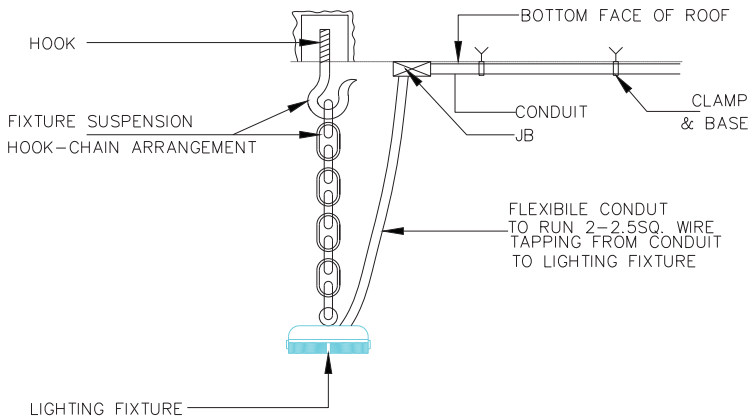
This is aTypical mounting arrangement dwgs/ details for guidance only. Final Mounting arrangment dwg shall be made by the successful bidder during detailed Engineering. It is to be noted that GI Conduit 20mm Dia and Flexible PVC Coated Conduit, Structural Steel shall be provided by BHEL. Balance all other accessories clamps/ chains/ clips/ steel rope/ pins etc required for mounting as per typical mounting arrangement for their fixtures shall be part of fixtures only and shall be provided by the Bidders.

2. In Lighting layout, Mounting arrangement also shown. If any Descrepency found on both documents than Consult with Design incharge/Site Incharge.
3. Quantity and Material shown in drawings are indicative only and may be change or vary as per site requirement.
4. If any new type of mounting required at site than we can optimized or change the arrangement with prior inform to BHEL site incharge.
5. All structural steel parts/supporting parts shall be hot dip galvanized as per BOQ/TS.

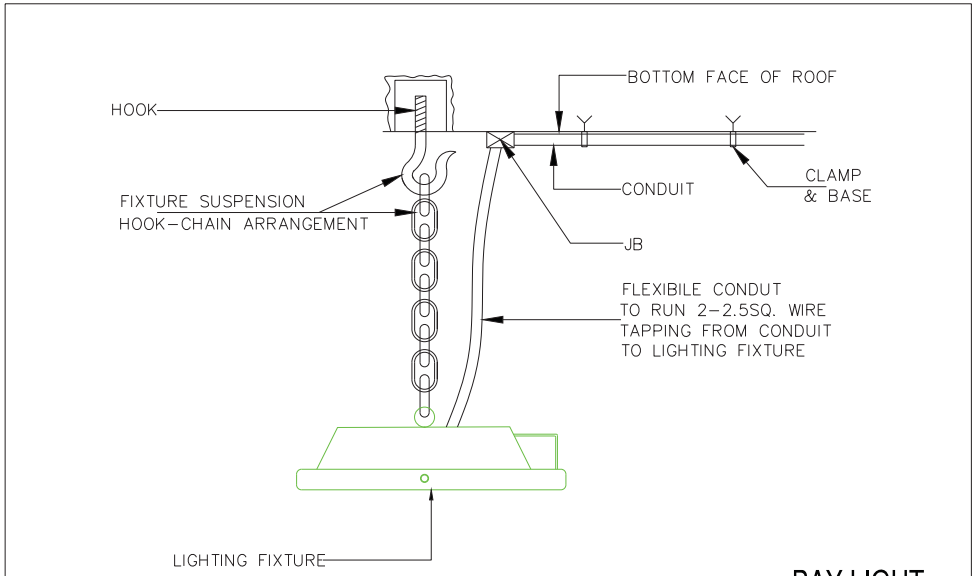
SIZE–A4



CEILING MOUNTING TYPE-O



CEILING MOUNTING TYPE-O



CEILING MOUNTING TYPE-O

BAY LIGHT

General Notes:

1. Mounting arrangement can be changed/ modified on site as per site requirements.
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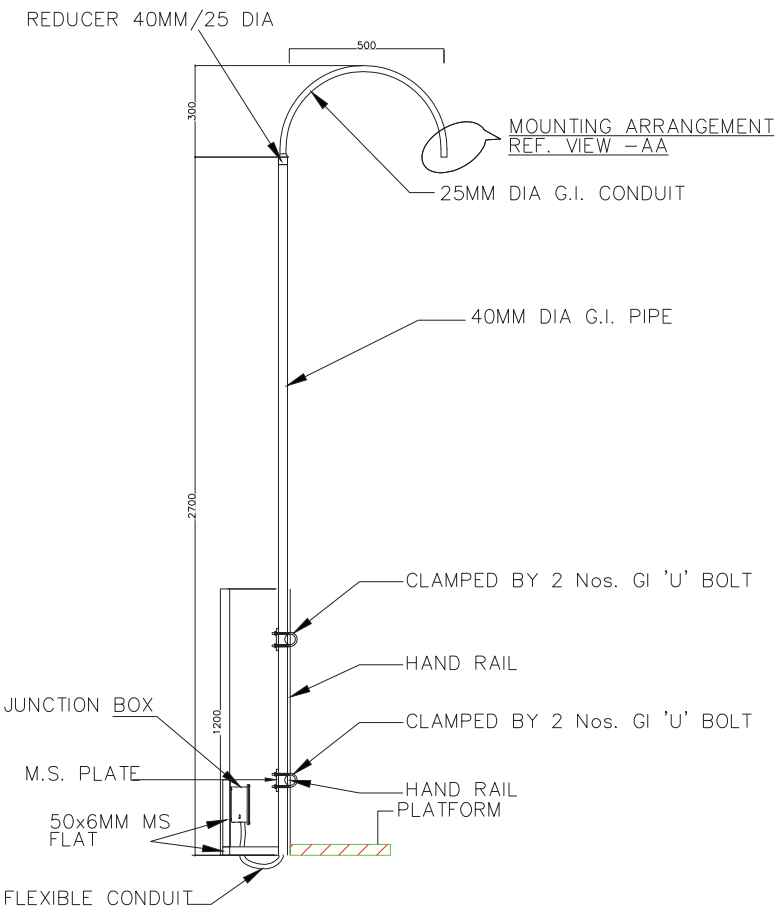
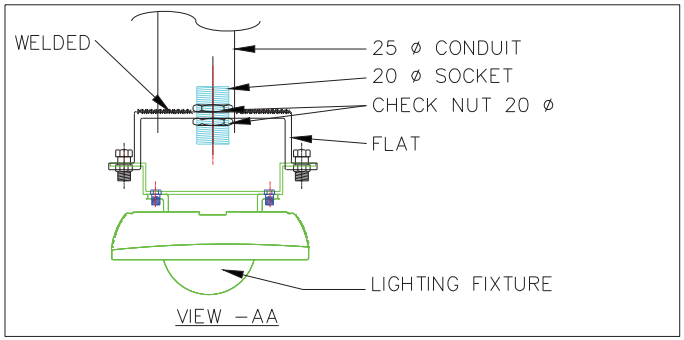
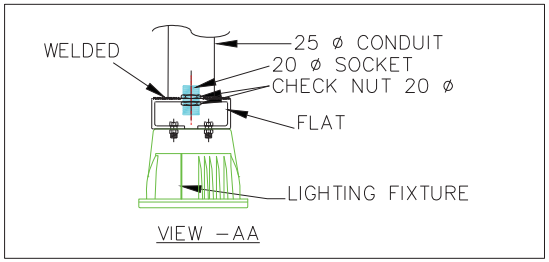
3. Quantity and Material shown in drawings are indicative only and may be change or vary as per site requirement.
4. If any new type of mounting required at site than we can optimized or change the arrangement with prior inform to BHEL site incharge.
5. All structural steel parts/supporting parts shall be hot dip galvanized as per BOQ/TS.

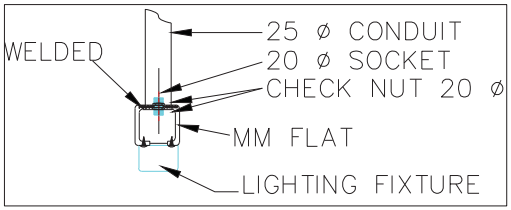
SIZE-A4



HAND RAIL MOUNTING TYPE-I



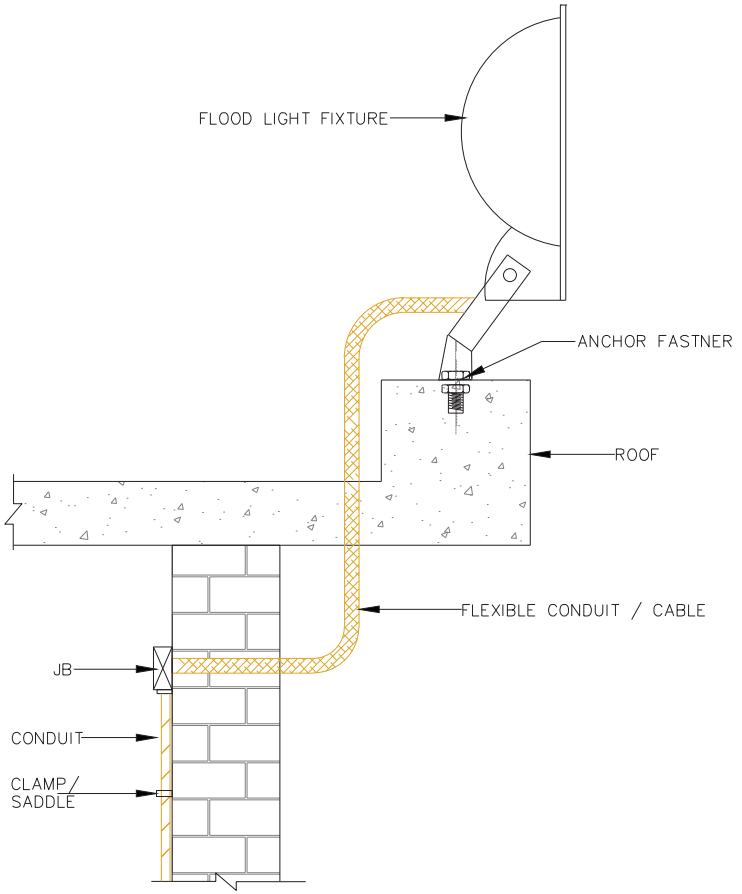




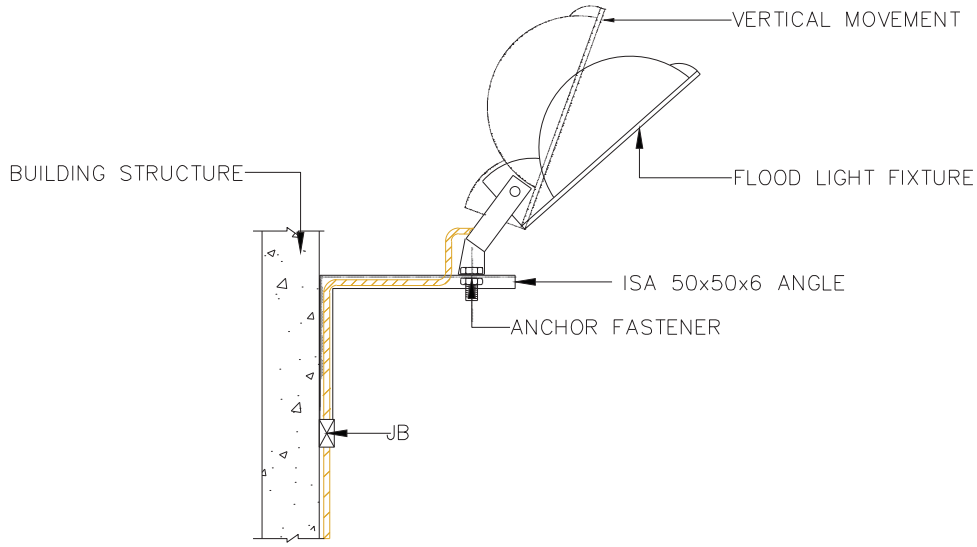
General Notes:

1. Mounting arrangement can be changed/ modified on site as per site requirements.
2. In Lighting layout, Mounting arrangement also shown. If any Descrepency found on both documents than Consult with Design incharge/Site Incharge.
3. Quantity and Material shown in drawings are indicative only and may be change or vary as per site requirement.
4. If any new type of mounting required at site than we can optimized or change the arrangement with prior inform to BHEL site incharge.
5. All structural steel parts/supporting parts shall be hot dip galvanized as per BOQ/TS.

SIZE–A4



ROOF MOUNTING
TYPE-P

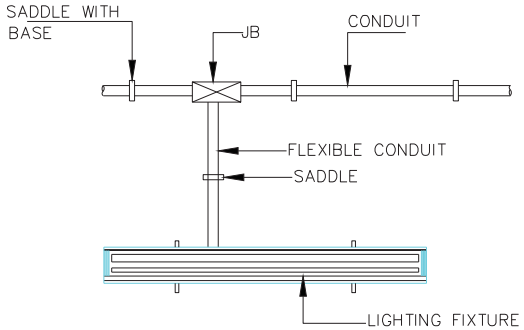


COLUMN MOUNTING
TYPE-Q

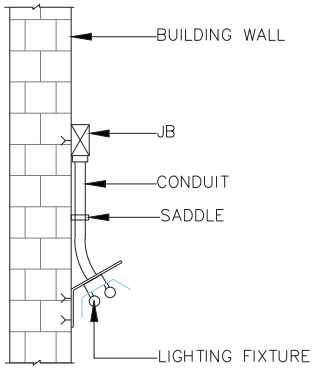
General Notes:

1. Mounting arrangement can be changed/ modified on site as per site requirements.
2. In Lighting layout, Mounting arrangement also shown. If any Descrepency found on both documents than Consult with Design incharge/Site Incharge.
3. Quantity and Material shown in drawings are indicative only and may be change or vary as per site requirement.
4. If any new type of mounting required at site than we can optimized or change the arrangement with prior inform to BHEL site incharge.
5. All structural steel parts/supporting parts shall be hot dip galvanized as per BOQ/TS.

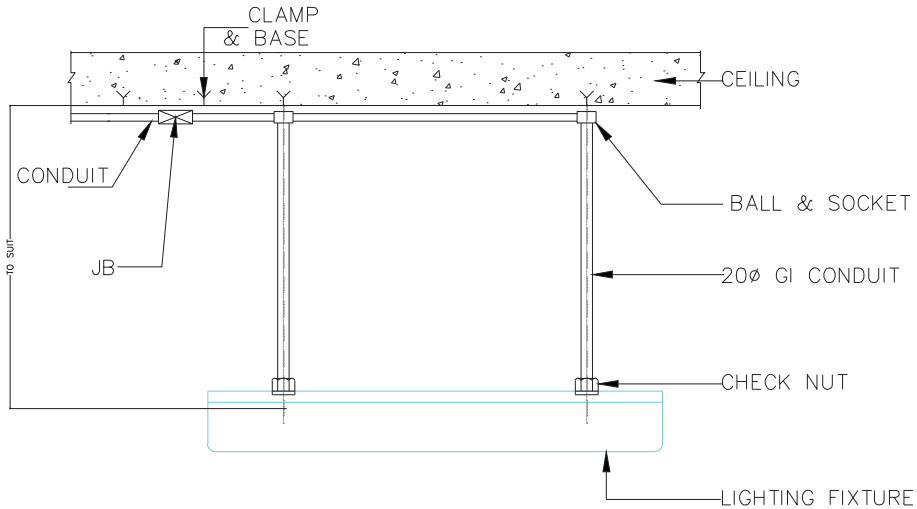
SIZE–A4



TYPICAL MOUNTING DETAIL OF WALL MOUNTED, TYPE-D



END VIEW

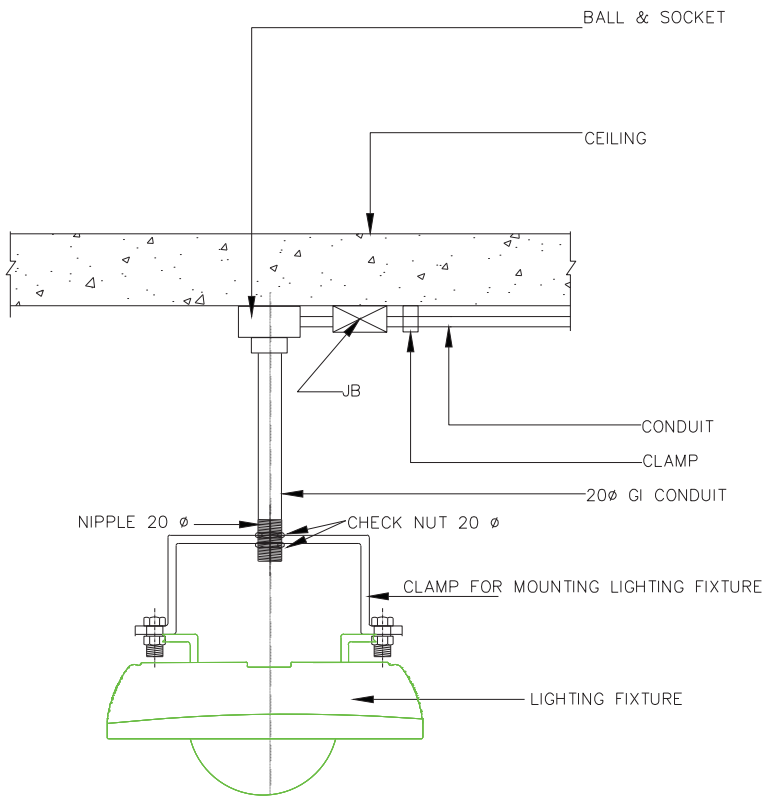


TYPICAL MOUNTING DETAIL OF SUSPANDED, TYPE C

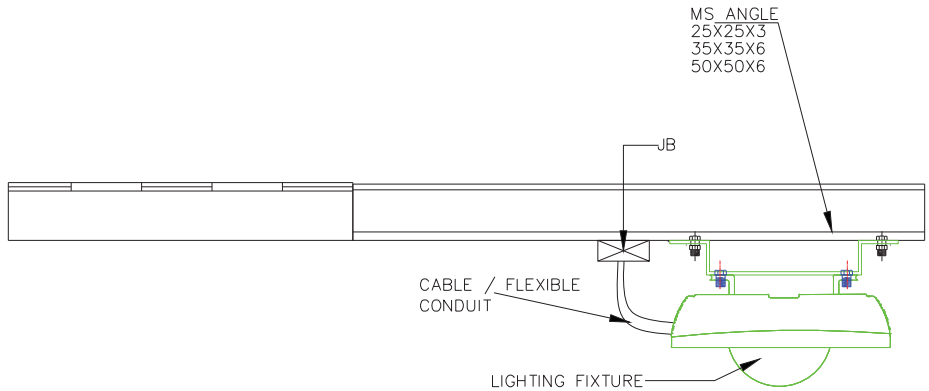
General Notes:

1. Mounting arrangement can be changed/ modified on site as per site requirements.
2. In Lighting layout, Mounting arrangement also shown. If any Descrepency found on both documents than Consult with Design incharge/Site Incharge.
3. Quantity and Material shown in drawings are indicative only and may be change or vary as per site requirement.
4. If any new type of mounting required at site than we can optimized or change the arrangement with prior inform to BHEL site incharge.
5. All structural steel parts/supporting parts shall be hot dip galvanized as per BOQ/TS.

SIZE-A4



SUPPORTED FROM CEILING
TYPE-F

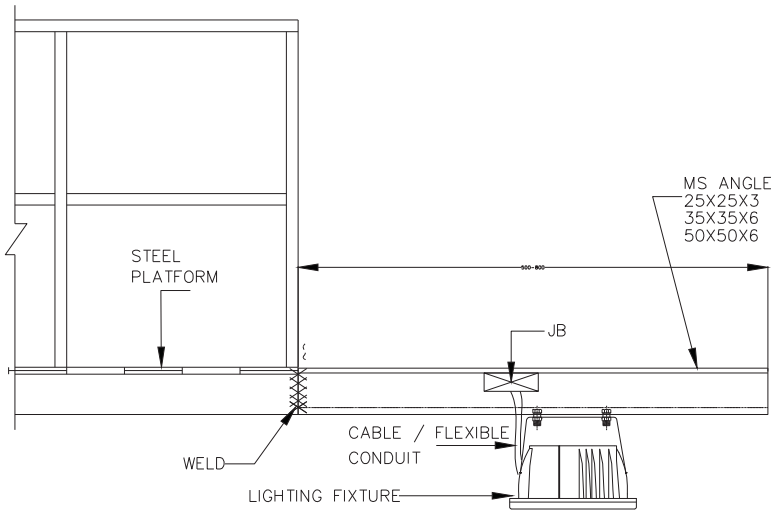


SUPPORTED FROM CHANNEL/
STRUCTURAL STEEL
TYPE-G

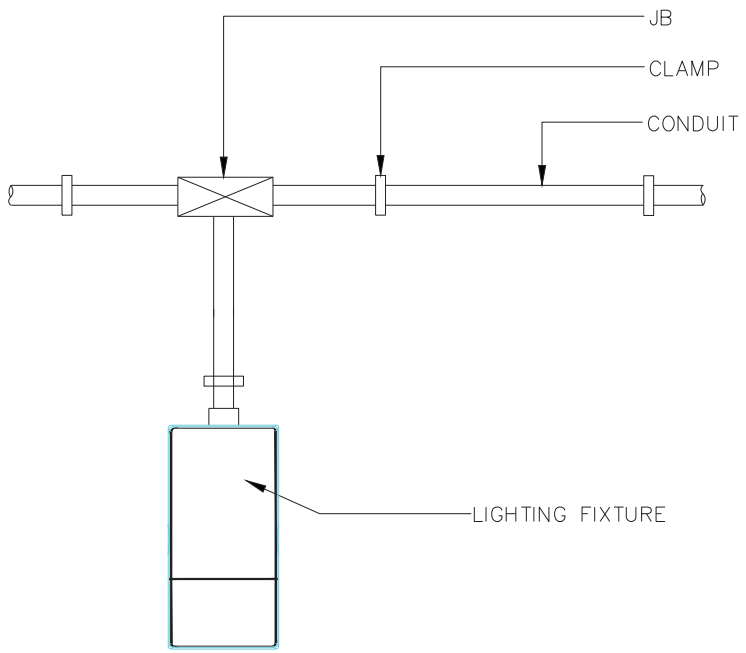
General Notes:

1. Mounting arrangement can be changed/ modified on site as per site requirements.
2. In Lighting layout, Mounting arrangement also shown. If any Descrepency found on both documents than Consult with Design incharge/Site Incharge.
3. Quantity and Material shown in drawings are indicative only and may be change or vary as per site requirement.
4. If any new type of mounting required at site than we can optimized or change the arrangement with prior inform to BHEL site incharge.
5. All structural steel parts/supporting parts shall be hot dip galvanized as per BOQ/TS.

SIZE-A4



TYPE-G

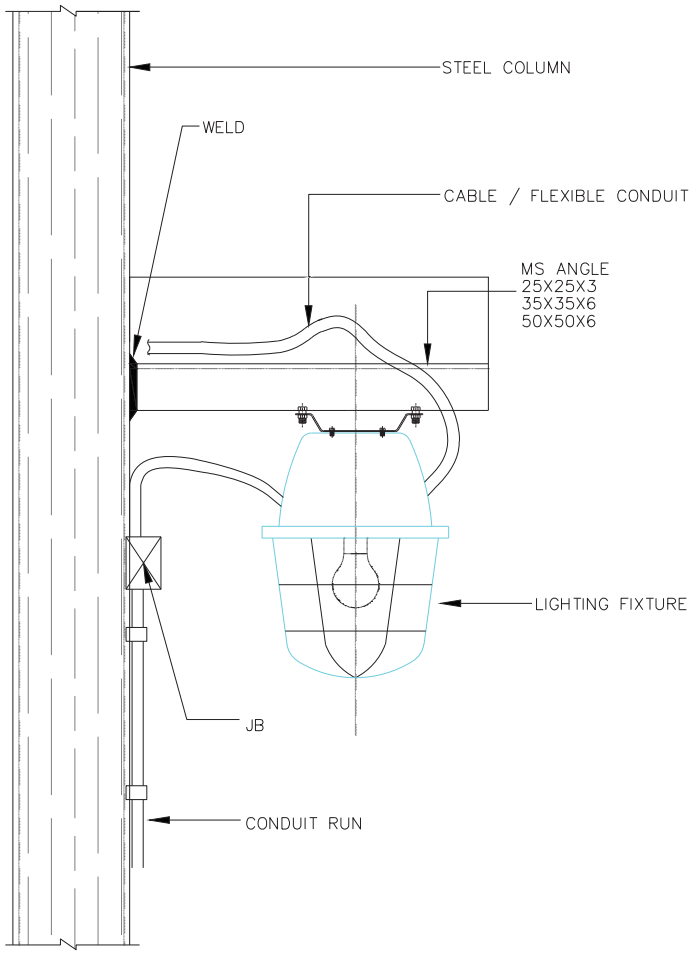


WALL MOUNTING
TYPE-H

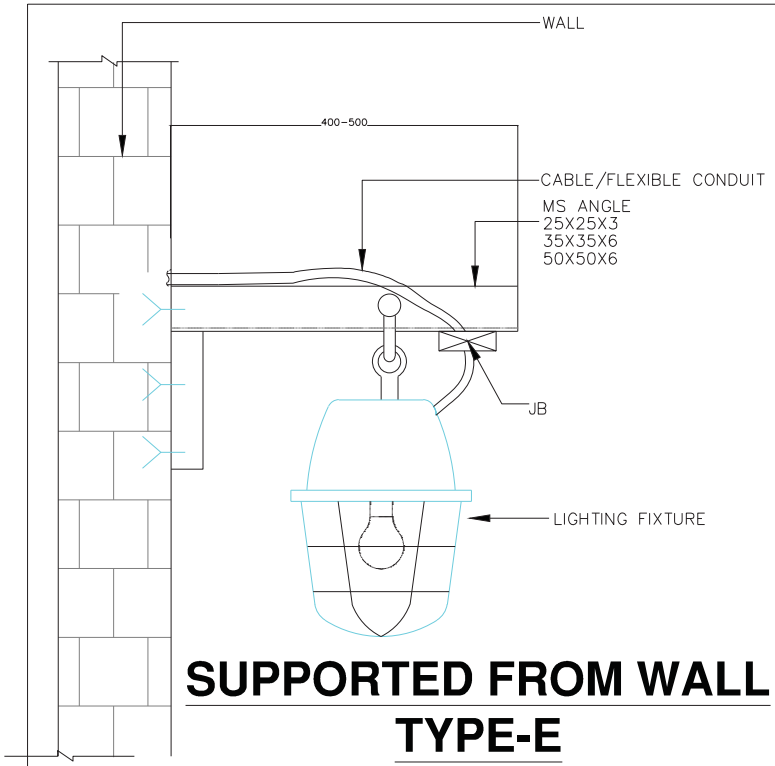
General Notes:

1. Mounting arrangement can be changed/ modified on site as per site requirements.
2. In Lighting layout, Mounting arrangement also shown. If any Descrepency found on both documents than Consult with Design incharge/Site Incharge.
3. Quantity and Material shown in drawings are indicative only and may be change or vary as per site requirement.
4. If any new type of mounting required at site than we can optimized or change the arrangement with prior inform to BHEL site incharge.
5. All structural steel parts/supporting parts shall be hot dip galvanized as per BOQ/TS.

SIZE-A4



COLUMN MOUNTING
TYPE-M

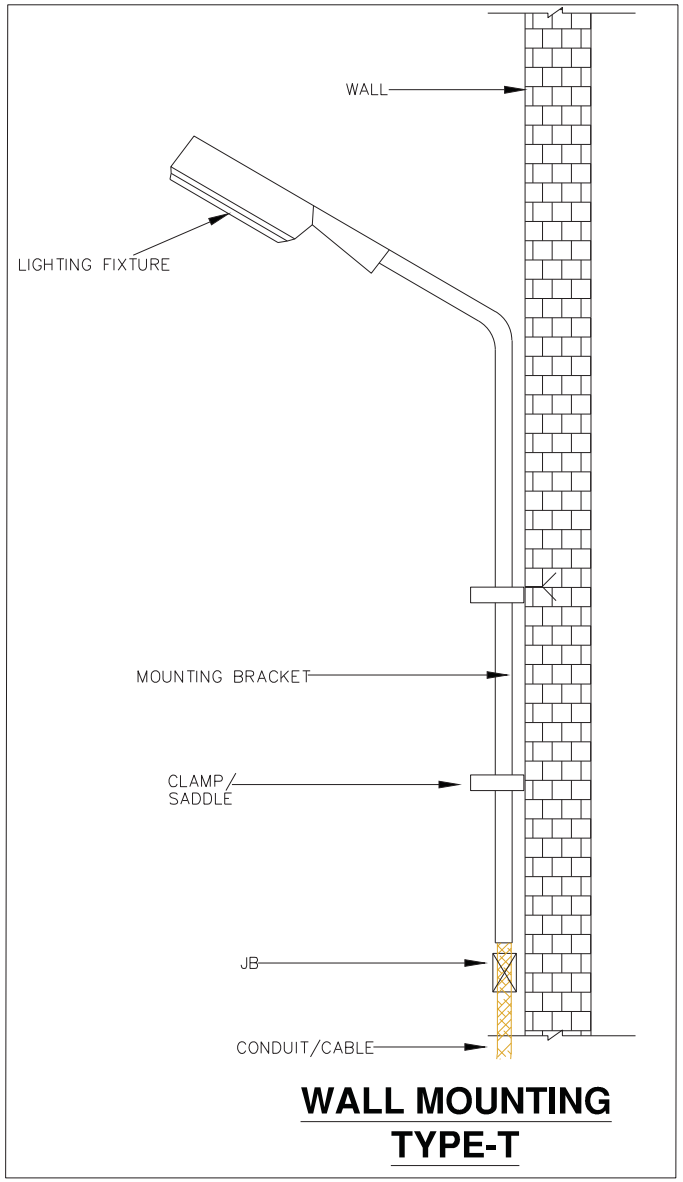


SUPPORTED FROM WALL
TYPE-E

General Notes:

1. Mounting arrangement can be changed/ modified on site as per site requirements.
2. In Lighting layout, Mounting arrangement also shown. If any Descrepency found on both documents than Consult with Design incharge/Site Incharge.
3. Quantity and Material shown in drawings are indicative only and may be change or vary as per site requirement.
4. If any new type of mounting required at site than we can optimized or change the arrangement with prior inform to BHEL site incharge.
5. All structural steel parts/supporting parts shall be hot dip galvanized as per BOQ/TS.

SIZE-A4

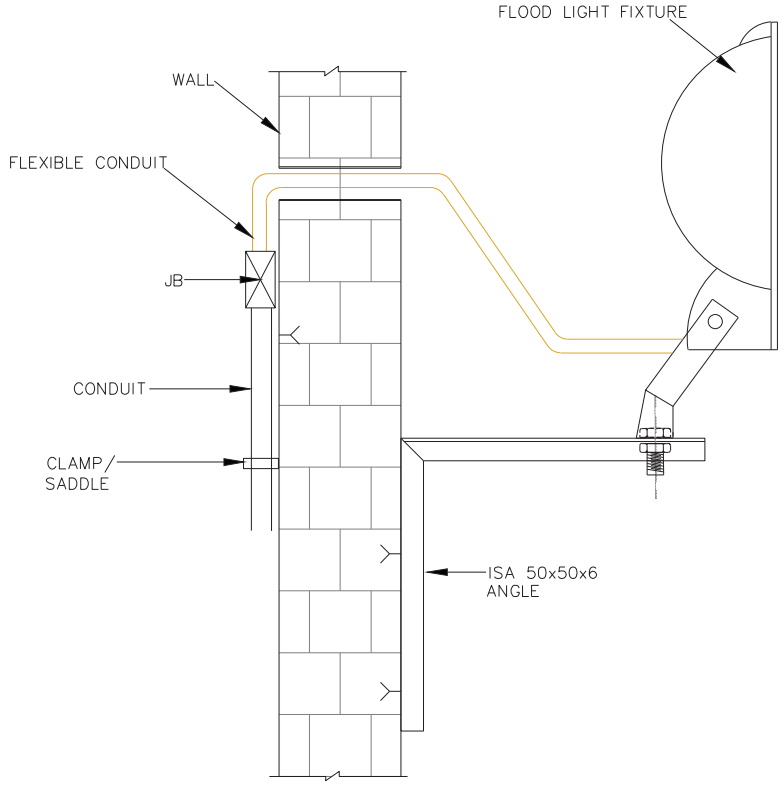


WALL MOUNTING
TYPE-T

General Notes:

1. Mounting arrangement can be changed/ modified on site as per site requirements.
2. In Lighting layout, Mounting arrangement also shown. If any Descrepency found on both documents than Consult with Design incharge/Site Incharge.
3. Quantity and Material shown in drawings are indicative only and may be change or vary as per site requirement.
4. If any new type of mounting required at site than we can optimized or change the arrangement with prior inform to BHEL site incharge.
5. All structural steel parts/supporting parts shall be hot dip galvanized as per BOQ/TS.

SIZE-A4



WALL MOUNTING
TYPE-R

General Notes:

1. Mounting arrangement can be changed/ modified on site as per site requirements.
2. In Lighting layout, Mounting arrangement also shown. If any Descrepency found on both documents than Consult with Design incharge/Site Incharge.
3. Quantity and Material shown in drawings are indicative only and may be change or vary as per site requirement.
4. If any new type of mounting required at site than we can optimized or change the arrangement with prior inform to BHEL site incharge.
5. All structural steel parts/supporting parts shall be hot dip galvanized as per BOQ/TS.

SIZE-A4