4 Painting

Battleship

Unless otherwise specified, the colour of finish shall be grey to shade No. 632 as per IS:5. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.

5 Testing and Inspection

5.1 Lighting panels, lighting fittings, lamps, socket outlets etc. and all accessories shall be subject to routine and type test in accordance with the requirement of appropriate Indian Standards in the presence of purchaser or purchaser's representative.

5.2 Tests at Site

On completion of erection work, the lighting installation shall then be tested and commissioned as per the requirement of appropriate Indian Standard in the presence of purchaser or purchaser representative. The test shall be made to ensure the guaranteed illumination level and level after 100 burning hours.

The tenderer shall furnish all required testing meters, instruments and equipment for testing all equipment specified.

6.0 SPARE PARTS

Recommended list of spares for commissioning and for operation and maintenance of the lighting system for a period specified in data Sheet-A shall be furnished. The tenderer shall furnish separate price and list of the same. Unit rates shall also be furnished in addition to total price.

7.0 Guaranteed performance Requirements

The vender shall guarantee satisfactory performance of equipment supplied under all conditions & requirement as laid down in the specification.

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8.0 DRAWINGS & DATA

General Arrangement Drawing of lighting panel
Single line distribution Diagram.
Detailed specification of the luminaire offered with dimensional and mounting details supported by illustrative leaflets.
Complete technical literature of equipment.

8.2 Drawings & Data to be furnished after award of contract

complete design calculation Sheets/arriving at the number and type of luminaire.
Design and calculation Sheets for the Selection of cables, MCBS, busbars.
Single line distribution diagram, General Arrangement Drawing of lighting panel.
Fixing and mounting detail of luminaires
Test certificates for all equipment.
Lighting layout plan showing luminaires, Sockets, conduit routing, conduit size, cable sizes, lighting panel etc.

9. Manufacturers catalogues/literatives for all equipment. Poler curves, Zonal flux diagram & C.U. charts of Luminaires

OPERATION AND MAINTENANCE MANUAL

Operation and maintenance manual of lighting shall contain the following:-

- Application of Lighting Luminaire with Lamp.
- Technical Data & Salient constructional feature of lighting equipment
- Instruction for maintenance of various lighting equipment.

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	LIGHTING FOR COOLING TOWER	SPECIFICATION NO. PES-558-02
		VOLUME NO. : II
		SECTION : D
		REV NO. : 00 DATE : 20/04/07
	DATA SHEET- A	SHEET : 1 OF 1

1. Details of Supply System
   a) Rated Voltage
   b) Rated frequency
   c) Combiend voltage and fiequency variation
   d) System fault level at rated voltage
   e) LV System grounding
   f) Design Ambient
2. Lighting Panel
   a) Enclosure
   b) Thickness
   c) Type
   d) Busbar Material
   e) Degree of protection
   f) Paint Finish
      i) Exterior:
      ii) Interior:
3. Cable
   Conductor material.
   Voltage grade.
4. Operation & maintenance Spares required for
5. Junction box
   a) Enclosure
   b) Thickness
   c) Type
   d) Degree of protection
6. Type of conduit

भारत हेवी इलेक्ट्रिकल्स लिमिटेड BHEL	LIGHTING FOR COOLING TOWER DATA SHEET – C	SPECIFICATION NO. PES-558-02 VOLUME NO. : II SECTION : D REV NO. : 00 DATE : 20/04/07 SHEET : 1 OF 4

1. Lighting Panel

a) Make

b) Type

c) Enclosure

i) Sheet Steel thickness (mm)

ii) degree of protection

d) Busbars

i) Material

ii) Size

iii) Maximum continuous current rating.

iv) Short time rating (for-sec)KA

e) Finish

Colour

Shade as per IS

f) Earthing busbar

i) Material

ii) Size

g) Switch

i) Make

ii) Type

iii) Rating

iv) Switch conforms to.

h) Miniature circuit breaker

i) Make

ii) Type

iii) No. of poles

iv) Rated voltage

v) Current rating at design Ambient..

vi) Short circuit Interrupting cap...

vii) Type ... device

viii) Type of over load thermal/magnetic

ix) Miniature breaker conforms to

i) Earthing terminal provided

j) Lighting panel outgoing feeder (NOS)

k) Dimensions (LengthxDepthxHeight) (mm)

l) Weight (kg.)

m) Whether lighting panel supplied will be complete with terminal blocks, Neutral links, Danger notice plate, Designation plate, gland plate with rubber gasket, circuit directory, cable glands & lug etc.?

2. Conduit

a) Make

b) Type

c) Size

d) Applicable Standard.

3. Junction box

a) Make

b) Material

c) Size

d) Applicable Standard

4. Socket outlet

a) Make

b) Type

c) Rating (A)

d) Voltage (V)

e) Applicable standard

5. Cables

a) [illegible]

b) [illegible]

c) [illegible] grade

d) Applicable standard

e) Conductor

Material

) Size

) Insulation

) Material

) Armouring

Diameter

) Insulation

Material

i) Continuous current rating at designed ambient.

j) Approximate overall Dia.

6) Luminatres

a) Make.

b) Type

c) Type of mounting

d) Material of luminaire

e) Material of support/Bracket

f) Type of lamp holder

g) Power factor

h) Ballast losses in watts

i) Capacitor rating

j) Weight of luminaire

k) Applicable standards.

7 Lamps

a) Make

b) Type

) Wattage

) [illegible]inal [illegible]

Light ou[illegible] ([illegible])

OBSTRUCTION LIGHTING SYSTEM

(i) Aviation obstruction lighting system shall conform to the requirements of the latest Indian Standard, the International Civil Aviation organisation (ICAO), the instruction issued by the Director General of Civil Aviation - India and the Directorate of Air Routes & Aerodromes' (DARA) circular No. 3 of 1987.

(ii) All aviation obstruction lights shall be of high intensity aviation obstruction lights having an effective intensity of 4000 to 2,00,000 cd depending upon back ground illuminance. The aviation obstruction lighting system shall be of type FTB 205 and FTC 110N of Flash Technology Corporation of USA or equivalent. Three levels will be provided with aviation obstruction lights and there will be four light units per level. The lowest level should not be lower than 75 meters above the ground and vertical spacing of the intermediate levels could vary between 75 and 105 meters. Aviation obstruction lighting shall be complete with lights, photocell, controller, special cables, etc.

(iii) All aviation fixtures and accessories shall be outdoor type conforming to degree of protection IPW-55.

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00

1.0 INTENT OF SPECIFIATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer's work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0 CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement ofr rotating electrical machnines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechnical vibration of rotatinf electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0 DESIGN REQUIREMENTS

3.1 Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2 Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3 Starting Requirements

3.3.1 Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.3.2 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.

The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.

3.3.3 The following frequency of starts shall apply

i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.

ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)

iii) Motors for coal conveyor and coal crusher application shall be suitable fro three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be sutable fro mimimum 20,000 starts during the life time of the motor

3.4 **Running Requirements**

3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.

3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.

3.5 **Stress During bus Transfer**

3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechnical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.

3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.

3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.

4.0 **CONSTRUCTIONAL FEATURES**

4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy

4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.

Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled

4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.

4.4. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.

4.5 Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.

4.6 In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation.
In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.

4.7 **Terminals and Terminal Boxes**

4.7.1 Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.

Unless otherwise statedin Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".

4.7.2 Unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.

4.7.3 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or V W & V respectively.

4.7.4 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.

4.7.5 Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.

4.7.6 Degree of protection for terminal boxes shall be IP 55 as per IS 4691.

4.7.7 Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.

4.7.8. Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.

4.7.9 Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.

4.8 Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.

4.9 **General**

4.9.1 Motors provided for similar drives shall be interchangeable.

4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.

4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.

4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.

4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.

4.9.6 Name plate with all particulars as per IS: 325 shall be provided

4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.

5.0 INSPECTION AND TESTING

5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.

5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.

5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.

5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.

6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT

a) OGA drawing showing the position of terminal boxes, earthing connections etc.
b) Arrangement drawing of terminal boxes.
c) Characteristic curves:
(*To be given for motor above 55 kW unless otherwise specified in Data Sheet*).

i) Current vs. time at rated voltage and minimum starting voltage.
ii) Speed vs. time at rated voltage and minimum starting voltage.
iii) Torque vs. speed at rated voltage and minimum voltage.
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.
iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.

15.0 LIGHTING SYSTEM

S.NO.	DESCRIPTION	UNITS	VALUE
A	**Lighting distribution board**		
1.0	**AC Lighting distribution board (AC LDB)**		
1.1	LDB type		Single front, Fixed type
1.2	Sheet thickness	mm	2.0
1.3	Degree of protection		
	a) Main Panel		IP:52
	b) Transformer Cubicle (where provided)		IP:42
1.4	Lighting transformer rating	kVA	100/ 50 kVA
1.5	No. of incomer		One
1.6	Incomer type		TPN SFU
1.6	Incomer rating	A	As per lighting transformer rating
1.7	Outgoing type		TPN SFU
1.8	No. of outgoing feeders	Nos.	12 or 8
1.9	Outgoing feeder rating	A	63
1.10	Metering on LDB		Ammeter & Voltmeter with selector switch
1.0	**DC Lighting distribution board (DC LDB)**		
1.1	LDB type		Single front, Fixed type
1.2	Sheet thickness	mm	2.0
1.3	Degree of protection		IP:52
1.4	No. of incomer		One
1.5	Incomer type		DP SFU with contactor
1.6	Incomer rating	A	125 A
1.7	Outgoing type		DP SFU
1.8	No. of outgoing feeders	Nos.	12 or 6
1.9	Outgoing feeder rating	A	32
B	**Lighting Panel**		
1.0	**AC Lighting Panel**		
1.1	Sheet thickness	mm	2.0
1.2	Degree of protection		
	a) Indoor		IP:54

	b) Outdoor		IP:55 (with canopy)
1.3	Incomer type		TPN SFU
1.4	Incomer rating	A	63A
1.5	Timer provided for ON/OFF control		
	a) Indoor panel		No
	b) Outdoor panel		Yes
1.6	Outgoing type		SPN MCB
1.7	No. of outgoing feeders	Nos.	18, 12, 6
1.8	Outgoing feeder rating	A	20A
1.0	**Street Lighting Panel**		
1.1	Sheet thickness	mm	2.0
1.2	Degree of protection		IP:55 (with canopy)
1.3	Incomer type		TPN SFU
1.4	Incomer rating	A	63A
1.5	Timer provided for ON/OFF control		Yes
1.6	Outgoing type		TPN MCB
1.7	No. of outgoing feeders	Nos.	6
1.8	Outgoing feeder rating	A	20A
1.0	**DC Lighting Panel**		
1.1	Sheet thickness	mm	2.0
1.2	Degree of protection		
	a) Indoor		IP:54
	b) Outdoor		IP:55 (with canopy)
1.3	Incomer type		DP SFU
1.4	Incomer rating	A	32A
1.6	Outgoing type		DP MCB
1.7	No. of outgoing feeders	Nos.	6
1.8	Outgoing feeder rating	A	20A
C	**LDBs & LPs COMPONENT DETAILS**		
3.0	**Miniature Circuit Breaker**		
3.1	Applicable standard		IS:8828
3.2	Short time rating	kA	9
4.0	**Isolator**		
4.1	Type		Air-break

5.0	**Fuses**		
5.1	Type		HRC
5.2	Applicable standard		IS:9224
6.0	**Contactor**		
6.1	Type		Air-break
6.2	Applicable standard		IS:2959
D	**OTHER LIGHTING EQUIPMENTS**		
1.0	**Emergency Lighting Unit (ELU)**		
1.1	Application		Off-site indoor areas for safe personal movement
1.2	Battery backup time		2 Hours
1.3	Battery type		Ni-Cd
1.4	Fluorescent Lamp		2x10 W
1.0	**24V supply module**		
1.1	Application		For maintenance purpose in TG Hall, Deaerator, Boiler platforms, ESP
1.2	Type		Fixed/ Portable
1.0	**24V Hand lamp unit**		
1.1	Lamp wattage		40W
1.2	Cable size & length		1.5 sq. mm, 15 meter
1.0	**Exit Lamp**		
1.1	Application		For safe exit of personal
1.2	Battery backup time		30 Minutes
1.3	Battery type		Ni-Cd
E	**LIGHTING FIXTURE DETAILS**		
	Applicable standard		Indian Standards
1.0	**Fluorescent fixture**		
1.1	Fluorescent fixture type		Energy Efficient T5 type
1.2	Fluorescent amp		28W
1.3	Fluorescent fixture application		CCR, CER, Switchgear/ Charger/ UPS rooms, cable vault, office area, Conference rooms, Battery rooms, AC

			plant, Air washer rooms, Labs, Corridor & passage etc.
1.0	**HPSV fixtures**		
1.1	HPSV fixtures type		As per requirement
1.2	HPSV lamp	Watt	70, 150, 250, 400 Watt
1.3	HPSV fixture application		TG Hall, Boiler/ESP platforms, Boiler area, Mill area, ID fan area, DG room, Compressor house, Pump houses, Outdoor lighting, street lighting etc.
1.0	**HPMV fixtures**		
1.1	HPMV fixtures type		As per requirement
1.2	HPMV lamp	Watt	125 Watt
1.3	HPMV fixture application		Only in hazardous area
1.0	**CFL fixture**		
1.6	CFL fixture		As per requirement
1.2	CFL lamp	Watt	As per requirement
1.3	CFL fixture application		DC emergency lighting, Corridor & passage etc.
F	**Receptacles**		
1.1	Material		Sheet steel
1.2	Thickness	mm	1.6
1.3	Type		Hot dipped galvanised
1.4	Degree of Protection		IP:55
1.5	Receptacles type & rating		
	RA Type (Industrial type)		20A, 240V
	RB Type (Decorative type)		5/15A, 240V
	RC Type (Welding Receptacle)		63A, 415V
G	**Junction Boxes**		
1.1	Material		Sheet steel
1.2	Thickness	mm	2
1.3	Type		Hot dipped galvanised
1.4	Degree of Protection		IP:55
H	**Rigid steel Conduits**		
1.1	Material		Hot dipped galvanized
1.2	Type		Medium duty
1.3	Minimum dia	mm	20
1.4	Size	mm	20, 25, 40, 50 mm

1.5	Conduit Thickness	mm	1.6mm upto 25 mm dia 2.0 mm above 25 dia
I	**Flexible Conduits**		
1.1	Material		Cold rolled annealed and electro galvanized mild steel strips coated with PVC
1.2	Type		electro galvanized
1.3	Size	mm	20
J	**Lighting wires**		
1.1	Voltage grade	V	1100
1.2	Size	mm sq.	1.5, 2.5, 4.0 sq. mm Lighting panel to Fixtures-1.5 sq. mm Lighting panel to JBs/ Swithches-2.5 sq. mm JBs/ Switches to Fixtures-1.5 sq.mm Lighting panels to receptacles-4.0 sq. mm First receptacles to looping other receptacles-4.0 sq.mm
1.3	Conductor material		Copper
1.4	InsulatIon		PVC
K	**Lighting poles**		
1.1	Type		Tubular, Painted
1.2	Pole height	M	11/13 meter as per IS:2713

ANNEXURE-I

AVERAGE LUX LEVEL & TYPE OF FIXTURES

S. No.	LOCATION	AVERAGE LUX LEVEL	TYPE OF LIGHTING FIXTURES
01	TG Hall operating floors	200	HPSV, high bay fixture with anodised Al reflector
02	TG hall ground, mezzanine floor	200	HPSV, Industrial well glass with integral control gear
03	Switchgear/ Charger rooms	200	FTL, Industrial type with vitreous enamel reflector
04	Central control room	300	FTL, Decorative recessed with wide angle, mirror optics, anti-glare type
05	Office areas, Conference rooms	300	FTL, Decorative recessed with wide angle, mirror optics, anti-glare type
06	UPS/ Operator room	300	FTL, Industrial type with vitreous enamel reflector
07	Battery rooms	200	FTL, corrosion proof, totally enclosed type with sheet aluminium housing.
08	Cable Vault	70	FTL, Industrial type with vitreous enamel reflector
09	Transformer yard	30 (General) 50 (On Equip)	HPSV, flood light, general purpose.
10	Boiler/ HRSG platforms	100	HPSV, dust proof/ dust tight well glass fixture
11	Boiler/ HRSG burner platforms	100	HPSV, dust proof/ dust tight well glass fixture
12	ESP platforms	100	HPSV, dust proof/ dust tight well glass fixture
13	ESP control room	300	FTL, Decorative recessed with wide angle, mirror optics, anti-glare type
14	DG room	200	HPSV, medium bay, industrial type.
15	AC plant/ Air washer room	200	FTL, industrial box type base without any cover.
16	Compressor room	150	HPSV, dust proof/ dust tight well glass fixture
17	Electrical/ Electronic Lab	300	FTL, Decorative recessed with wide angle, mirror optics, anti-glare type
18	Chemical Lab	300	FTL, corrosion proof, totally enclosed type with sheet aluminium housing.
19	Pump houses	150	HPSV, medium bay, industrial type.
20	Fuel Oil Pump house*	150	HPMV, well glass, flame proof with vitreous enamelled reflector and cast aluminium
21	Coal Mill area, feeder floor, bunker floor	100	HPSV, well glass, dust proof with vitreous enamelled reflector.
22	Street lighting	20 (Primary roads) 10 (Secondary roads)	HPSV, street light fixture
23	Corridors walk ways, staircase, toilets, wash rooms etc	70	FTL, Industrial type with vitreous enamel reflector

ANNEXURE-I

24	Unloading and maintenance bay	200	HPSV, high bay, industrial type.

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

Decorative type fixtures will be provided for false ceiling areas.

ANNEXURE-II

LIGHTING & LV POWER SERVICES IN DIFFERENT AREAS

S. No.	AREA	ACN	ACE	DCE	5/15A Socket	20A Socket	63/125A Socket	ELU $
01	TG building	Y	Y	Y	Y*	Y	Y	-
02	Boiler platforms & boiler area	Y	Y	Y	-	Y	Y	-
03	ESP platforms & Mill area	Y	Y	Y	-	Y	Y	-
04	ID, FD & PA FAN area	Y	Y	Y	-	Y	Y	-
05	Transformer Yard	Y	Y	Y	-	Y	Y	-
06	ESP control room	Y	Y	Y	Y*	Y	Y	-
07	DG room	-	Y	Y	Y*	Y	Y	-
08	Compressor house	Y	Y	Y	Y*	Y	Y	-
09	Fuel oil area	Y	-	-	Y*	Y	Y	Y
10	Outdoor area	Y	-	-	-	-	-	-
10	Administrative building	Y	-	-	Y*	Y	Y	Y
12	Service building	Y	-	-	Y*	Y	Y	Y

LEGEND:

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