

TELANGANA STATE POWER GENERATION CO. LTD.

4 X 270 MW BHADRADRI TPS

VOLUME – II

**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND MISCELLANEOUS ITEMS**

SPECIFICATION NO : PE-TS-411-558-E006, REV-0



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UTTAR PRADESH, INDIA – 201301**



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
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4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

CONTENTS SHEET

REV. 0

DATE: 16.10.2017

SHEET 1 OF 1

CONTENTS

S NO. DESCRIPTION

NO. OF SHEETS

01 SECTION - I

COMPLIANCE CERTIFICATE	1
SPECIFIC TECHNICAL REQUIREMENT	1
ANNEXURE A (AVERAGE LUX LEVEL & TYPE OF FIXTURES)	1
ANNEXURE B (LIGHTING & LV POWER SERVICES IN DIFFERENT AREAS)	1
ANNEXURE C (SUB-VENDOR LIST)	2
ANNEXURE D (DOCUMENTS REQUIRED AFTER AWARD OF LOI)	8
DATA SHEET-A / C	9

02 SECTION - II

STANDARD TECHNICAL REQUIRMENTS	38
QUALITY PLAN	2

TOTAL NUMBER OF SHEETS (INCLUDING COVER & SEPARATOR SHEETS): 72



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

4X270 MW BHADRADRI TPS

REV. 0

DATE: 16.10.2017

SHEET 1 OF 1

SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 1 OF 1

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 are 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).

BIDDER'S STAMP & SIGNATURE



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 1 OF 18

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.
- 1.2 **SYSTEM ENGINEERING**: System Engineering is included in vendor's scope, which includes design of complete lighting system for indoor and outdoor areas. The aspect of engineering covers preparation of electrical distribution and control schemes, quantity estimation, luminaire layout drawings, conduit layout drawings, wiring schemes upto luminaires, cable schedules and all associated design work not specifically mentioned in the specification.
- 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 vendor 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.

2.0 BILL OF QUANTITIES:

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

3.0 SPECIFIC TECHNICAL REQUIREMENTS

Sl. No.	Reference Clause No. of Section- II	Specific Requirement/ Change
1.0	Additional requirement in Clause no. 5.2	General lighting service (GLS) lamps shall be with clear glass and screwed caps. All fluorescent lamp shall be bi-pin rotary type. Lamp holder shall be spring loaded, low contact resistance type and shall have resistance to wear. CFL and T5 fluorescent tube with electronic ballast or tri- phosphorous tube. Fluorescent lamp will be used in indoor application having low height like 3 to 5 metres requiring good colour rendering. All control rooms, electrical panel room, auxiliary building, laboratories, office area, etc. will be



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 2 OF 18

		provided with fluorescent lamp fixtures. The fluorescent lamp will be tubular, cool daylight type of 28W as per annexure. Mercury/Sodium vapour lamp shall be colour corrected type with screwed cap. HPSV lamp has the advantage of very high efficiency (lumens/watt) and hence recommended for indoor application with elevation more than 4 meters such as TG Hall, Boiler & ESP platform, Pump House and all outdoor application such as area lighting, roads, boundary wall, etc. Flameproof fixtures will be used for hazardous areas with HPMV lamps. The HPSV/ HPMV lamps will be elliptical of rating 70W/150W/250W/400W as required depending on application. Lamps shall be suitable for use in position and capable of withstanding small vibrations. Reflector shall be of sheet steel or aluminium, minimum 20 SWG thick, securely fixed by fastening device of captive type. High bay fixtures shall have provision for vibration damper to ensure rated lamp life.
2.0	Additional requirement in Clause no. 5.7	Ballasts shall be heavy duty, low loss, polyester-filled type with copper winding. Ballast shall be free from hum. Ballast windings shall have maximum operating temperature of 120°C without rated temperature rise marking. Electronic Ballast shall be suitable for 220 V DC and also 240 V AC. Electronic Ballast shall be compact, lightweight, high frequency electronic standard ballast for fluorescent lamps. It shall be Flicker-free warm start, ideal for areas with high switching frequency. Electronic Ballast shall be of such design that minimum 25% reduction in energy consumption at constant luminous flux compared with conventional gear. Electronic Ballast shall not cause high harmonic distortion. Electronic Ballast shall provide constant light independent of mains voltage fluctuation.
3.0	Additional requirement in Clause no. 5.11	Junction boxes shall be of 16 SWG sheet steel hot-dip galvanised, dust and damp proof, generally conforming to IP-55. Junction boxes shall be complete with gasketed inspection cover, conduit knock out/threaded hub and terminal blocks. Junction boxes for outdoor use shall be weatherproof IPW-55 and those for hazardous location shall be flame-proof type. Junction boxes shall have following indelible markings: Circuit nos. on top Circuit nos. with ferrules (inside) as per drawing



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 3 OF 18

		DANGER sign in case of 415V circuit
4.0	Clause no. 5.12 g) I) i & ii II) i III) i & ii IV) i & ii	RA: 6A, 240 V, 2 pole, 3 pin with third pin earthed, suitable for flush mounting in office areas and control room. The switch shall be also flush mounted piano type. RB: 16A, 240V, 2 pole, 3 pin with third pin earthed, wall/ column mounted, metal clad gasketed construction, 20mm conduit entry, screwed metal cover tied to it by a metal chain, weatherproof suitable for indoor/outdoor installation. RC: 63A, 415 V, 3 phase, 4 pin interlocked plug and switch with earthing contact, wall/column mounted, metal clad gasketed construction, weatherproof, suitable for loop-in/loop-out connection of 4/C-35 Sq.mm XLPE cable. These shall be fed from Welding DB. RD: 125 A, 415 V, 3 phase 5 pin interlocked plug & switch with fifth pin earthed, wall/column mounted metal clad gasketed construction, weatherproof, suitable for loop in and loop out connection of 3-1/2C -95 Sq.mm XLPE cable. These shall be fed from A.C-Distribution Board/Station MCC.
5.0	Clause no. 5.14 f)	All switch boards/boxes shall be of bent steel construction, fabricated of 14 SWG M.S. sheet with 6 mm thick bakelite cover with brass fixing screws. Switch boards/boxes located in control room and office areas shall be flush mounted type on brick wall with only the switch knob projecting outside. Flush type receptacles where provided shall be so located that only the plug projects outside. Switches shall have quick-make and quick-break mechanism operated by a suitable external handle complete with position indicator. S-1 Switch board with 1-6A switch. S-2 Switch board with 3-6A switch and 1-6A receptacle. S-3 Switch board with 6-6A switch and 1-6A receptacle.
6.0	Additional clause	Portable Emergency Lighting Unit The portable emergency lighting unit shall be complete with 6 volt storage battery (rechargeable), inverter, automatic charger, twin 6 watts fluorescents tube lamp and test switch. Contractor shall furnish make, type and catalogue out sub vendor list.
7.0	Additional clause	24 V Supply Module Each 24V A.C. supply module shall have one (1) no dry type two winding transformer and necessary terminals for incoming and outgoing connections. The 240V terminals of 24V AC supply module shall be fed from AC emergency lighting panels (ACELP). Details of 24V A.C. supply modules shall be as given below: Module type: Portable type/ Fixed type with receptacle distribution panel Transformer rating: 500 VA Transformer voltage ratio: 240/26.5 Volt Primary side isolation: DP MCB with HRC fuse



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 4 OF 18

		Isolation rating: 16A HRC fuse rating: 6A Secondary side isolation: SPN MCB with HRC fuse Isolation rating: 6A HRC fuse rating: 16A
8.0	Additional clause	The Contractor shall furnish list of all erection materials, hardware and consumables required for the complete installation. The list materials shall include but shall not be limited to the following : a) Consumables: Welding rods & gas, oil and grease, cleaning fluids, paints, electrical tape, soldering materials etc. b) Hardware: Bolts, nuts, washers, screws, brackets, supports, clamps, hangers, saddles, cleats, sills, shims etc. c) Materials: Junction boxes, terminal blocks, connectors, ferrules, lugs, brass glands, rigid/flexible conduits, cables, ground wires etc.

4.0 DOCUMENTATION

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



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 5 OF 18

ANNEXURE - A

AVERAGE LUX LEVEL & TYPE OF FIXTURES

S. No.	LOCATION	AVERAGE LUX LEVEL	TYPE OF LIGHTING FIXTURES
01	TG Hall operating floors	200	HPSV, high bay fixture with anodised Al reflector, industrial type.
02	Switchgear rooms	200	FTL, industrial type with vitreous enamel reflector.
03	Central control room	400	FTL, decorative recessed with wide angle, mirror optics, anti-glare type.
04	Office areas, Conference rooms	300	FTL, decorative recessed with wide angle, mirror optics, anti-glare type.
05	UPS/ Operator room	300	FTL, industrial type with vitreous enamel reflector.
06	Battery rooms	200	FTL, corrosion proof, totally enclosed type with sheet aluminium housing.
07	Cable Vault	100	FTL, industrial type with vitreous enamel reflector.
08	Transformer yard	30 (general) 50 (on Equip.)	HPSV, flood light, general purpose.
09	Boiler platforms	100	HPSV, dust proof/ dust tight well glass fixture.
10	ESP platforms	100	HPSV, dust proof/ dust tight well glass fixture.
11	ESP Control room	300	FTL, decorative recessed with wide angle, mirror optics, anti-glare type.
12	DG room	200	HPSV, medium bay, industrial type.
13	AC Plant/ Air washer room)	200	FTL, industrial box type base without any cover.
14	Compressor room	200	HPSV, dust proof/ dust tight well glass fixture.
15	Electrical/ Electronic lab	300	FTL, decorative recessed with wide angle, mirror optics, anti-glare type.
16	Chemical lab	300	FTL, corrosion proof, totally enclosed type with sheet aluminium housing.
17	Pump houses	250	HPSV, medium bay, industrial type.
18	Fuel oil pump house*	150	HPMV, well glass, flame proof, with vitreous enamel reflector and cast aluminium.
19	Coal Mill area, feeder floor, bunker floor	100	HPSV, well glass, dust proof with vitreous enamel reflector.
20	Street lighting (for BHEL scope Area)	10 (Primary road) 20 (Secondary road)	HPSV, street light with one piece cast aluminium body.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 6 OF 18

21	Corridors walk ways, staircase, toilets, wash rooms etc.	100	FTL, industrial type with vitreous enamel reflector.
22	Unloading and maintenance bay	200	HPSV, high bay, industrial type.
23	Administrator building, Service building & canteen	300	FTL, decorative recessed with wide angle, mirror optics, anti-glare type.
24	Security gate, parking sheds	200	FTL, industrial type with vitreous enamel reflector.
25	Weigh Bridge	150	HPSV, medium bay, industrial type.
26	Fuel oil tank farm area	20	HPSV, flood light, general purpose.
27	All buildings periphery lighting	10	HPSV, street light/flood light, general purpose.

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

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

(ii) Compact florescent fixture shall be used for emergency DC lighting.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 7 OF 18

ANNEXURE – B

LIGHTING & LV POWER SERVICES IN DIFFERENT AREAS

S. No.	Area	ACN	ACE	DCE	5/15A Socket	20A Socket	63A Socket	ELU \$
01	TG building	Y	Y	Y	Y*	Y	Y	-
02	Boiler platforms & boiler area	Y	Y	Y	-	Y	Y	-
03	ESP platforms & Mill area	Y	Y	Y	-	Y	Y	-
04	ID, FD & PA fan area	Y	Y	Y	-	Y	Y	-
05	Transformer Yard	Y	Y	Y	-	Y	Y	-
06	ESP control room	Y	Y	Y	Y*	Y	Y	-
07	DG room	Y	Y	Y	Y*	Y	Y	-
08	Compressor house	Y	Y	Y	Y*	Y	Y	-
09	Fuel oil area	Y	-	-	Y*	Y	Y	Y
10	Outdoor area	Y	-	-	-	-	-	-
11	CW, ACW, FW, RW, DM transfer pump houses	Y	-	-	Y*	Y	Y	Y
12	Administrative building	Y	-	-	Y*	Y	Y	Y
13	Service building	Y	-	-	Y*	Y	Y	Y

LEGEND

ACN	AC Normal Lighting
ACE	AC Emergency
DCE	DC Emergency Lighting
Y	Yes
Y*	Yes, only in control room, offices & toilets
\$	Emergency lighting unit (ELU)



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 8 OF 18

ANNEXURE – C

SUB-VENDOR LIST

ANNEXURE-C
LIST OF MAKES (SUB VENDOR ITEMS)

SL NO.	NAME OF ITEM/ COMPONENTS	NAME OF SUB VENDOR
1	LIGHTING FIXTURES (NON LED)	BALIGA LIGHTING EQPT PVT LTD
		ELEXPRO ELECTRICALS PVT/ LTD.
		BAJAJ ELECTRICALS
		CROMPTON GREAVES
		EVERGREEN ENGG. CO.
		PHILIPS
		WIPRO LTD.
		M/S HPL ELECTRIC & POWER PVT. LTD
		SURYA ROSHNI LIMITED
		HAVELLS INDIA LIMITED
	LIGHTING FIXTURES (FLAME PROOF)	HAVELLS INDIA LIMITED
		BAJAJ ELECTRICALS
		BALIGA ELECTRICALS
2	LIGHTING LAMP (NON LED)	INSTA POWER
		WIPRO LTD.
		ESSEN DEINKI
		BAJAJ ELECTRICALS
		INSTA POWER
		PHILIPS
		HAVELLS INDIA LIMITED
		HPL
3	DICHORIC SPOT LIGHT FIXTURES	PHILIPS INDIA LTD.
		GEMINI WITH OSRAM LAMP
4	DECORATIVE RECEPTACLES, SWITCH BOXES	ANCHOR KENWOOD ELECTRICAL
		FLEXPRO ELECTRICALS PVT. LTD.
		BAJAJ ELECTRICALS LTD.
		AJMERA INTERNATIONAL
		S.B. ELECTRICAL ENGG. CORP.
5	MODULAR SWITCH BOARD	ANCHOR KENWOOD ELECTRICAL
		FLEXPRO ELECTRICALS PVT. LTD.
		HAVELLS
6	JUNCTION BOXES	JASPER ENGINEERS PVT. LTD.
		SHRENIK & COMPANY
		S B ELECTRICAL ENGG. CORP.
		BAJAJ ELECTRICALS LTD.
		AJMERA INTERNATIONAL
		ELECTRO CONTROLS & DEVICES
		PHOENIX MECANO LTD.
		ADROIT CONTROL ENGINEERS PVT.LTD.
7	INDUSTRIAL RECEPTACLES & HAND LAMPS	AJMERA INDUSTRIES & ENGG. WORKS
		CROMPTON GREAVES
		CYCLO ELECTRIC DEVICE & SERV. CO.
		BCH
		BEST & CROMPTON
8	FLAME PROOF RECEPTACLES	SUDHIR SWITCHGEAR PVT. LTD.
		FLAME PROOF CONTROLGEAR (FCG)
9	CEILING FANS & PEDESTAL FANS	REPUTED MAKE
10	EMERENGENCY LIGHTING UNIT (FIXED & PORTABLE TYPE)	PROLITE PRODUCTS
		BAJAJ ELECTRICALS
11	24V SUPPLY MODULE WITH COMPLETE ACCESSORIES & LAMP UNIT	POWER PACK ENTERPRISES
		AMES IMPEX
		INDOCOIL
12	FLEXIBLE LEAD COATED CONDUIT	PLICA
13	EXIT SIGN	REPUTED MAKE

14	LADDER	REPUTED MAKE
15	CABLE GLAND	ARUP ENGG. & FOUNDRY WORKS
		COMMET BRASS PRODUCTS
		ELECTROMAC INDUSTRIES
		BALIGA LIGHTING EQPT.
		INCAB
		ALLIED TRADERS
		DOWELL'S ELECTRICALS
16	CABLE LUGS	DOWELLS
		UNIVERSAL MACHINES
17	FUSE BASE	GE POWER
		L & T
		ALSTOM LTD.
		SIEMENS
		C & S ELECTRIC
		SCHNEIDER
		INDO ASIAN
		SPACEAGE
		ABB
18	FUSES	GE POWER
		SIEMENS
		ALSTOM LTD.
		L & T
		C & S ELECTRIC
		SCHNEIDER
		INDO ASIAN
		SPACEAGE
		ABB
19	INDICATING LAMP (LED)	SIEMENS
		C & S ELECTRIC
		VAISHNO
		BCH
		GE POWER
		SCHNEIDER
		ESSEN DEINKI
20	MINIATURE CIRCUIT BREAKER (MCB)	SCHNEIDER
		INDO ASIAN
		MDS SWITCHGEAR
		S & S POWER SWITCHGEAR
21	TERMINALS BLOCK(FIXED/DRAWOUT)	PHOENIX
		CONNECT WELL
		ELEMEX
		WAGO
		ESSEN DEINKI
		TECHNOPLAST
22	HUME PIPE	REPUTED MAKE

Note:

The makes of all equipment/ instrument under this specification shall be subject 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 11 OF 18

**ANNEXURE – D
DOCUMENTS REQUIRED AFTER AWARD OF LOI**

S. NO.	DRAWING NO.	DRAWING TITLE
1	PE-V0-411-558-E028	GA DRAWING OF FIXTURE TYPE (SF63) WITH CACG
2	PE-V0-411-558-E095	GA DRAWING OF FIXTURE TYPE (SF64) WITH CACG
3	PE-V0-411-558-E029	GA DRAWING OF FIXTURE TYPE (SF66) WITH CACG
4	PE-V0-411-558-E030	GA DRAWING OF FIXTURE TYPE (SB11)
5	PE-V0-411-558-E031	GA DRAWING OF FIXTURE TYPE (SB02)
6	PE-V0-411-558-E032	GA DRAWING OF FIXTURE TYPE (SB03)
7	PE-V0-411-558-E033	GA DRAWING OF FIXTURE TYPE (SS61)
8	PE-V0-411-558-E034	GA DRAWING OF FIXTURE TYPE (SS62)
9	PE-V0-411-558-E035	GA DRAWING OF FIXTURE TYPE (SS63)
10	PE-V0-411-558-E036	GA DRAWING OF FIXTURE TYPE (SW41)
11	PE-V0-411-558-E037	GA DRAWING OF FIXTURE TYPE (SW42)
12	PE-V0-411-558-E038	GA DRAWING OF FIXTURE TYPE (MW96)
13	PE-V0-411-558-E085	GA DRAWING OF DOWNLIGHTER 1x18W CFL
14	PE-V0-411-558-E086	GA DRAWING OF FIXTURE TYPE (FC02)
15	PE-V0-411-558-E087	GA DRAWING OF FIXTURE TYPE (FC06)
16	PE-V0-411-558-E088	GA DRAWING OF FIXTURE TYPE (FC26)
17	PE-V0-411-558-E089	GA DRAWING OF FIXTURE TYPE (FC30)
18	PE-V0-411-558-E090	GA DRAWING OF FIXTURE TYPE (FC32)
19	PE-V0-411-558-E091	GA DRAWING OF FIXTURE TYPE (FC81)
20	PE-V0-411-558-E092	GA DRAWING OF FIXTURE TYPE (FC07)
21	PE-V0-411-558-E093	GA DRAWING OF FIXTURE TYPE (FC33)
22	PE-V0-411-558-E094	GA DRAWING OF FIXTURE TYPE (FC34)
23	PE-V0-411-558-E056	GA DRAWING OF SWITCH BOARD-TYPE SWB1
24	PE-V0-411-558-E057	GA DRAWING OF SWITCH BOARD-TYPE SWB2
25	PE-V0-411-558-E058	GA DRAWING OF SWITCH BOARD-TYPE SWB3
26	PE-V0-411-558-E059	GA DRAWING OF JB TYPE- JB-F
27	PE-V0-411-558-E060	GA DRAWING OF JB TYPE- JB-FE
28	PE-V0-411-558-E062	GA DRAWING OF RECEPTACLE RA
29	PE-V0-411-558-E063	GA OF FLAME PROOF RECEPTACLE TYPE RA
30	PE-V0-411-558-E064	GA DRAWING OF RECEPTACLE RB
31	PE-V0-411-558-E065	GA DRAWING OF RECEPTACLE RC
32	PE-V0-411-558-E095	GA OF FLAME PROOF RECEPTACLE TYPE RC
33	PE-V0-411-558-E067	GA DRAWING OF CEILING FAN 1400MM



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 12 OF 18

34	PE-V0-411-558-E068	GA DRAWING OF CEILING FAN 1200MM
35	PE-V0-411-558-E069	GA DRAWING OF EMERGENCY LIGHTING UNIT
36	PE-V0-411-558-E070	GA DRAWING OF 24V AC SUPPLY MODULE-FIXED
37	PE-V0-411-558-E071	GA DRAWING OF 24V AC SUPPLY MODULE-PORTABLE
38	PE-V0-411-558-E072	GA DRAWING OF HAND LAMP
39	PE-V0-411-558-E073	GA DRAWING OF 5A,24V SWITCHED PLUG
40	PE-V0-411-558-E096	GA DRAWING OF FREE STANDING LADDER 5M
41	PE-V0-411-558-E097	GA DRAWING OF FREE STANDING LADDER 3M
42	PE-V0-411-558-E098	GA DRAWING OF WHEEL MOUNTED LADDER
43	PE-V0-411-558-E099	GA DRAWING OF SYNCHRONOUS TIMER 24 HRS.
44	PE-V0-411-558-E100	GA DRAWING OF 20 AMP ROTARY SWITCHES
45	PE-V0-411-558-E074	GA DRAWING OF EMERGENCY EXIT SIGN
46	PE-V0-411-558-E079	MOUNTING ARRANGEMENT OF LIGHTING FIXTURE IN FALSE CEILING AREA
47	PE-V0-411-558-E080	MOUNTING ARRANGEMENT OF WELL GLASS FIXTURE
48	PE-V0-411-558-E082	MOUNTING ARRANGEMENT OF HIGH/ MEDIUM BAY FIXTURE
49	PE-V0-411-558-E083	MOUNTING ARRANGEMENT OF FLOOD LIGHT FIXTURE
50	PE-V0-411-558-E084	MOUNTING ARRANGEMENT OF SWITCH/ RECEPTACLE BOXES
51	PE-V0-411-558-E401	TDS OF 20 MM DIA PVC COATED CONDUIT
52	PE-V0-411-558-E402	TDS OF 28W T5 FLUORESCENT TUBE
53	PE-V0-411-558-E403	TDS OF 14W T5 FLUORESCENT TUBE
54	PE-V0-411-558-E404	TDS OF 18W CFL
55	PE-V0-411-558-E405	TDS OF 125W HPMV LAMP (SON-E)
56	PE-V0-411-558-E406	TDS OF 70W HPSV LAMP (SON-E)
57	PE-V0-411-558-E407	TDS OF 150W HPSV LAMP (SON-E)
58	PE-V0-411-558-E408	TDS OF 250W HPSV LAMP (SON-E)
59	PE-V0-411-558-E409	TDS OF 400W HPSV LAMP (SON-E)
60	PE-V0-411-558-E410	TDS OF 70W HPSV LAMP (SON-T)
61	PE-V0-411-558-E411	TDS OF 150W HPSV LAMP (SON-T)
62	PE-V0-411-558-E412	TDS OF 250W HPSV LAMP (SON-T)
63	PE-V0-411-558-E413	TDS OF 400W HPSV LAMP (SON-T)
64	PE-V0-411-558-E101	LDC MV SWITCHGEAR ROOM
65	PE-V0-411-558-E103	LDC MAIN SWITCHGEAR ROOM
66	PE-V0-411-558-E105	LDC BOILER SWITCHGEAR ROOM
67	PE-V0-411-558-E106	LDC BELOW MV SWGR ROOM



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 13 OF 18

68	PE-V0-411-558-E108	LDC BELOW MAIN SWITCHGEAR ROOM
69	PE-V0-411-558-E110	LDC BELOW BOILER SWITCHGEAR ROOM
70	PE-V0-411-558-E112	LDC 220V DC BATTERY ROOM
71	PE-V0-411-558-E114	LDC TG HALL OPERATING FLOOR
72	PE-V0-411-558-E115	LDC MAIN / COMMON CONTROL ROOM
73	PE-V0-411-558-E116	LDC SWAS ROOM
74	PE-V0-411-558-E117	LDC AHU ROOM
75	PE-V0-411-558-E118	LDC EER ROOM
76	PE-V0-411-558-E119	LDC TG HALL GROUND FLOOR
77	PE-V0-411-558-E120	LDC TG HALL MEZZANINE FLOOR
78	PE-V0-411-558-E122	LDC DEARATOR FLOOR
79	PE-V0-411-558-E123	LDC ESP CONTROL ROOM
80	PE-V0-411-558-E124	LDC ESP PLATFORMS
81	PE-V0-411-558-E125	LDC BOILER EL0.0M & MILL AREA
82	PE-V0-411-558-E126	LDC ID & PA FAN AREA
83	PE-V0-411-558-E127	LDC BOILER PLATFORMS
84	PE-V0-411-558-E128	LDC TRANSFORMER YARD
85	PE-V0-411-558-E129	LDC ROADS
86	PE-V0-411-558-E130	LDC DG BUILDING
87	PE-V0-411-558-E131	LDC COMPRESSOR HOUSE
88	PE-V0-411-558-E132	LDC SERVICE BUILDING
89	PE-V0-411-558-E133	LDC ADMIN BUILDING
90	PE-V0-411-558-E134	LDC SECURITY & TIME OFFICE
91	PE-V0-411-558-E135	LDC FUEL OIL PUMP HOUSE
92	PE-V0-411-558-E142	LDC WORKSHOP BILDING
93	PE-V0-411-558-E143	LDC FIRE WATER PUMP HOUSE
94	PE-V0-411-558-E149	LDC CANTEEN BUILDING
95	PE-V0-411-558-E150	LDC CHLORINATION PLANT
96	PE-V0-411-558-E151	LDC AIR WASHER BUILDING
97	PE-V0-411-558-E153	LDC INFLAMMABLE STORE & OFFICE
98	PE-V0-411-558-E154	LDC FUEL OIL TRANSFER PUMP HOUSE
99	PE-V0-411-558-E155	LDC CLARIFIED WATER PUMP HOUSE
100	PE-V0-411-558-E156	LDC CONDENSATE TRANSFER PUMP HOUSE
101	PE-V0-411-558-E157	LDC FIRE STATION
102	PE-V0-411-558-E158	LDC AC PLANT
103	PE-V0-411-558-E159	LDC COAL FUEL OIL LAB



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 14 OF 18

104	PE-V0-411-558-E160	LDC ENVIORNMENT LAB
105	PE-V0-411-558-E161	LDC C&I LAB
106	PE-V0-411-558-E162	LDC BATTERY ROOM (UPS)
107	PE-V0-411-558-E163	LDC CHARGER ROOM (220 V DC)
108	PE-V0-411-558-E164	LDC CHARGER ROOM (UPS)
109	PE-V0-411-558-E165	LDC RESERVIOR
110	PE-V0-411-558-E166	LDC CHLORINATION PLANT
111	PE-V0-411-558-E167	LDC CWTP (PH+ELEC BUILDING)
112	PE-V0-411-558-E168	LDC ETP
113	PE-V0-411-558-E169	LDC STP
114	PE-V0-411-558-E170	LDC PTP
115	PE-V0-411-558-E171	LDC DM PLANT
116	PE-V0-411-558-E172	LDC CST
117	PE-V0-411-558-E173	LDC CENTRAL LUBE OIL PUMP HOUSE
118	PE-V0-411-558-E174	LDC FOAM PUMP HOUSE
119	PE-V0-411-558-E175	LDC BOOSTER PUMP HOUSE
120	PE-V0-411-558-E176	LDC WORKSHOP
121	PE-V0-411-558-E177	LDC WATCH TOWER
122	PE-V0-411-558-E178	LDC PARKING AREA
123	PE-V0-411-558-E179	LDC WEIGH BRIDGE
124	PE-V0-411-558-E180	LDC OPEN STORAGE SHED
125	PE-V0-411-558-E201	LLO MV SWITCHGEAR ROOM
126	PE-V0-411-558-E203	LLO MAIN SWITCHGEAR ROOM
127	PE-V0-411-558-E205	LLO BOILER SWITCHGEAR ROOM
128	PE-V0-411-558-E206	LLO BELOW MV SWGR ROOM
129	PE-V0-411-558-E208	LLO BELOW MAIN SWITCHGEAR ROOM
130	PE-V0-411-558-E210	LLO BELOW BOILER SWITCHGEAR ROOM
131	PE-V0-411-558-E212	LLO 220V DC BATTERY ROOM
132	PE-V0-411-558-E215	LLO MAIN / COMMON CONTROL ROOM
133	PE-V0-411-558-E216	LLO SWAS ROOM
134	PE-V0-411-558-E217	LLO AHU ROOM
135	PE-V0-411-558-E218	LLO EER ROOM
136	PE-V0-411-558-E219	LLO TG HALL GROUND FLOOR
137	PE-V0-411-558-E220	LLO TG HALL MEZZANINE FLOOR
138	PE-V0-411-558-E221	LLO TG HALL OPRTAING FLOOR
139	PE-V0-411-558-E222	LLO DEARATOR FLOOR



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 15 OF 18

140	PE-V0-411-558-E223	LLO ESP CONTROL ROOM
141	PE-V0-411-558-E224	LLO ESP PLATFORMS
142	PE-V0-411-558-E225	LLO BOILER EL0.0M & MILL AREA
143	PE-V0-411-558-E226	LLO ID & PA FAN ARE
144	PE-V0-411-558-E227	LLO BOILER PLATFORMS
145	PE-V0-411-558-E228	LLO TRANSFORMER YARD
146	PE-V0-411-558-E229	LLO ROADS
147	PE-V0-411-558-E230	LLO DG BUILDING
148	PE-V0-411-558-E231	LLO COMPRESSOR HOUSE
149	PE-V0-411-558-E232	LLO SERVICE BUILDING
150	PE-V0-411-558-E233	LLO ADMIN BUILDING
151	PE-V0-411-558-E234	LLO SECURITY & TIME OFFICE
152	PE-V0-411-558-E235	LLO FUEL OIL PUMP HOUSE
153	PE-V0-411-558-E242	LLO WORKSHOP BILDING
154	PE-V0-411-558-E243	LLO FIRE WATER PUMP HOUSE
155	PE-V0-411-558-E249	LLO CANTEEN BUILDING
156	PE-V0-411-558-E250	LLO CHLORINATION PLANT
157	PE-V0-411-558-E251	LLO AIR WASHER BUILDING
158	PE-V0-411-558-E253	LLO INFLAMMABLE STORE & OFFICE
159	PE-V0-411-558-E254	LLO FUEL OIL TRANSFER PUMP HOUSE
160	PE-V0-411-558-E255	LLO CLARIFIED WATER PUMP HOUSE
161	PE-V0-411-558-E256	LLO CONDENSATE TRANSFER PUMP HOUSE
162	PE-V0-411-558-E257	LLO FIRE STATION
163	PE-V0-411-558-E258	LLO AC PLANT
164	PE-V0-411-558-E259	LLO COAL FUEL OIL LAB
165	PE-V0-411-558-E260	LLO ENVIORNMENT LAB
166	PE-V0-411-558-E261	LLO C&I LAB
167	PE-V0-411-558-E262	LLO BATTERY ROOM (UPS)
168	PE-V0-411-558-E263	LLO CHARGER ROOM (220 V DC)
169	PE-V0-411-558-E264	LLO CHARGER ROOM (UPS)
170	PE-V0-411-558-E265	LLO RESERVIOR
171	PE-V0-411-558-E266	LLO CHLORINATION PLANT
172	PE-V0-411-558-E267	LLO CWTP (PH+ELEC BUILDING)
173	PE-V0-411-558-E268	LLO ETP
174	PE-V0-411-558-E269	LLO STP
175	PE-V0-411-558-E270	LLO PTP



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 16 OF 18

176	PE-V0-411-558-E271	LLO DM PLANT
177	PE-V0-411-558-E272	LLO CST
178	PE-V0-411-558-E273	LLO CENTRAL LUBE OIL PUMP HOUSE
179	PE-V0-411-558-E274	LLO FOAM PUMP HOUSE
180	PE-V0-411-558-E275	LLO BOOSTER PUMP HOUSE
181	PE-V0-411-558-E276	LLO WORKSHOP
182	PE-V0-411-558-E277	LLO WATCH TOWER
183	PE-V0-411-558-E278	LLO PARKING AREA
184	PE-V0-411-558-E279	LLO WEIGH BRIDGE
185	PE-V0-411-558-E280	LLO OPEN STORAGE SHED
186	PE-V0-411-558-E301	CLO MV SWITCHGEAR ROOM
187	PE-V0-411-558-E303	CLO MAIN SWITCHGEAR ROOM
188	PE-V0-411-558-E305	CLO BOILER SWITCHGEAR ROOM
189	PE-V0-411-558-E306	CLO BELOW MV SWGR ROOM
190	PE-V0-411-558-E308	CLO BELOW MAIN SWITCHGEAR ROOM
191	PE-V0-411-558-E310	CLO BELOW BOILER SWITCHGEAR ROOM
192	PE-V0-411-558-E312	CLO 220V DC BATTERY ROOM
193	PE-V0-411-558-E315	CLO MAIN / COMMON CONTROL ROOM
194	PE-V0-411-558-E316	CLO SWAS ROOM
195	PE-V0-411-558-E317	CLO AHU ROOM
196	PE-V0-411-558-E318	CLO EER ROOM
197	PE-V0-411-558-E319	CLO TG HALL GROUND FLOOR
198	PE-V0-411-558-E320	CLO TG HALL MEZZANINE FLOOR
199	PE-V0-411-558-E321	CLO TG HALL OPRTAING FLOOR
200	PE-V0-411-558-E322	CLO DEARATOR FLOOR
201	PE-V0-411-558-E323	CLO ESP CONTROL ROOM
202	PE-V0-411-558-E324	CLO ESP PLATFORMS
203	PE-V0-411-558-E325	CLO BOILER EL0.0M & MILL AREA
204	PE-V0-411-558-E326	CLO ID & PA FAN ARE
205	PE-V0-411-558-E327	CLO BOILER PLATFORMS
206	PE-V0-411-558-E328	CLO TRANSFORMER YARD
207	PE-V0-411-558-E329	CLO ROADS
208	PE-V0-411-558-E330	CLO DG BUILDING
209	PE-V0-411-558-E331	CLO COMPRESSOR HOUSE
210	PE-V0-411-558-E332	CLO SERVICE BUILDING
211	PE-V0-411-558-E333	CLO ADMIN BUILDING



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 17 OF 18

212	PE-V0-411-558-E334	CLO SECURITY & TIME OFFICE
213	PE-V0-411-558-E335	CLO FUEL OIL PUMP HOUSE
214	PE-V0-411-558-E342	CLO WORKSHOP BILDING
215	PE-V0-411-558-E343	CLO FIRE WATER PUMP HOUSE
216	PE-V0-411-558-E348	CLO PERMANENT STORE
217	PE-V0-411-558-E349	CLO CANTEEN BUILDING
218	PE-V0-411-558-E350	CLO CHLORINATION PLANT
219	PE-V0-411-558-E353	CLO INFLAMMABLE STORE & OFFICE
220	PE-V0-411-558-E354	CLO FUEL OIL TRANSFER PUMP HOUSE
221	PE-V0-411-558-E355	CLO CLARIFIED WATER PUMP HOUSE
222	PE-V0-411-558-E356	CLO CONDENSATE TRANSFER PUMP HOUSE
223	PE-V0-411-558-E357	CLO FIRE STATION
224	PE-V0-411-558-E358	CLO AC PLANT
225	PE-V0-411-558-E359	CLO COAL FUEL OIL LAB
226	PE-V0-411-558-E360	CLO ENVIORNMENT LAB
227	PE-V0-411-558-E361	CLO C&I LAB
228	PE-V0-411-558-E362	CLO BATTERY ROOM (UPS)
229	PE-V0-411-558-E363	CLO CHARGER ROOM (220 V DC)
230	PE-V0-411-558-E364	CLO CHARGER ROOM (UPS)
231	PE-V0-411-558-E365	CLO RESERVIOR
232	PE-V0-411-558-E366	CLO CHLORINATION PLANT
233	PE-V0-411-558-E367	CLO CWTP (PH+ELEC BUILDING)
234	PE-V0-411-558-E368	CLO ETP
235	PE-V0-411-558-E369	CLO STP
236	PE-V0-411-558-E370	CLO PTP
237	PE-V0-411-558-E371	CLO DM PLANT
238	PE-V0-411-558-E372	CLO CST
239	PE-V0-411-558-E373	CLO CENTRAL LUBE OIL PUMP HOUSE
240	PE-V0-411-558-E374	CLO FOAM PUMP HOUSE
241	PE-V0-411-558-E375	CLO BOOSTER PUMP HOUSE
242	PE-V0-411-558-E376	CLO WORKSHOP
243	PE-V0-411-558-E377	CLO WATCH TOWER
244	PE-V0-411-558-E378	CLO PARKING AREA
245	PE-V0-411-558-E379	CLO WEIGH BRIDGE
246	PE-V0-411-558-E380	CLO OPEN STORAGE SHED
247	PE-V0-411-558-E901	MQP FOR LUMINARIES



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS AND
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REV. 0

DATE: 16.10.2017

SHEET 18 OF 18

248	PE-V0-411-558-E905	MQP FOR MISCELLANEOUS ITEMS
249	PE-V0-411-558-E906	MQP FOR GALVANISED & EPOXY COATED RIGID CONDUIT
250	PE-V0-411-558-E916	FIELD QUALITY PLANT FOR LUMINARIES
251	PE-V0-411-558-E917	FIELD QUALITY PLANT FOR MISC ITEMS
252	PE-V0-411-558-E413	TECHNICAL DATA SHEET-C
253	PE-V0-411-558-E414	TYPE TEST REPORT FOR LUMINARIES
254	PE-V0-411-558-E415	TYPE TEST REPORT FOR MISC ITEMS

Note:

1. The above list of drawings and documents is indicative.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REVISION 0

DATE: 16.10.2017

SHEET 1 OF 9

DATA SHEET -A / C

S. No.	Description	Unit	Value
1.0	SYSTEM DESIGN DATA		
1.1	Design ambient	°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.	25 kA 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		



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REVISION 0

DATE: 16.10.2017

SHEET 2 OF 9

4.2	Degree of protection for drip proof luminaires		IPW-55
4.3	Flame proof luminaires		
a)	Hazardous area classification		IS 5572 Zone II Group IIA & IIB
b)	Degree of protection		IP55
c)	Mounting type for well glass		☒ Eye-bolt ☐ MS Galvanised Strap
4.4	Non-integral control gear box for HPMV/HPSV 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		IP-55 for indoor & IPW-55 for outdoor
d)	Surface treatment		☒ Painted ☐ Galvanized
e)	If galvanized		
	Process		Hot dip
	Weight of zinc (Thickness)	g/m ²	460 (65 micron)
f)	If painted		
	Paint shade as per IS 5		
	Minimum paint thickness	micron	80
4.5	Lamps		
a)	Type of Fluorescent Lamps		☒ Cool Daylight ☒ White Light
b)	Type of cap for incandescent lamp		☒ Screw type ☐ Pin type
c)	Type of HPMV lamp		☒ Clear ☐ Fluorescent powder coated
d)	Type of cap for HPMV & HPSV lamp		Screw type
e)	Type of beam for		
	HPMV lamps		☐ Short beam ☐ Long beam ☒ Both



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REVISION 0

DATE: 16.10.2017

SHEET 3 OF 9

	HPSV 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	6
d)	Lumen output of lamp at rated voltage	Lumen	After placement of order
e)	Type of battery		☒ Ni-Cd ☐ Lead-Acid ☐ Li-Ion
f)	AH capacity of battery	AH	After placement of order
g)	Battery voltage	V	After placement of order
h)	Battery backup time	Hr	2
4.7	Exit Sign		
a)	Lamp type		☒ FLT ☐ CFL ☐ LED
b)	Nos. of Lamp		1
c)	Lamp wattage	W	20
d)	Lumen output of lamp at rated voltage	Lumen	After placement of order
e)	Type of battery		☒ Ni-Cd ☐ Lead-Acid ☐ Li-Ion
f)	AH capacity of battery	AH	After placement of order
g)	Battery voltage	V	After placement of order
h)	Battery backup time	Hr	2.5
4.8	24V Supply Module		
a)	Enclosure		
	Enclosure material		☐ Cast aluminium alloy ☒ CRCA sheet steel
	Enclosure thickness	mm	☐ 3 for Cast aluminium alloy ☒ 2 for CRCA sheet steel
	Louvers provided		☒ Yes ☐ No
b)	Surface treatment		☐ Painted ☒ Galvanized
c)	If galvanized		



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REVISION 0 DATE: 16.10.2017

SHEET 4 OF 9

	Process		Hot dip
	Weight of zinc (Thickness)	g/m ²	460 (65 micron)
d)	If painted		
	Paint shade as per IS 5		631
	Minimum paint thickness	micron	50
e)	Transformer		
	Rating	VA	500
	Voltage ratio	V	240 V/26.5 V
	Class of insulation		Class F, temperature rise limited to Class-B
f)	24V Hand lamp unit		
	Lamp type		☒ Halogen ☐ LED
	Lamp wattage	W	40
g)	No. of outgoing sockets		4
h)	Whether cord coiling arrangement provided		☒ Yes air cooled ☐ No
5.0	Junction Box (other than Street Light Junction box)		
a)	Enclosure material		☐ FRP ☒ CRCA Sheet.
b)	Enclosure thickness	mm	2
c)	Galvanized (applicable for CRCA sheet)		☒ Yes ☐ No
d)	Degree of protection		IP-55 for indoor & IPW-55 for outdoor
6.0	Industrial/ Welding Receptacle		
a)	Enclosure material		☐ Heavy duty cast aluminium alloy ☒ CRCA sheet steel
b)	Enclosure thickness	mm	☐ 3 for cast aluminium alloy ☒ 2 for CRCA sheet steel
c)	Surface treatment		☐ Painted ☒ Galvanized
d)	If galvanized		
	Process		Hot dip
	Weight of zinc (Thickness)	g/m ²	460 (65 micron)
e)	If painted		
	Paint shade as per IS 5		631



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REVISION 0

DATE: 16.10.2017

SHEET 5 OF 9

	Minimum paint thickness	micron	50
f)	Degree of protection		IP-55
7.0	Decorative Receptacle		
a)	Enclosure material		[] Cast aluminium alloy [√] CRCA sheet steel
b)	Enclosure thickness	mm	[] 3 for cast aluminium alloy [√] 2 for CRCA sheet
c)	Surface treatment		[] Painted [√] Galvanized
d)	If galvanized		
	Process		Hot dip
	Weight of zinc (Thickness)	g/m ²	460 (65 micron)
e)	If painted		
	Paint shade as per IS 5		631
	Minimum paint thickness	micron	50
f)	Degree of protection		IP-55
8.0	Switch Box		
a)	Enclosure material		[] FRP [√] CRCA Sheet.
b)	Enclosure thickness	SWG	14 SWG
c)	Galvanized		[√] Yes [] No
d)	Degree of protection		IP-55
9.0	Conduit (Flexible)		
a)	Type		[√] Electrogalvanized [] Lead coated
b)	Size	mm	20
c)	Standard length	m	25 to 50
d)	Thickness of Galvanization	microns	25 microns
10.0	Cable Glands		By vendor for all incoming and outgoing cables
a)	Type		[√] Double compression [] Single compression
b)	Material		Brass
c)	Nickel Plating provided		[√] Yes [] No
d)	Flameproof glands with flameproof		[√] Yes [] No



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REVISION 0

DATE: 16.10.2017

SHEET 6 OF 9

	equipment		
11.0	Cable Lugs		By vendor for all incoming and outgoing cables
a)	Type		Crimping type/ ring type
b)	Material		Tinned copper
12.0	LADDERS		
a)	Type		[] Free standing [] wheel mounted [✓] both
b)	Material		[] Steel [✓] Aluminium
c)	Duty		[] Heavy [✓] Medium
d)	Surface treatment		[] Galvanised [✓] Painted

Note:

Detailed luminaire and lamp data shall be placed by vendor after award of contract



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REVISION 0

DATE: 16.10.2017

SHEET 7 OF 9

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

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



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REVISION 0

DATE: 16.10.2017

SHEET 8 OF 9

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 controlgear.	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



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-558-E006

VOLUME II

SECTION - I

REVISION 0

DATE: 16.10.2017

SHEET 9 OF 9

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



**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

SHEET 1 OF 1

SECTION – II

STANDARD TECHNICAL REQUIREMENTS



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 1 OF 38

**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS**



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 2 OF 38

CONTENTS

CLAUSE DESCRIPTION

- 1.0 INTENT OF SPECIFICATION
 - 2.0 CODES & STANDARDS
 - 3.0 LIGHTING SYSTEM DESCRIPTION (CONCEPTUAL VIEW)
 - 4.0 SYSTEM DESIGN ENGINEERING
 - 4.1 ENGINEERING INPUTS
 - 4.2 DESIGN CRITERIA
 - 4.3 ENGINEERING OUTPUTS
 - 5.0 LUMINAIRES, ACCESSORIES AND LAMPS
 - 5.1 GENERAL REQUIREMENTS OF LUMINAIRES
 - 5.2 LUMINAIRE & OTHER ITEMS
 - 5.3 CONTROLGEAR BOX (NON-INTEGRAL TYPE)
 - 5.4 REFLECTORS
 - 5.5 LAMP HOLDERS
 - 5.6 STARTER HOLDERS
 - 5.7 BALLASTS
 - 5.8 STARTERS
 - 5.9 CAPACITORS
 - 5.10 LAMPS
 - 5.11 JUNCTION BOXES
 - 5.12 RECEPTACLES
 - 5.13 CEILING FANS & REGULATORS
 - 5.14 LIGHTING CONTROL SWITCHBOXES
 - 5.15 CABLE GLANDS
 - 5.16 CABLE LUGS
 - 5.17 FLEXIBLE METALLIC CONDUITS AND FITTINGS
 - 5.18 PVC CONDUITS
 - 6.0 SURFACE TREATMENT
 - 7.0 PACKING
 - 8.0 GUARANTEED PERFORMANCE REQUIREMENTS
 - 9.0 INSPECTION & TESTING
 - 10.0 SPARES
 - 11.0 TOOLS & TACKLES
 - 12.0 DOCUMENTATION
- ANNEXURE-I: LUMINAIRE DETAILS



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 3 OF 38

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



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 4 OF 38

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



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 5 OF 38

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, annunciators 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



TECHNICAL SPECIFICATION FOR LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 6 OF 38

- 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 energised 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 switchgear. The DC supply will be automatically switched OFF after about 3 minutes



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 7 OF 38

following the restoration of supply to system.

normal AC or emergency AC lighting

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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 8 OF 38

- 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.

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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 9 OF 38

- 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 10 OF 38

- 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 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 11 OF 38

- 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". Sheets 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 12 OF 38

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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 13 OF 38

- 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 14 OF 38

- Separate side mounted and top connected controlgear box shall be provided for use with HPMV & HPSV lamps. Separate, non-integral controlgear box is also acceptable.
- Integral controlgear box, where applicable, shall be of die cast aluminium material with one piece neoprene gasket between the box and its cover to make it dust and vapour proof.
- 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 15 OF 38

- 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)



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 16 OF 38

- 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 17 OF 38

- 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 70 Lm/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



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 18 OF 38

- 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 loop-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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 19 OF 38

- 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 20 OF 38

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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 21 OF 38

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 galvanized. 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. |



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 22 OF 38

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.
- 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 mm² Al conductor.
 - II. Type RB: It shall have the following:



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 23 OF 38

- 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 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.
- 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:



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 24 OF 38

- 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 25 OF 38

- 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 SWB2a - 4 nos. 5A switches, JB type SW2.
- iv. Type SWB3 - 7 nos. 5A switches, 3 nos. fan regulator, JB type SW3.
- v. Type SWB3a - 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 mm² 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 26 OF 38

- 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



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 27 OF 38

- 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) Gasketing
 - d) Inter-changeability



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 28 OF 38

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 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 29 OF 38

- 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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 30 OF 38

- 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.



TECHNICAL SPECIFICATION FOR LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

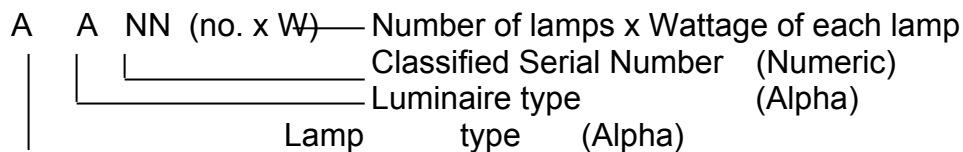
SHEET 31 OF 38

ANNEXURE-I

LUMINAIRE DETAILS

LUMINAIRE CODING SCHEME

1.0 Code Structure



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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 32 OF 38

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. |



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 33 OF 38

- | | | | |
|------|------|--------|---|
| 1.19 | FC32 | 2 x 20 | 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. |



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 34 OF 38

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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 35 OF 38

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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 36 OF 38

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.



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 37 OF 38

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. |



**TECHNICAL SPECIFICATION FOR
LIGHTING FIXTURES, LAMPS &
MISCELLANEOUS ITEMS**

SPECIFICATION NO. PE-SS-999-558-E006

VOLUME II

SECTION II

REVISION: 0

DATE: 8.09.2016

SHEET 38 OF 38

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.

		QUALITY PLAN		CUSTOMER : KARNATAKA POWER CO. LTD.		PROJECT TITLE : 370 MW YELAHANKA CCPP			SPECIFICATION NO. : PE-TS-409-558-E006 R0			
				BIDDER/ VENDOR :		STANDARD QP NO. : PE-QP-999-558-E906, REV.0			SPECIFICATION TITLE : LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS			
		SHEET 1 OF 2		SYSTEM : ILLUMINATION		ITEM : LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS			DOC. NO. :			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0	LUMINAIRES & LAMPS	1. ACCEPTANCE TEST a) VISUAL b) IR (Dry) c) HIGH VOLTAGE d) DUST PROOF e) PHOTOMETRIC 2. ROUTINE TEST a) VISUAL b) IR (Dry) c) HIGH VOLTAGE 3. TYPE TEST	MA CR CR CR CR MA CR CR MA	VISUAL ELECTRICAL ELECTRICAL ELECTRICAL ELECTRICAL VISUAL ELECTRICAL ELECTRICAL ELECTRICAL	IS 10322 (PART5 SEC1) IS 10322 -DO- -DO- -DO- * 100% -DO- -DO- 1 OF EACH TYPE	IS 10322 / APPROVED DRG. -DO- -DO- -DO- -DO- IS 10322 / APPROVED DRG. -DO- -DO- IS 10322 / IEC 62384/ IEC 61347	IS 10322 / APPROVED DRG. -DO- -DO- -DO- -DO- IS 10322 / APPROVED DRG. -DO- -DO- IS 10322 / IEC 62384/ IEC 61347	TEST CERT -DO- -DO- -DO- -DO- TEST CERT -DO- -DO- TEST REPORT	3/2 3/2 3/2 3/2 3/2 3/2 3/2 3/2 3/2	1 1 1 1 1 - - - - -	- - - - - 1 1 1**	AFTER SUCCESSFUL COMPLETION OF 1a, 1b & 1c FURTHER TESTING OF 1d) TO BE DONE BY PAPER INSERTION METHOD. * : ONE NO. LUMINAIRE OF EACH TYPE TO BE WITNESSED BY BHEL. MAIN VENDOR TO WITNESS AS PER IS-10322. ** : TYPE TEST CERTIFICATE TO BE FURNISHED FOR CLEARANCE FROM BHEL/ CUSTOMER
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDORS COMPANY SEAL				
LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION												

		QUALITY PLAN		CUSTOMER : KARNATAKA POWER CO. LTD.		PROJECT TITLE : 370 MW YELAHANKA CCPP			SPECIFICATION NO. : PE-TS-409-558-E006 R0			
				BIDDER/ VENDOR :		STANDARD QP NO. : PE-QP-999-558-E906, REV.0			SPECIFICATION TITLE : LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS			
		SHEET 1 OF 2		SYSTEM : ILLUMINATION		ITEM : LIGHTING FIXTURES, LAMPS & MISCELLANEOUS ITEMS			DOC. NO. :			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.0	JUNCTION BOXES & RECEPTACLES	1.DIMENSIONS 2.PAINT SHADE/ THICKNESS 3.HV/IR/HV 4.DEGREE OF PROTECTION 5.SPECIAL TESTS IF ANY,EXPLOSION PROOF ETC.	MA MA MA MA MA	MEASUREMENT VISUAL/ MEASUREMENT ELECT.TESTS TEST TEST	100% 10% 100% 1/SIZE 1/SIZE	APPROVED DRG. APPROVED DRG. 2KV AC FOR 1 MINUTE IS:5572 IS:60079	APPROVED DRG. APPROVED DRG. 2KV AC FOR 1 MINUTE IS:5572 IS:60079	INSP. REPORT -DO- -DO- TEST CERT. TEST CERT.	3 3 3 3 3	- - - - -	2 2 2 2,1 2,1	COMPONENTS TO BE OF APPROVED MAKE
NOTES: 1. IN CASE TYPE TEST CERTIFICATE FOR DEGREE OF PROTECTION/EXPLOSION PROOFNESS FROM INDEPENDENT LAB. IS NOT AVAILABLE, THE ITEM SHALL BE TESTED AT AN INDEPENDENT LAB. 2. ITEMS LIKE CEILING FANS, EMERGENCY LIGHTING UNIT, PVC CONDUIT, FLEXIBLE CONDUIT, EARTHING WIRE & FLATS, 24V SUPPLY MODULE, LADDERS, HUME PIPE, SWITCHBOXES, EXIT SIGNS, STRUCTURAL STEEL ETC. WILL BE CLEARED BASED ON COC (CERTIFICATE OF COMPLIANCE).												
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE									
LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION												
BIDDER'S/VENDORS COMPANY SEAL												