

METTUR ESP R&M UNIT # 4

TECHNICAL SPECIFICATION FOR STATION LIGHTING SYSTEM

DOC. NO. PE-TS-458-558-E001

REVISION 0



BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA, INDIA



**TECHNICAL SPECIFICATION FOR
STATION LIGHTING SYSTEM**

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SPECIFICATION NO. PE-TS-458-558-E001

VOLUME II

REV. 0

DATE: 23.09.2019

SHEET 1 OF 1

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TOTAL NUMBER OF SHEETS (INCLUDING COVER & SEPARATOR SHEETS: 115



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COMPLIANCE CERTIFICATE

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

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.
2. There is no deviation with respect to specification other than those furnished in the 'schedule of deviations'.
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in BOQ-Cum-Price schedule of the specification shall not be considered (i.e. technical description & quantities as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

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1.0 SCOPE OF SUPPLY AND SERVICES

1.1 SUPPLY:

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

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

1.2 SYSTEM DESIGN ENGINEERING:

System Design Engineering scope includes complete lighting system on Dialux for indoor and outdoor areas of the ESP pass-E & F (drawing attached). Lighting layout and conduit layout shall be prepared by the bidder.

1.3 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 equipment at site.

1.4 Standard technical requirements of the various items of lighting system design requirements are indicated in Section-II. Project specific requirements are listed in Section-I.

1.5 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.

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

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

1.8 Make of all equipment and components shall be as per attached Sub-Vendor List enclosed as per Annexure-A to section- I.

2.0 BILL OF QUANTITIES:

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

3.0 STATUTORY AND REGULATORY REGULATION

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

4.0 DOCUMENTATION

4.1 Documents required along with the technical offer: -

a) Signed & Stamped copy of Compliance certificate

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

4.2 Documents required after award of LOI/PO shall be as detailed in specification (to be submitted by successful bidder).

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5.0 GENERAL REQUIREMENTS

All the electrical equipment and devices shall be designed for design ambient temperature of 50 °C.

Technical Parameters for various equipment are listed in ‘Data Sheet-A’ attached with this section.

All cable glands & lugs (for the equipments in bidder’s scope) for all incoming & outgoing cables are in bidder’s scope. Sizes of cables shall be intimated during detailed engineering. The cable glands shall be double compression, tinned brass.

Cable lugs/ferrules for aluminium compacted conductor cables shall be tinned copper solderless crimping type suitable. Cable lugs and ferrules for copper type cables shall be tinned copper type. Cable lugs and ferrule shall conform to relevant standard

Name Plates

Name plates shall be furnished for identification of devices and circuits. All switches, controls and indications shall be permanently and legibly marked in English as to clearly indicate their functions.

All lighting fixtures, receptacles, fans, junction boxes etc. shall be property marked up indelibly with corresponding circuit numbers.

Samples

Owner reserves the right to call for samples if considered necessary and the same shall be submitted by the Bidder free and without any obligation.

6.0 SPECIFIC TECHNICAL REQUIREMENTS

6.1 Equipment and Material

Equipment and material shall comply with description, rating, type and size as detailed in this specification, drawings and annexure.

Equipment and materials furnished shall be complete and operative in all details.

All accessories, control devices, internal wiring, fittings, supports, hangers, anchor bolts etc. which form part of the equipment or which are necessary for safe and satisfactory installation and operation of the equipment shall be furnished.

All parts shall be made accurately to standard gauges so as to facilitate replacement and repair. All corresponding parts of similar equipment shall be interchangeable.



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6.2 Lighting Fixtures

Description of fixtures shall be as mentioned below:

SL. NO.	Type of Luminaire	Description	Watt
1	SW41	HPMV, Well glass type, vapour proof with vitreous enamelled reflector suitable for platforms with integral control gear box.	1 x 70W
2	SW42	HPMV, Well glass type, vapour proof with vitreous enamelled reflector suitable for platforms with integral control gear box.	1 x 150W

J pole for mounting of above fixtures on ESP platform shall be in scope of supply of Bidder and the cost for the same shall be included in the fixture price. Bidder to calculate the no. of J pole based on layout drawing attached with the specification.

Fixtures shall be fully wired up to respective terminal blocks, suitable for loop in and loop out connection of PVC wires of following sizes:

- a) Lighting fixture : 2.5 mm² copper
- b) Flood light fixture : 2.5 mm² copper

6.2.1 LIGHTING FIXTURES & LUX LEVELS

1. Well glass lighting fixture shall be provided in ESP Area.
2. The type of lighting fixtures and illumination levels shall be as per **Annexure-A**
3. Load shall be balanced on the three phases of each lighting panel as far as possible.
4. All lighting fittings shall be designed for an operating voltage of 240V +/-10%, 50Hz +/-3%, AC supply.
5. ESP Area lighting's control shall be automatic using timer for energy saving.

ANNEXURE-A			
Sr. No.	Area/Location	Average Illumination Level (Lux)	Type of Fixtures
1.	ESP Platforms	50	HPMV Well Glass Fixture
2.	ESP Grade Level (0 Mtr.)	50	HPMV Well Glass Fixture
3.	ESP Roof Top	50	HPMV Well Glass Fixture

6.3 LIGHTING DISTRIBUTION SCHEME

1. Area Lighting shall be distributed & fed from Total of 02 Nos. of Normal Lighting Panel & 01 No. of Emergency Lighting Panel envisaged to install in each New ESP Passes (Pass-E & Pass-F).
2. All Normal Lighting Panels shall be fed from Lighting Distribution Board (N-LDB) (R-01) containing lighting Transformer with cable of size 3.5CX50sqmm (PVC, Armoured, Al Cable).
3. All Emergency Lighting Panel shall be fed from Lighting Distribution Board LDB (E-LDB) (R-01) containing lighting Transformer with cable of size 3.5CX50sqmm (PVC, Armoured, Al Cable).
4. N-LDB (R-01) shall be fed from ESP Switchgear with cable of 3.5CX95sqmm (PVC, Armoured, Al Cable).
5. E-LDB (R-01) shall be fed from customer provided feeder from N/E Unit-IV Switchgear with cable of 3.5CX95sqmm (PVC, Armoured, Al Cable).
6. 63A & 20A Receptacles (R-01) shall be fed from Receptacle Distribution Board envisaged to install at suitable location in consultation with site near New ESP pass.
7. 24V Socket Supply shall be fed from Normal Lighting Panels (R-01).
8. Receptacle Distribution Board shall be fed from customer provided feeder with cable of size 3.5CX95sqmm (PVC, Armoured, Al Cable).
9. Maximum of 3 Nos. of 63A Receptacle shall be looped together by cable of size 3.5CX50sqmm (PVC, Armoured, Al Cable).
10. Maximum of 03 Nos. of 20A Receptacle shall be looped together by the cable of 4sqmm size.
11. Maximum of 03 Nos. of 24V Socket shall be looped together by the cable of 4sqmm size.
12. Lighting power supply distribution shall be from Lighting Panels with 20mm/25mm GI Conduits & 2.5/4 sqmm Wire.
13. Circuit of same phase of particular Lighting Panel may be laid (run) in same conduit. Wires of different phases shall run in different conduits.
14. Lighting fixtures shall be group controlled from lighting panel with each ~~switch~~ MCB controlling group of lighting fixtures.

6.4 LIGHTING PANEL & DISTRIBUTION BOARD

1. Lighting panels & Distribution Board shall be constructed out of 2 mm thick CRCA sheet steel.
2. Lighting panel shall be double door type with locking arrangement and shall be gasketed to achieve IP: 55 degree of protection.
3. Wiring inside the panel & distribution board shall be carried out with 1100V grade PVC insulated stranded copper conductors of adequate size. On both ends of each wire engraved identification ferrules shall be provided.
4. Bus bars shall be of aluminium alloy.
5. The incoming to each lighting panel shall be provided with ELCB of adequate rating and sensitivity.
6. All MCBs / ~~Isolators~~ shall be mounted inside the panel. MCB knob shall be marked with ON/OFF indication.
7. Front of the panel & distribution board shall be provided with label engraved with designation of the panel & distribution board. Labels shall be made of 3 ply lamicaid / engraved PVC having white letters on black background.
8. A continuous galvanized steel grounding bus of adequate size shall be provided along the bottom of the panel & board structure. It shall run continuously throughout the length of the panel & board and shall have provision at both ends for connection to the grounding grid.
9. Metallic parts of all components shall be effectively earthed using green colored insulated copper wire. Electrical continuity of the whole enclosure / frame work shall be maintained even after painting. All hinged doors shall be earthed through flexible earthing braids of copper.
10. Space heater/power circuits shall have wires having adequate current carrying capacity but of size not less than 2.5 sq.mm copper.
11. The space heaters shall be suitable for continuous operation on 240 V AC, 50 Hz, single phase supply and shall be automatically controlled by the thermostat.
12. Lighting panel & Distribution board shall be powder coated with color shade RAL 9002. The inside of the panel shall be glossy white.
13. Terminal blocks shall be 1100 V grade, stud type, moulded in melamine, suitable for terminating incoming cable and outgoing circuits of specified sizes. All the terminals shall be shrouded, numbered and provided with identification strip for the feeders.

6.5 RECEPTACLES

a) 63A RECEPTACLES

Industrial type Receptacles of 63A, 415V AC, TPN, 5-pin metal clad type shall be provided. The receptacles shall be complete with suitable switch and plug with interlocking.

Receptacles boxes shall be fabricated out of MS sheet of 2mm thickness and hot dipped galvanised or of die-cast aluminium alloy of thickness not less than 2.5 mm.

The boxes shall be provided with two nos. earthing terminals, gasket to achieve IP55 degree of protection.

8 Way, 2 Nos. Terminal blocks for loop-in loop-out to terminate cable of size 3.5CX50sqmm mounting brackets suitable for surface mounting on wall/column/structure, gland plate etc. shall be provided.

The ON-OFF switch shall be rotary type heavy duty, double break, AC23 category, suitable for AC supply. Plug and Socket shall be shrouded Die-cast aluminium. Socket shall be provided with lid safety cover with rope.

Robust mechanical interlock shall be provided such that the switch can be put ON only when the plug is fully engaged and plug can be withdrawn only when the switch is in OFF position. Also cover can be opened only when the switch is in OFF position.

Wiring shall be carried out with 1100 V grade PVC insulated. Stranded aluminium /copper wire of adequate size shall be provided

The Terminal blocks shall be of 1100V grade made up of unbreakable polyamide 6.6 grade with adequate current rating and size.

The welding receptacles shall be provided with inbuilt ELCB rated for 100mA sensitivity.

b) 20A RECEPTACLES

Industrial type Receptacles of 20A, 240V AC, SPN 3-pin metal clad type shall be provided. The receptacles shall be complete with suitable switch and plug with interlocking.

Receptacles boxes shall be fabricated out of MS sheet of 2mm thickness and hot dipped galvanised or of die-cast aluminium alloy of thickness not less than 2.5 mm.

The boxes shall be provided with two nos. earthing terminals, gasket to achieve IP55 degree of protection.

Terminal blocks to terminate cable of suitable size, mounting brackets suitable for surface mounting on wall/column/structure, gland plate etc. shall be provided. The Terminal blocks shall be of 1100 V grade.

The ON-OFF switch shall be rotary type, suitable for AC supply. Plug and Socket shall be shrouded Die-cast aluminium. Socket shall be provided with lid safety cover with rope.

Robust mechanical interlock shall be provided such that the switch can be put ON only when the plug is fully engaged and plug can be withdrawn only when the switch is in OFF position. Also cover can be opened only when the switch is in OFF position.

Wiring shall be carried out with 1100 V grade PVC insulated. Stranded aluminium /copper wire of adequate size shall be provided.

c) 24V SOCKET

Industrial 24V Socket metal clad type shall be provided. The socket shall be provided with suitable switch.

Enclosure shall be fabricated out of MS sheet of 2mm thickness and hot dipped galvanised or of die-cast aluminium alloy of thickness not less than 2.5 mm.

The boxes shall be provided with two nos. earthing terminals, gasket to achieve IP55 degree of protection.

Terminal blocks to terminate cable of size 6sqmm, mounting brackets suitable for mounting on wall/column/structure, gland plate etc. shall be provided. The Terminal blocks shall be of 1100 V grade

Wiring shall be carried out with 1100 V grade PVC insulated. Stranded aluminium /copper wire of adequate size shall be provided.

250VA, 230/24V Transformer shall be provided in the enclosure. 24V Socket shall be fed from Receptacle Distribution Board.

QUANTITIES FOR RECEPTACLES & 24V SUPPLY SOCKET

Sr. No.	Item	Unit	Quantity	Area
1	63A Receptacles	Nos.	3 (R-01)	New ESP Pass-E – Hopper Area
2	63A Receptacles	Nos.	3 (R-01)	New ESP Pass-E – CE Rapping System Floor
3	63A Receptacles	Nos.	3 (R-01)	New ESP Pass-E – ESP Roof Top
4	63A Receptacles	Nos.	3 (R-01)	New ESP Pass-F – Hopper Area
5	63A Receptacles	Nos.	3 (R-01)	New ESP Pass-F – CE Rapping System Floor
6	63A Receptacles	Nos.	3 (R-01)	New ESP Pass-F – ESP Roof Top
7	20A Receptacle	Nos.	5 (R-01)	New ESP Pass-E – CE Rapping System Floor
8	20A Receptacle	Nos.	5 (R-01)	New ESP Pass-E – ESP Roof Top
9	20A Receptacle	Nos.	5 (R-01)	New ESP Pass-F – CE Rapping System Floor
10	20A Receptacle	Nos.	5 (R-01)	New ESP Pass-F – ESP Roof Top
11	24V Supply Socket	Nos.	5 (R-01)	New ESP Pass-E – CE Rapping System Floor
12	24V Supply Socket	Nos.	5 (R-01)	New ESP Pass-E – ESP Roof Top
13	24V Supply Socket	Nos.	5 (R-01)	New ESP Pass-F – CE Rapping System Floor
14	24V Supply Socket	Nos.	5 (R-01)	New ESP Pass-F – ESP Roof Top

The above BOQ is already considered in price schedule and is shown here for design purpose.

6.6 LIGHTING WIRES

DATA SHEET OF LIGHTING WIRE				
S.No.	Description	Unit	2.5 sqmm Wire	4 sqmm Wire
1	GENERAL			
	Cable Type		LV PVC Flexible Copper Cables	
	Applicable Standard		IS: 694, IS:8130	
2	CONDUCTOR			
	Material		Flexible annealed bare Copper as per Class-5 of IS:8130	
	Size	sqmm	2.5	4
	Minimum No. of Wires		50	56
	Maximum Dia. of each wire (Before Stranding)	mm	0.26	0.31
3	INSULATION			
	Material		Extruded FRLS PVC as per IS: 5831	
	Thickness (Nom.)	mm	0.8	0.8
4	Max. Overall Diameter of Cable	mm	4.1	4.8
5	FRLS Properties			
	Oxygen Index		Min. 29% as per ASTMD - 2863	
	Smoke Density Rating		Max. 60% as per ASTMD - 2843	
	Temperature Index		Min. 250 °C as per ASTMD - 2863	
	Acid Gas Generation		Max. 20% as per IEC - 754 - 1	
6	Max. D.C. Resistance at 20 Deg C	Ohms/Km	7.98	4.95
7	Core Identification		Red, Blue, Yellow, Black, Green	
8	Coil Length		90/180/300/ As per Manufacturer Standard	

6.7 GI CONDUIT

DATA SHEET OF GI CONDUIT				
S.No.	Description / Parameter	Unit	20 MM	25 MM
1	Name of Manufacturer / Offered Make		Manufacturer with Valid BIS (IS 9537: Part 2:1981) License Certificate for Metallic Conduit.	
2	Type		Heavy Duty	Heavy Duty
3	Applicable Standard		IS 9537 (Part - 2)	IS 9537 (Part - 2)
4	Type of Protection		Heavy Protection	Heavy Protection
5	Conduit Size	mm	20	25
6	Finish		Smooth	Smooth
7	Inside & Outside surface		Zinc Hot Dip Galvanised	Zinc Hot Dip Galvanised
8	Mass of Zinc Coating (IS 4736)	gm/m ²	Minimum 360 gm/m ²	
9	Wall thickness	mm	1.6±0.20mm as per IS 9537 (Part - II)	1.6±0.20mm as per IS 9537 (Part - II)
10	Outer Diameter	mm	19.7-20	24.6-25
11	Compression Force	N	1250	1250
12	Bend Test	IS 9537	No Crack	No Crack
13	Uniformity of Zinc coating	IS 2633	4 dip test	4 dip test
14	Marking Details	IS 9537	As per Manufacturer Standard	
15	Standard Length of Conduit	Mtr	As per Manufacturer Standard	

6.8 LIGHTING TRANSFORMER

Sr. No.	Technical Parameter	Lighting Transformer
1	Type of Transformer	Dry Type
2	Rating (KVA) (R-01)	50 KVA (2.5 MVA/11KV/0.415KV)
3	Applicable Standard	IS 11171
4	Rated Voltage	415V (Primary) 415V (Secondary)
5	Tapings	±5% in steps of 2.5%
6	Vector Group	Dyn11
7	Rated Frequency	50 Hz
8	No. of Phases	3
9	Winding Material	Copper
10	Insulation Class	F
11	Percentage Impedance (With Tolerance)	4%
12	Type of Cooling	Air Natural
13	Mounting	Inside Lighting Distribution Board (LDB)

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6.9 WIRING / CONDUITS

Wiring of lighting system will be done as follows:

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

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

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

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

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

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

Lighting Panel to Fixtures: 2.5 sq. mm (Cu)

Lighting Panel to JBs/ Switches: 2.5 sq. mm (Cu)

JBs/ switches to Fixtures: 2.5 sq. mm (Cu)

Panel to Receptacles: 4 sq. mm (Cu)

6.10 EARTHING

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

Lighting Distribution Board: GS Flat 25x6 mm

Lighting Panels: GS Flat 25x6 mm

Lighting fixtures, receptacles, conduits, junction boxes & switch boxes: 14 SWG GI wire

Welding receptacles: GS Flat 25x6 mm

6.11 Maintenance Equipment

One (1) no. free standing adjustable aluminium ladder, adjustable from 5 m to 10 m.

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6.12 INSPECTION & TESTING

SHOP TEST: All equipment shall be completely assembled, wired adjusted and routine tested as per relevant Indian standards at manufacturer's works.

Tests on lighting distribution boards/Panel shall include: a) wiring continuity tests b) high voltage insulation tests c) operational tests

6.13 TESTS

a) All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

b) However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

6.14 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

6.15 Selection of samples for type test, acceptance test & routine test and acceptance criteria for all the items shall be as per relevant IS

6.16 Type test reports of the following items as per technical specification requirements/standards shall be submitted for approval.

SL NO.	DESCRIPTION
i.	Lighting fixtures of each type
ii.	Lighting panel and Distribution board (Degree of Protection)
iii.	Lighting transformer (Temperature rise)

6.17 Acceptance Test and Routine Test

All lighting fixtures, lamps and other items shall be subjected to acceptance and routine test, as per relevant specified standards.

Junction boxes, switch boxes, receptacle enclosure etc. shall be subjected to physical and dimensional checks also.

6.18 To be Submitted after Award of Contract:

Detail dimensional drawing showing constructional features, cable / conduit entry, grounding, fixing arrangement etc. of:

Lighting panels & distribution boards

Receptacles, supply modules & junction boxes

Lighting fixtures complete with lamps and accessories

Ladder

Data sheets for lighting fixture, lamps, accessories with light distribution curves, co-efficient of utilisation charts etc. Type and routine test certificates of transformer and cables.

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Technical leaflets and data sheet on each piece of equipment / device such as MCB, switch, fuse, receptacle etc. Type and routine test certificates of transformer and cables.

Any other relevant drawings, data and manuals necessary for satisfactory installation, operation and maintenance.

The Bidder may note that the drawings, data and manuals listed are minimum requirement only. The Bidder shall ensure that all other necessary write-ups, curves and information required to fully describe the equipment offered are submitted.

SL. NO.	DRAWING TITLE	DRAWING NUMBER
1	GA Drawing of LDB-F (8)	PE-V0-458-558-E101
2	GA Drawing of 50 KVA Transformer	PE-V0-458-558-E102
3	GA Drawing of WDB	PE-V0-458-558-E103
4	GA Drawing of Luminaire Type SW41	PE-V0-458-558-E104
5	GA Drawing of Luminaire Type SW42	PE-V0-458-558-E105
6	GA Drawing of Junction Box Type JB-F	PE-V0-458-558-E106
7	GA Drawing of Type RA	PE-V0-458-558-E107
8	GA Drawing of Type RC	PE-V0-458-558-E108
9	GA Drawing of 24V supply module	PE-V0-458-558-E109
10	GA Drawing of Portable Halogen Lamp unit	PE-V0-458-558-E110
11	GA Drawing of 5A ,24V Industrial Type Socket	PE-V0-458-558-E111
12	GA Drawing of Free standing ladder (Adjustable from 5M to 10M)	PE-V0-458-558-E112
13	Datasheet - C	PE-V0-458-558-E001
14	Quality Plan of Station lighting system	PE-V0-458-558-E002
15	Type Test Reports	PE-V0-458-558-E003
16	Typical Mounting arrangement for Different luminaries	PE-V0-458-558-E004

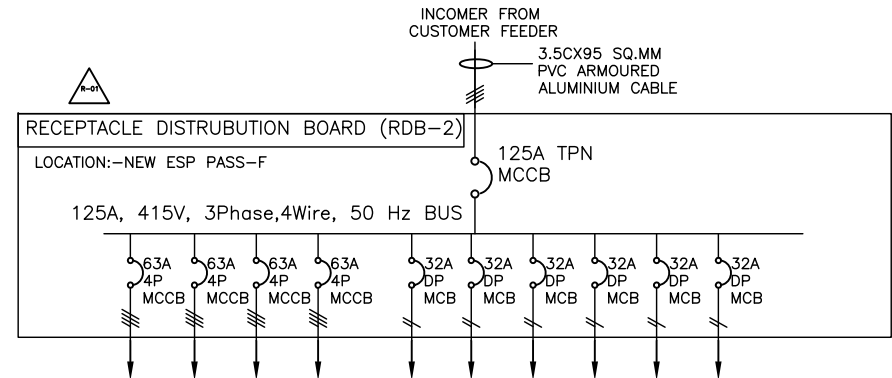
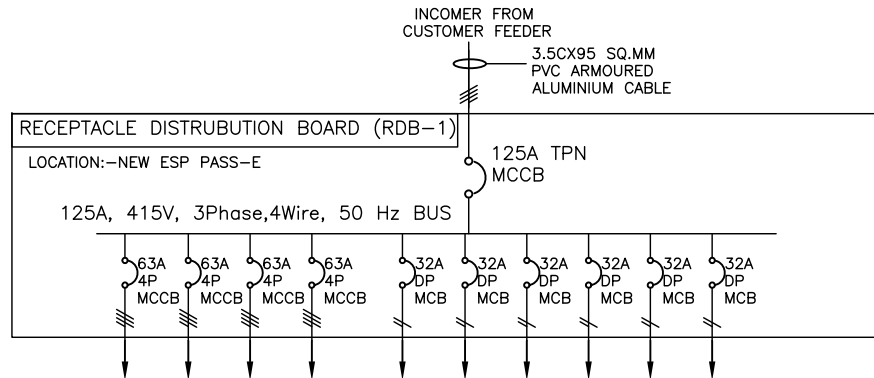
6.19 DOCUMENTS SUBMISSION SCHEDULE FOR STATION LIGHTING PACKAGE

SL. No.	DOCUMENT TITLE	Nature	SUBMISSION SCHEDULE
1	Lighting Design Document	Secondary	Within two weeks from the date of LOI.
2	GA, Data sheets and manufacturing quality plan	Primary	Within two weeks from the date of LOI.
3	Resubmission of BHEL/ customer commented document	-	Within one week from date of receipt of comments.
4	Type Test Report, Mounting arrangement drg	Secondary	Within two weeks from the date of LOI.

Basic Design Documents covers: Drawings/ documents schedule, technical data sheets, GA drawings of equipment, quality plan and type test reports for Station Lighting System.

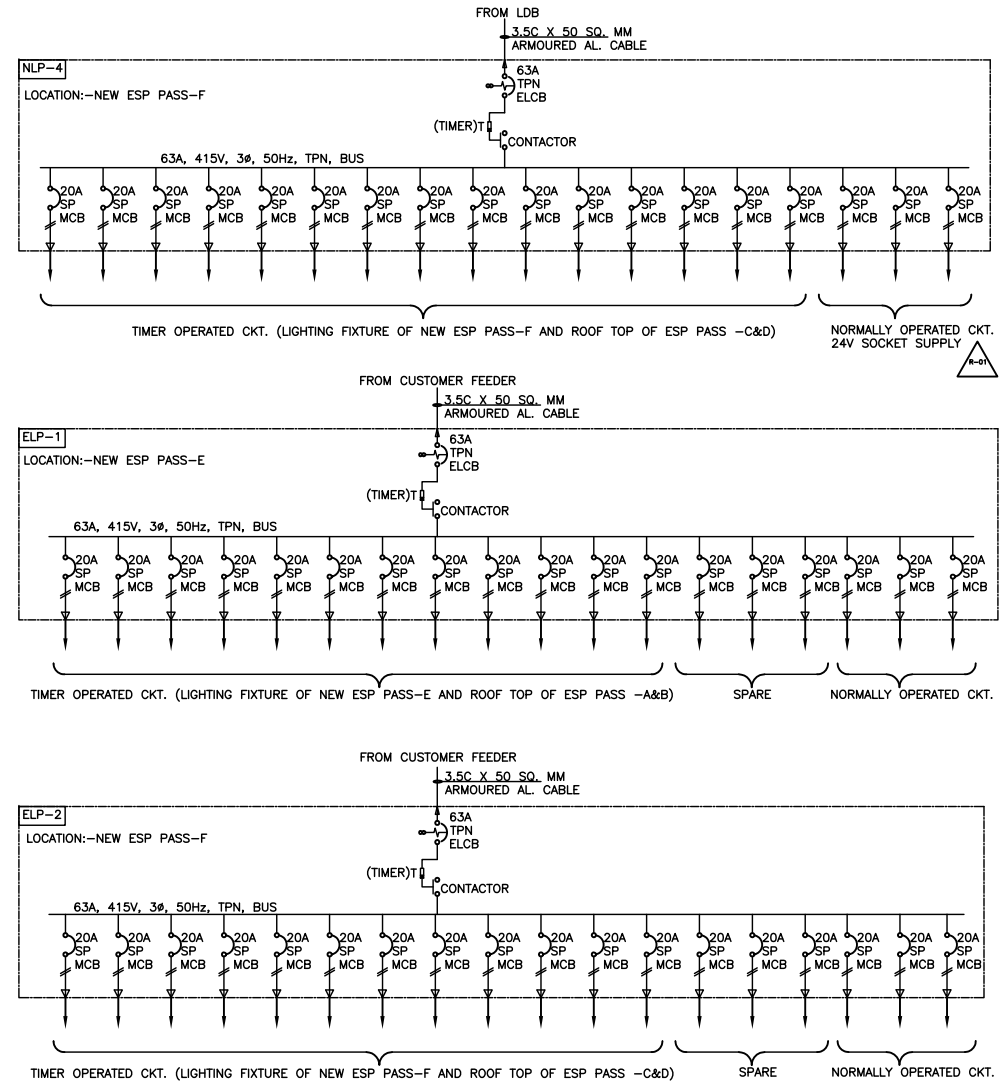
Further if submission of any documents is required during detail engineering than same submission/ re submission schedule shall be followed.

ILLUMINATION SLD & WIRING DIAGRAM

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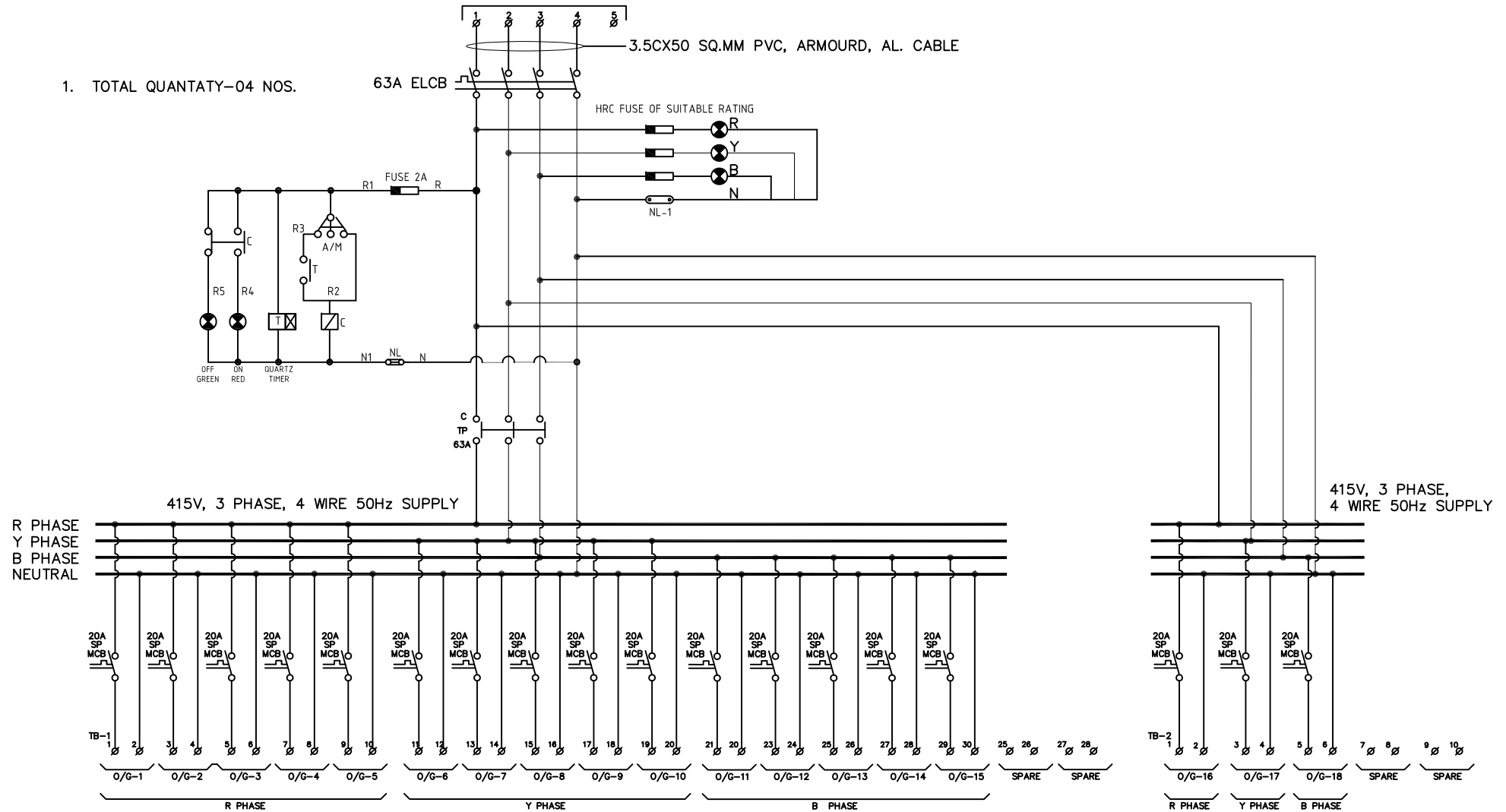
PROJECT:										ESP R&M OF METTUR TPS, STAGE-I, UNIT#4			
	BHARAT HEAVY ELECTRICALS LIMITED												
	R & M SYSTEM GROUP BHOPAL												
DEPT/CODE	UN. TOL.DIM.GR.		SCALE	WEIGHT		NAME	SIGN	DATE	NO.OF				
RMSG/915	N.A.		NTS	(KG.)		DRN	NN		06.09.18	ITEMS			
				N.A.	CKD	PV		06.09.18	00				
TITLE					APPD	SG		06.09.18	REV.				
SLD FOR ILLUMINATION SYSTEM					DRG NO				SHEET				
					SLD/ILLUMINATION/01				1 OF 2				

INVENTORY NO.



DEPT/CODE	UN. TOL.DIM.GR.		SCALE	WEIGHT	NAME	SIGN	DATE	NO.OF
RMSG/915	N.A.		NTS	(KG.)	DRN	NN	06.09.18	ITEMS
TITLE					CKD	PV	06.09.18	00
					APPD	SG	06.09.18	REV.
SLD FOR ILLUMINATION SYSTEM					DRG NO			SHEET
					SLD/ILLUMINATION/01			2 OF 2

1. TOTAL QUANTATY-04 NOS.



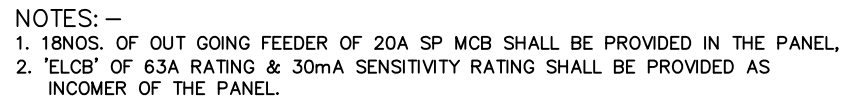
1. 18NOS. OF OUT GOING FEEDER OF 20A SP MCB SHALL BE PROVIDED IN THE PANEL,
2. 'ELCB' OF 63A RATING & 30mA SENSITIVITY RATING SHALL BE PROVIDED AS INCOMER OF THE PANEL.

ESP R&M OF METTUR TPS, STAGE-I, UNIT#4

BHARAT HEAVY ELECTRICALS LIMITED
R & M SYSTEM GROUP
BHOPAL

DEPT/CODE	UN. TOL.DIM.GR.		SCALE	WEIGHT	NAME	SIGN	DATE	NO.OF
RMSG/915	N.A.		NTS	(KG.)	DRN	NN	06.09.18	ITEMS
TITLE NORMAL LIGHTING PANEL WIRING DIAGRAM					KCD	PV	06.09.18	00
					APPD	SG	06.09.18	REV.
					DRG NO			00
					NLP/WIRING/01			SHEET 1 OF 1

INVENTORY NO.

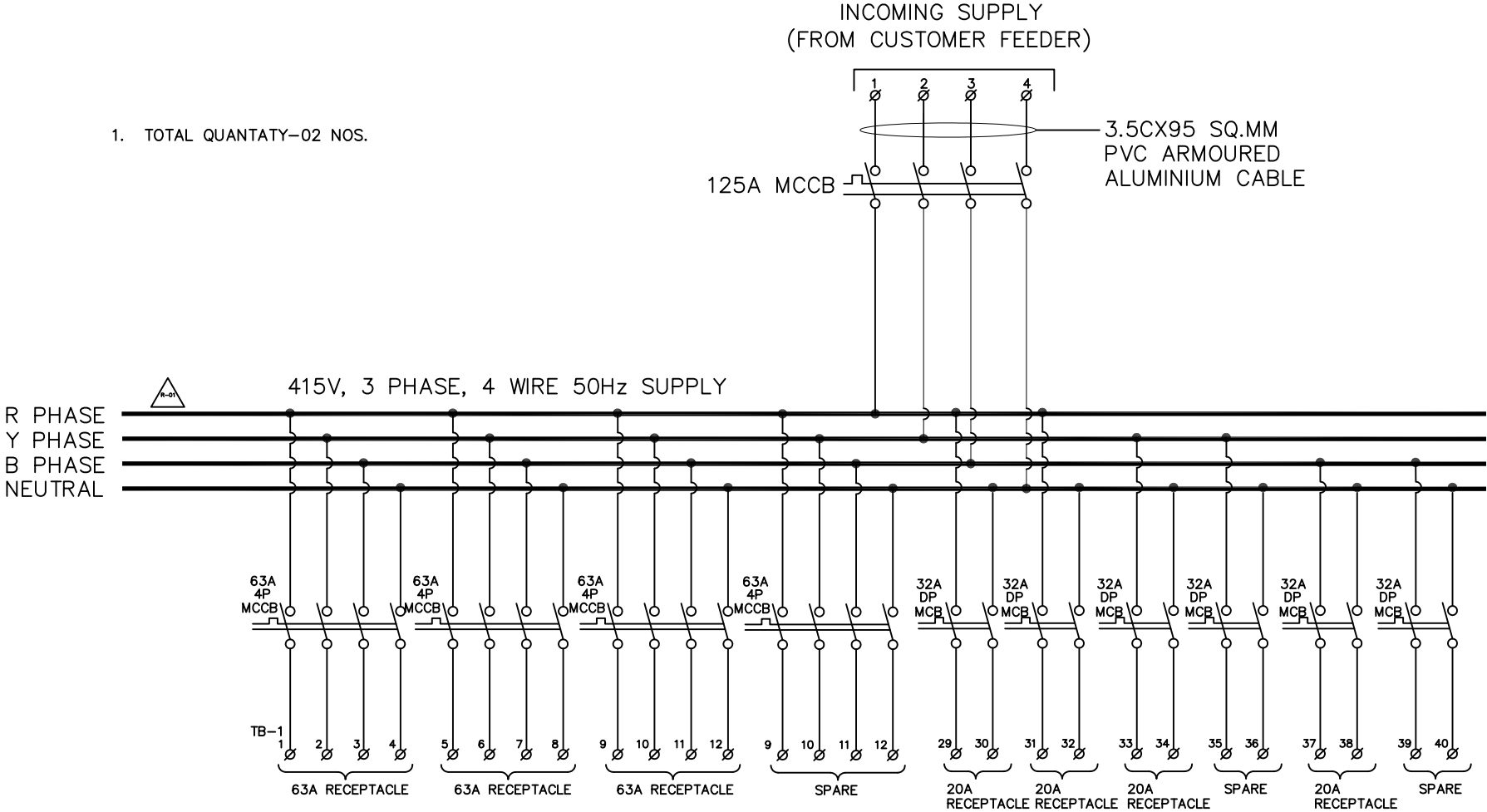


PROJECT:		ESP R&M OF METTUR TPS, STAGE-I, UNIT#4									
		BHARAT HEAVY ELECTRICALS LIMITED R & M SYSTEM GROUP BHOPAL									
DEPT/CODE	UN. TOL.DIM.GR.		SCALE	WEIGHT		NAME	SIGN	DATE	NO.		
RMSG/915	N.A.		NTS	(KG.)		DRN	NN	06.09.18	ITEM		
					CKD	PV	06.09.18	REV			
					APPD	SG	06.09.18	00			
TITLE					DRG NO	ELP/WIRING/01				SHE	
EMERGENCY LIGHTING PANEL WIRING DIAGRAM										1 OF	

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

INVENTORY NO. SIGN. & DATE REF.DRG.NO.

1. TOTAL QUANTATY-02 NOS.



PROJECT:

ESP R&M OF METTUR TPS, STAGE-I, UNIT#4



BHARAT HEAVY ELECTRICALS LIMITED

R & M SYSTEM GROUP

BHOPAL

DEPT/CODE	UN. TOL.DIM.GR.		SCALE	WEIGHT		NAME	SIGN	DATE	NO.OF	
RMSG/915	N.A.		NTS	(KG.)		DRN	NN		ITEMS	
				N.A.		CKD	PV		00	
TITLE					APPD	SG		REV.		
RECEPTACLE DISTRUBUTION BOARD WIRING DIAGRAM					DRG NO				SHEET	
					RDB/WIRING/01				1 OF 1	
								06.09.18	01	
								06.09.18	01	



TECHNICAL SPECIFICATION FOR STATION LIGHTING SYSTEM

SPECIFICATION NO. PE-TS-458-558-E001

VOLUME II

SECTION - I

METTUR ESP R&M UNIT # 4

REV. 0

DATE: 23.09.2019

1.0 SYSTEM DESIGN DATA

1.1 Design Ambient : 50⁰ C

1.2 Details of Operating Parameters

a) AC Supply

i. Rated Voltage : 415 V

ii. Rated Frequency : 50 HZ

iii. Voltage variation:
(Permissible) $\pm 10\%$

iv. Frequency variation
(Permissible) : +3% to - 3%

v. Combined voltage &
frequency variation
(sum of absolutes
permissible) : 10 %

vi. System fault level
at rated voltage : 50 KA for 1 sec

2.0 APPLICABLE STANDARDS : As per specification

3.0 LIGHTING CONCEPT

3.1 Areas

a) Location : ☐ Indoor ☐ Outdoor
☒ Both

b) Street Lighting : ☐ Yes ☒ No

c) Platforms : ☒ Yes ☐ No

3.2 Types of supplies considered (other than AC Normal)

a) DC Normal : ☐ Yes ☒ No

b) DC Emergency : ☐ Yes ☒ No

c) AC Emergency : ☒ Yes ☐ No

3.3 Diversity Factor Considered for Sockets : 25 %



TECHNICAL SPECIFICATION FOR STATION LIGHTING SYSTEM

METTUR ESP R&M UNIT # 4

SPECIFICATION NO. PE-TS-458-558-E001

VOLUME II

SECTION - I

REV. 0

DATE: 23.09.2019

4.0 **SCOPE OF SYSTEM DESIGN ENGG.** : ☒ Included in vendor's scope
☐ Excluded from vendor's scope

5.0 LUMINAIRES, LAMPS & ACCESSORIES

5.1 Whether all type of luminaires as per BOQ : ☒ Yes ☐ No
offered

5.1.1 If no, Types of luminaires not : NA
offered as per BOQ

5.2 List of lamps which can be installed only : None
specified angle.

5.3 Type of false ceiling for recessed : Not applicable
fluorescent luminaire

5.4 Degree of Protection for drip proof : IP55
luminaires

5.5 Non-Integral control gear box : Not applicable (only Integral CG to be offered)

5.6 Lamps

a) Type of Lamps : ☒ HPMV

6.0 DESIGN PARAMETERS OF MAIN EQUIPMENT

6.1 Lighting Distribution Boards

6.1.1 Sheet Thickness : 2mm

6.1.2 Degree of Protection

a) Main Panel : IP 52

b) Transformer cubicle : IP 42

c) Transformer terminal box : IP 52

6.1.3 Type of Incomer : ☒ MCCB
☒ Switch-Fuse

6.1.4 Type of Outgoing feeders : ☐ Switch-Fuse
(as per attached drg) ☒ MCCB
☒ MCB

6.1.5 Bus bar material : ☒ Aluminium ☐ Copper

6.1.6 Cable entry : ☒ Bottom ☐ Top



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VOLUME II

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REV. 0

DATE: 23.09.2019

6.1.7 Range of time delay relay : During detail engineering

6.1.8 Whether hinged door with locking facility provided : ☒ Yes ☐ No

6.1.9 Whether earth busbar provided : ☒ Yes ☐ No

6.1.10 Fault current and duration : Later

6.1.11 Lighting Transformer

a) Voltage Rating(s) : 415/415 V

b) Whether encapsulated : Yes

c) Transformer Impedance : 4%

6.2 Lighting Panel

6.2.1 Application : ☐ Indoor ☒ Outdoor ☐ Both

6.2.2 Sheet thickness : 2mm

6.2.3 Degree of protection

a) Indoor : IP55 with canopy

b) Outdoor : IP55 with canopy

6.2.4 a) Type of Incomer : ☒ TPN ELCB

b) Type of outgoing feeder : ☒ SPN MCB

6.2.5 MCB type for street lighting panel : NOT APPLICABLE

6.2.6 Busbar material : Aluminium

6.2.7 Whether hinged door with locking facility provided : ☒ Yes ☐ No

6.2.8 Whether earthing studs provided : ☒ Yes ☐ No

6.2.9 LP with programmable digital timer : ☒ Yes ☐ No

6.3 Receptacles

6.3.1 Material : MS sheet & hot dip galvanised/ Die cast aluminium alloy

6.3.2 Sheet thickness : 2mm (min) / 2.5mm (min) respectively

6.3.3 Galvanization



TECHNICAL SPECIFICATION FOR STATION LIGHTING SYSTEM

SPECIFICATION NO. PE-TS-458-558-E001

VOLUME II

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METTUR ESP R&M UNIT # 4

REV. 0

DATE: 23.09.2019

a) Process :

b) Wt. of zinc deposited :

6.3.4 Degree of protection : IP-55

7.1 COMPONENT OF LIGHTING SYSTEM EQUIPMENT

7.2 Switch-Fuse Unit

7.2.1 Utilisation category for main contacts : AC23

7.3 Indicating Meters

7.3.1 Ammeter

a) Type : As per IS-1248

b) Shape :

c) Size : 96 x 96 mm

d) Accuracy class : 2

e) Current coil rating : 1A

f) Angle of deflection : 240°

7.3.2 Voltmeter

a) Type : As per IS-1248

b) Shape :

c) Size : 96 x 96 mm

d) Accuracy class : 2 (min.)

e) Voltage Coil rating : 0-500V AC, 0-250V DC

f) Angle of deflection : 240°

7.4 Power Contactors

7.4.1 Coil Voltage (nominal)

a) AC contactors : 240 V

b) DC contactors : 220V



**TECHNICAL SPECIFICATION FOR
STATION LIGHTING SYSTEM**

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REV. 0

DATE: 23.09.2019

7.5 Under Voltage Relay

7.5.1 Type : ☐ Static ☒ Electromagnetic

7.5.2 Coil Voltage Rating :

7.5.3 Means for in-built testing provided : ☒ Yes ☐ No

7.6 Current Transformers

7.6.1 Type : Cast resin

7.6.2 Secondary Rating : ☒ 1 Amp ☐ 5 Amp

7.6.3 Output : 5 VA

7.6.4 Accuracy Class : 1

7.7 Voltage Transformers

7.7.1 Type : Cast resin

7.7.2 System Earthing : ☒ Effective ☐ Non-Effective

7.7.3 Secondary Terminal voltage(phase-phase) : 110 V

7.7.4 Accuracy Class : 0.5

7.7.5 Output : 5 VA

7.7.6 Winding configuration : Vee Vee

7.8 Miniature Circuit Breaker

7.8.1 Min. Rating : 20A

7.8.2 Short Time rating : 9 KA

7.8.3 Thermal overload and magnetic short circuit protection provided : ☒ Yes ☐ No

7.9 Selector Switch

7.9.1 Type of selector switch : ☒ Stay put ☐ Wing knob

7.9.2 Lock ability : ☐ Provided ☒ Not provided

7.10 Indication Lamps



TECHNICAL SPECIFICATION FOR STATION LIGHTING SYSTEM

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VOLUME II

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REV. 0

DATE: 23.09.2019

7.10.1 Lens Colour

- a) On condition : Red
- b) OFF condition : Green

7.10.2 Circuit Voltage : As per control supply voltage

7.11 Push Buttons

- 7.11.1 Voltage Grade : 500V
- 7.11.2 No. of Contacts : (2 NO + 2 NC)

7.12 Terminals

- 7.12.1 Type : 1100 V grade box clamp, 10 mm² minimum
- 7.12.2 Material : Copper
- 7.12.3 Whether inter-terminal barrier provided : ☒ Yes ☐ No

7.13 Cable Glands

- 7.13.1 Provision for all power and control cables considered : By vendor all incoming & outgoing cables
- 7.13.2 Type : Double compression
- 7.13.3 Material : Brass
- 7.13.4 Nickel Plating provided : ☒ Yes ☐ No

7.14 Cable Lugs

- 7.14.1 Provision for all power and control terminations considered : By vendor for all power and control connections
- 7.14.2 Type : Ring type
- 7.14.3 Material : as per specification

7.15 Timers

- 7.15.1 Time Switch
 - a) Type : As per spec



TECHNICAL SPECIFICATION FOR STATION LIGHTING SYSTEM

SPECIFICATION NO. PE-TS-458-558-E001

VOLUME II

SECTION - I

METTUR ESP R&M UNIT # 4

REV. 0

DATE: 23.09.2019

b) Range : 00-24 Hours

7.15.2 Delay Timer :

a) No. of Contacts : As per scheme

i. ON time delay :

ii. OFF time delay :

iii. Instantaneous : -

b) Coil Voltage Rating

i. AC timer : 240 V

ii. DC timer : 220 V

c) Time delay range

i. AC timer : 1-99 sec

ii. DC timer : 24-240 Secs

8.0 Conduit

8.1 Rigid Conduit

8.1.1 Duty : Heavy duty

8.1.2 Application standard : IS 9537 Part - II

8.1.3 Material : Hot Dip Galvanised Steel

8.1.4 Sheet thickness : 1.6 mm upto 25 mm dia
2.0 mm upto 32 mm & upto 50 mm dia.

8.1.5 Surface treatment : Hot dip galvanising inside and outside as per IS 2629

8.1.6 Min. Weight of zinc coating (gm/m²) : 360 upto 32 mm dia
460 above 32 mm & upto 50 mm dia.

8.1.7 Min. Thickness of zinc coating (microns) : 50 upto 32 mm dia, 65 above 32 mm &
Upto 50 mm dia [By Elcometer]

8.1.8 Standard length approximate : 3-5 meters



**TECHNICAL SPECIFICATION FOR
STATION LIGHTING SYSTEM**

SPECIFICATION NO. PE-TS-458-558-E001

VOLUME II

SECTION - I

METTUR ESP R&M UNIT # 4

REV. 0

DATE: 23.09.2019

9.0 FLEXIBLE CONDUITS:

- a) Material : Strip steel cold rolled and annealed
- b) Standard applicable : IS: 3480
- c) Surface treatment : Electro galvanized as per IS: 3480
- d) Minimum thickness : 25 microns of zinc coating
- e) Whether lead coated : NO

10 24 V Supply Module

10.1.1 Enclosure

- a) Material : CRCA Sheet Steel
- b) Sheet Thickness : 2.0 mm

10.1.2 Transformer

- a) Rating : 3kVA, 3 phase, 4 wire
- b) Primary Voltage : 415V
- c) Secondary voltage : 42V
- d) Class of Insulation : Class- F or better

10.1.3 Lamp

- a) Rating :
- b) Type :

10.1.4 No. of outgoing feeders : 24

10.1.5 Whether cord coiling arrangement
Considered : ☒ Yes ☐ No

10.1.6 Louvers : ☒ Provided ☐ Not Provided

11.0 LABELING

Requirement of Specification complied : ☒ Yes ☐ No



TECHNICAL SPECIFICATION FOR STATION LIGHTING SYSTEM

SPECIFICATION NO. PE-TS-458-558-E001

VOLUME II

SECTION - I

METTUR ESP R&M UNIT # 4

REV. 0

DATE: 23.09.2019

12.0 PAINTING

12.1	Shade (As per IS:5)	:	Interior	Exterior
a)	LDBs	:	RAL9002	RAL9002
b)	LPs	:	RAL9002	RAL9002
c)	Receptacles	:		
	Decorative	:		
	Industrial	:		
d)	Lighting kit box	:		
e)	24V Supply Module	:		
f)	Junction Box	:	RAL7035	RAL7035
12.2	Finish			
a)	Interior	:	[] Matt [√] Semi - glossy	
b)	Exterior	:	[√] Semi - glossy [] Full - glossy	
12.3	Paint Thickness(min)	:	As per spec	
13.0	MAKE	:	As per spec	

List of make of Sub Vendor items for Station Lighting System

METTUR ESP R&M UNIT # 4							
STATION LIGHTING SYSTEM (List of Sub vendor) Annexure-A							
ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
ES1	AC CONTACTORS	1	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
	AC CONTACTORS	2	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
	AC CONTACTORS	3	E1144	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
	AC CONTACTORS	4	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
	AC CONTACTORS	5	B04	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	
ES3	AC MCCB	1	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
	AC MCCB	2	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
	AC MCCB	3	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
	AC MCCB	4	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
	AC MCCB	5	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
	AC MCCB	6	C02	CROMPTON GREAVES	RAIL TRANSPORTATION SYSTEMS,VANDANA BUILDING, 11, TOLSTOY MARG, TOLSTOY MARG, NEW DELHI, DL 110001	011 3041 6300	
ES7	AUXILIARY RELAYS	1	A24	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
	AUXILIARY RELAYS	2	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
	AUXILIARY RELAYS	3	E1075	JYOTI LTD.	JYOTI LIMITED, E&CS DIVISION,3/15, BIDC, GORWA,VADODARA - 390 016, E-MAIL ID: ECS@JYOTI.COM	Ph. No.:+91-265-2281214 , Fax No.:+91-265-2281214	
	AUXILIARY RELAYS	4	E1099	OEN INDIA LTD	29/1479, VYTILLA, COCHIN - 682 019 KERALA, INDIA	Phone : +91 484 2301132, 2303709 Fax : +91 484 2302287, 2302221 sales@oenindia.com	
	AUXILIARY RELAYS	5	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
ES8	BIMETAL RELAYS	1	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
	BIMETAL RELAYS	2	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
	BIMETAL RELAYS	3	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
	BIMETAL RELAYS	4	E1144	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
ES11	CABLE GLANDS	1	E1201	ALLIED TRADERS & EXPORTERS	C-124 A, SECTOR-2, NOIDA -201 301, UTTAR PRADESH, INDIA	Mr. Vijay Mohan Sood +(91)-(120)-2525694 +(91)-(120)-3052594 +(91)-(11)-23287156 vijay_mohansood@yahoo.com	
	CABLE GLANDS	2	E1017	ARUP ENGG & FOUNDARY WORKS	391/119,PRINCE ANWAR SHAH ROAD, CALCUTTA-700068	033 2473 0850	
	CABLE GLANDS	3	E1206	BALIGA LIGHTING EQPT.PVT.LTD.	63A,CP RAMASWAMY ROAD, ALWARPET,P.B.No 6910, CHENNAI-600018	44-24995505,22680990-4	
	CABLE GLANDS	4	E1036	COMMET BRASS PRODUCTS	NUTAN CHEMICAL COMPOUND, WALBHAT ROAD, GOREGAON, MUMBAI-400063	91-022-26852961/62/63 comet@vsnl.net	
	CABLE GLANDS	5	DW08	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST). MUMBAI 400 063.	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/ 022-29270878.	
	CABLE GLANDS	6	E1044	ELECTROMAC INDUSTRIES	27/28AF NEW EMPIRE IND.ESTT., R.KRISHNA MANDIR RD.JB NGR ,ANDHERI(E),MUMBAI-400059	91-22-28324829 / 66919034 devang@electromacglands.com	
	CABLE GLANDS	7	I01	INCAB	HARE STREET,KOLKATA,WEST BENGAL-700001	91-33-2480161/62/63/64 Fax : 91-33-2485766	
ES12	CABLE LUGS	1	E1040	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST).	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/ 022-29270878.	
	CABLE LUGS	2	E1149	UNIVERSAL MACHINES LTD.	4,B.B.D.BAG (EAST) 90,STEPHEN HOUSE,5TH FLR CALCUTTA-700001	033 2282 2540	
ES13	D.C. MCCB	1	C02	CROMPTON GREAVES	RAIL TRANSPORTATION SYSTEMS,VANDANA BUILDING, 11, TOLSTOY MARG, TOLSTOY MARG, NEW DELHI, DL 110001	011 3041 6300	
	D.C. MCCB	2	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
	D.C. MCCB	3	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
	D.C. MCCB	4	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
ES16	GI CONDUITS				BIS APPROVED MAKE		

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
ES17	GI CONDUIT (EPOXY PAINTED)				BIS APPROVED MAKE		
ES18	FLEXIBLE CONDUITS (TERNE/LEAD COATED)	1	P03	PLICA INDIA PVT. LTD.	V.P.AGARWAL MANAGING DIRECTOR, PLICA INDIA PVT. LTD. 149, MODEL TOWN EAST GHAZIABAD - 201009	M - 9810052131 / 0120-4563979 / 9810557567 Mail: agr@plicaindia.com	
ES19	FLEXIBLE CONDUIT (PVC COATED)				REPUTED MAKE		
ES20	DC CONTACTORS	1	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
	DC CONTACTORS	2	E1030	BHEL (BHOPAL)	HEAVY ELECTRICAL PLANT		
	DC CONTACTORS	3	E1044	ELECTROMAC INDUSTRIES	27/28AF NEW EMPIRE IND.ESTT., R.KRISHNA MANDIR RD.JB NGR ,ANDHERI(E),MUMBAI-400059	91-22-28324829 / 66919034 devang@electromacglands.com	
	DC CONTACTORS	4	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
	DC CONTACTORS	5	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
	DC CONTACTORS	6	E1144	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
	DC CONTACTORS	7	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
ES21	CONTROL SWITCHES/ SELECTOR SWITCH	1	E1076	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELHI-110014	Rajiv Sharma-9312004687	
	CONTROL SWITCHES/ SELECTOR SWITCH	2	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
	CONTROL SWITCHES/ SELECTOR SWITCH	3	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479000	
	CONTROL SWITCHES/ SELECTOR SWITCH	4	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
	CONTROL SWITCHES/ SELECTOR SWITCH	5	SRC01	M/s Shrenik & Co.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR,		
	CONTROL SWITCHES/ SELECTOR SWITCH	6	RE05	RECOM PVT. LTD.	M/S RECOM PVT. LTD.,16A, 2ND FLOOR A, WING RAI INDUSTRIAL COMPLEX, MILITARY ROAD,	Mr. Chandrashekar Kamath (MD) : 09820249503	
ES23	LT- CURRENT TRANSFORMER	1	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
	LT- CURRENT TRANSFORMER	2	E1009	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
	LT- CURRENT TRANSFORMER	3	E1066	INDCOIL	PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	
	LT- CURRENT TRANSFORMER	4	K18	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., SOUTHERN ELECTRIKS 14, CART TRACK ROAD, MADUVANKARAI, CHENNAI - 600 042, INDIA.	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795 FAX: +91 - 44 - 22351662, 22451693 E-MAIL: mira@kappaelectricals.com sales@kappaelectricals.com	
	LT- CURRENT TRANSFORMER	5	E1104	PRAGATI ELECTRICALS	280/3,II POKHRAN RD	5341779,5427041	
	LT- CURRENT TRANSFORMER	6	E1106	PRECISE ELECTRICALS	47A-49A,CHAKALA ROAD ANDHERI(E),MUMBAI-99 MUMBAI, MAHARASHTRA, INDIA PIN-400 099	022-8323402 / 022-8216433	
	LT- CURRENT TRANSFORMER	7	E1128	SILKAANS ELECT.MFG.CO.PVT.LTD	PLOT NO: R-247, T.T.C. INDUSTRIAL AREA, M.I.D.C , RABALE, NAVI MUMBAI- 400 701 INDIA	+91-22- 27607787 / 27607927 +91-22- 27607997	
	LT- CURRENT TRANSFORMER	8	E1111	PRAYOG ELECTRICALS PVT. LTD.	GROUND FLOOR, THAKORE INDUSTRIAL COMPUND, STATION ROAD, VIDYA VIHAR (W), NATHANI ROAD , OPP. AMBIKA TEMPLE,MUMBAI Mumbai - 400086, Maharashtra, India	91-22-25164288/25133146 Mr. P. U. PATWARDHAN (MANAGING DIRECTOR)	
	LT- CURRENT TRANSFORMER	9	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
ES24	LT- POTENTIAL TRANSFORMER	1	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
	LT- POTENTIAL TRANSFORMER	2	E1009	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
	LT- POTENTIAL TRANSFORMER	3	E1066	INDCOIL	PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	
	LT- POTENTIAL TRANSFORMER	4	K18	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., SOUTHERN ELECTRIKS 14, CART TRACK ROAD, MADUVANKARAI, CHENNAI - 600 042, INDIA.	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795 FAX: +91 - 44 - 22351662, 22451693 E-MAIL: mira@kappaelectricals.com sales@kappaelectricals.com	
	LT- POTENTIAL TRANSFORMER	5	E1104	PRAGATI ELECTRICALS	280/3,II POKHRAN RD	5341779,5427041	
	LT- POTENTIAL TRANSFORMER	6	E1106	PRECISE ELECTRICALS	47A-49A,CHAKALA ROAD ANDHERI(E),MUMBAI-99 MUMBAI, MAHARASHTRA, INDIA PIN-400 099	022-8323402 / 022-8216433	
	LT- POTENTIAL TRANSFORMER	7	E1128	SILKAANS ELECT.MFG.CO.PVT.LTD	PLOT NO: R-247, T.T.C. INDUSTRIAL AREA, M.I.D.C , RABALE, NAVI MUMBAI- 400 701 INDIA	+91-22- 27607787 / 27607927 +91-22- 27607997	

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
	LT- POTENTIAL TRANSFORMER	8	E1111	PRAYOG ELECTRICALS PVT. LTD.	GROUND FLOOR, THAKORE INDUSTRIAL COMPUND, STATION ROAD, VIDYA VIHAR (W), NATHANI ROAD , OPP. AMBIKA TEMPLE,MUMBAI Mumbai - 400086, Maharashtra, India	91-22-25164288/25133146 Mr. P. U. PATWARDHAN (MANAGING DIRECTOR)	
ES25	DC SWITCH	1	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
	DC SWITCH	2	E1076	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELHI-110014	Rajiv Sharma-9312004687	
	DC SWITCH	3	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
ES26	DISTRIBUTION BOX	1	SRC01	M/S SHRENIK & CO.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR, AHMEDABAD – 382 213		
ES27	EMER. PORTABLE LTG. SET	1	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srbans@bajajelectricals.com;	
	EMER. PORTABLE LTG. SET	2	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srbans@bajajelectricals.com;	
ES28	FUSE BASE	1	E1068	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
	FUSE BASE	2	G01	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
	FUSE BASE	3	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
	FUSE BASE	4	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
	FUSE BASE	5	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 ;amit.bhadauria@siemens.com	
	FUSE BASE	6	A24	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
	FUSE BASE	7	S02	SPACEAGE SWITCHGEARS LTD.	68 & 13-A INDUSTRIAL DEVELOPMENT COLONY, MEHRAULI ROAD GURGAON, HARYANA-122001	0124-2302711, 4085091	
	FUSE BASE	8	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
	FUSE BASE	9	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
	FUSE BASE	10	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
ES29	HRC FUSES	1	E1068	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
	HRC FUSES	2	G01	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
	HRC FUSES	3	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
	HRC FUSES	4	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
	HRC FUSES	5	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 ;amit.bhadauria@siemens.com	
	HRC FUSES	6	A24	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
	HRC FUSES	7	S02	SPACEAGE SWITCHGEARS LTD.	68 & 13-A INDUSTRIAL DEVELOPMENT COLONY, MEHRAULI ROAD GURGAON, HARYANA-122001	0124-2302711, 4085091	
	HRC FUSES	8	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
	HRC FUSES	9	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
	HRC FUSES	10	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
	GALVANISING	1		Jenco Industrial Corporation	Chincholi Bundar Khkar Road Near Link Road Devruwadi Malad (W) Mumbai 400064		
	GALVANISING	2		National Galvanizing Company	66, Barrackpore Kamarhatt Trunck Road Calcutta-700058		
	GALVANISING	3		Sigma Galvanising Pvt. Ltd.	Plot No.C-169, TTC, MIDC Ind Area Navin Mumbai-400705	8725402,8725765	
	GALVANISING	4		B.P. Projects PVT LTD	167A, Vivekananda Road Kolkata-700006	033 2553 1254	
	GALVANISING	5		Standard Galvanisers	Makardah Road, Kabar Para, Bankra, Howarah - 711403	28756318/28741986/28725402/28725765	
	GALVANISING	6		Steel Products	National Highway No. 6, Chamrail, Kona, Howrah-711114		
	GALVANISING	7		Unitech Fabricators & Engineers Pvt. Ltd.	Village- Ajab Nagar, P.O. -Molla Simla, P.S. - Singur, Dist - Hoogly, Pin-712223	022 -27686606/ 1907	
	GALVANISING	8		Shivam Engineers & Fabricators	AO-282-284, Industrial Area, South Side of G.T. Road, Ghaziabad, U.P.		

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
ES30	GALVANISING	9		B.G. Shirke Construction Technology Pvt. Ltd	72-76, Mundhawa, Pune - 401 036		
	GALVANISING	10		Galbro Ispat Galvanizers Pvt. Ltd.	GUT 11 AND 12, OPP. Kudus Steel,Rolling Mill, Wada, Thane , Mumbai		
	GALVANISING	11		Eros Metals	G-97, MIDC, Bhutibori , Nagpur		
	GALVANISING	12		Industrial Perforation (India) Pvt. Ltd.	Ganganagr, Katakhal, Kolkata-700132		
	GALVANISING	13		Indmark Formtech Pvt. Ltd.	Phase - 3, E - 11 / 1, M. I. D. C., Chakan, Pune - 410 501, Maharashtra, India.		
	GALVANISING	14		Namdhari Industrial Traders Pvt. Ltd.	Village Latton Dana, Chandigarh Road, Ludhiana		
	GALVANISING	15		Neha Galvaniser	Jalan Industrial Estate, Gate No-1, 1st Right Choise Lane, Near N.G-6, Jangalpur, PO Domjur Howrah - 700071, West Bengal, India		
	GALVANISING	16		Patny Systems (P) Ltd.	Unit-IV, Sy No. -228/9, Plot No. 6, IP Kuchavaram, Toopran(M) Dist.- Medak, Telegana - 502336		
	GALVANISING	17		Parmar Metal Company	Survey No.207,Veraval (Shapar) Dist. Rajkot, India.		
	GALVANISING	18		Passive Infra Projects Pvt. Ltd	8th KM Stone, Sampla Kharkhoda Road, Hassangarh, Rohtak, Haryana		
	GALVANISING	19		Rukmani Electrical & Fabricators Pvt. Ltd.	Urla Industrial Area, Urla Sarora Road, Raipur- 493 221 (Chhattisgarh)		
	GALVANISING				Shankharidaha Baniyarah, Jalan Industrial Complex, Gate no.3, Lane no. 4, Domjur, Howrah , W.B - 71141		
	GALVANISING	20		DMP Projects Pvt.Ltd.	Dulagarh Industrial Park , PS-Sankrail , Howrah - 711302		
	GALVANISING	21		Vinfab Engineers India Private Limited	Gut no. 224/1 &2 Bhiwandi Wada State Highway, Village khupri, Dist. Thane, Maharashtra -421303		
	GALVANISING	22		Saral Projects & Processors	B-1, Industrial Area, Site-II, Amawan Road Rae Bareli		
ES31	GI WIRE & FLAT	1	I039	INDUSTRIAL PERFORATION (I) PVT.LTD.	MR. A. K. SAHA 327, R.N.GUHA ROAD, DUM DUM KOLKATA-West Bengal-India Phone- 9830241788 Pincode : 700028 Email : ipipl@cal2.vsnl.net.in	011 2737 3579	
	GI WIRE & FLAT	2	I070	INDIA ELECTRICALS SYNDICATE	Mr. Suresh Kumar Agarwal 55, Ezra Street, Kolkata, West Bengal-India Phone- 033-22354047 Pincode : 700001 Email : cabletray@vsnl.com	022-28511704	
	GI WIRE & FLAT	3	I072	INDMARK FORMTECH PVT. LTD.	Mr. Narendra R. Meher J Block, Plot No.-375, MIDC BHOSARI PUNE-MAHARASHTRA-INDIA Phone- 020-27130546 Pincode : 411026 Email : indmarkformtech@vsnl.net		
	GI WIRE & FLAT	4	P039	PREMIER POWER PRODUCTS (CAL) PVT. LTD.	Chatterjee International Centre, 33A, Jawaharlal Nehru Road, 6th Floor, Suit No. - 11A, Kolkata,- West Bengal-India Phone- 9331008739 Pincode : 700071 Email : hemantdaga@dagaventures.com		
	GI WIRE & FLAT	5	P050	PATNY SYSTEMS (P) LTD	PATNY PLAZA 160 , SARDAR PATEL ROAD SEUNDRABAD SECUNDRABAD-TELANGANA-INDIA Phone- 040-27902451 Pincode : 500003 Email : mr.mkt@patnysystems.com		
	GI WIRE & FLAT	6	P079	PASSIVE INFRA PROJECTS PVT. LTD.	MR. VARUN AGRAWAL 182, VAISHALI, PITAMPURA Delhi-DELHI-INDIA Phone- 9871183059 Pincode : 110088 Email : ATANU.SAHA@PASSIVEINFRA.COM		
	GI WIRE & FLAT	7	R036	RUKMANI ELECTRICAL & COMPONENTS PVT LTD	11A, MAHARISHI DEBENDRA ROAD 1ST FL , ROOM NO.4 KOLKATA-WEST BENGAL-INDIA Phone- Pincode : 700007 Email : maruthikabra@gmail.com		
	GI WIRE & FLAT	8	R037	RATAN PROJECTS & ENGINEERING CO. PVT.LTD.	MR. G.D. SINGHEE/MR. MAHESH SINGHEE 26, P.K. TAGORE STREET, MAIN BUILDING KOLKATA-WEST BENGAL-INDIA Phone- 9830177331 Pincode : 700006 Email : mahesh@ratans.com		
	GI WIRE & FLAT	9	R041	RABI ENGINEERING WORKS PVT. LTD.	MR. TAPAN KUMAR SEN/MR. SIDDHARTHA 327, R.N. GUHA ROAD, DUM DUM, KOLKATA-WEST BENGAL-INDIA Phone- 9748753002 Pincode : 700028 Email : rabiengineering@gmail.com		
	GI WIRE & FLAT	10	R200	RAJASTHAN METAL SMELTING CO.	Mr. R. K. Tibrewala D-80, Road No. 7, V.K.I.A., Jaipur-Rajasthan-India Phone- 0141-2332269 Pincode : 302013 Email : info@rmscoindia.com		
	GI WIRE & FLAT	11	S210	SARAL INDUSTRIES	Mr. Y.K. Gupta L-1, L-2, Industrial Area-1 Sultanpur Road Rae Bareli-Uttar Pradesh-India Phone- 0535-2702474 Pincode : 229010 Email : saralindustries@gmail.com		

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
	GI WIRE & FLAT	12		PARCO Engineers Pvt. Ltd.	401, skyline Epitom Building ,Near to Jolly Gym Khana, Kirol Road , Vidhyavihar, MH 400086 India		
	GI WIRE & FLAT	13	U019	UNITECH FABRICATORS and ENGINEERS PVT LTD	INDRAPRASHTHA APARTMENT 24 , M.B.RAOD , BIRATI KALABAGAN KOLKATA KOLKATA-WEST BENGAL-INDIA Phone- Pincode : 700051 Email : ufepl@vsnl.net; ufepl@rediffmail.com	022 - 26230814	
ES33	IND.POWER & WLDG SOCKETS	1	C02	CROMPTON GREAVES	3RD FLOOR, EXPRESS BUILDING,9-10, BAHADUR SHAH ZAFAR MARG, NEAR ITO CROSSING,NEW DELHI-110002, INDIA	91 11 23460700 - 999 'Sunil.Das@cgglobal.com	
	IND.POWER & WLDG SOCKETS	2	E1207	CYCLO ELECTRIC DEVICE & SERV.CO.	: A-3, NEAR ANTHEM BIOSCIENCE, KSSIDC INDUSTRIAL AREA, BOMMASANDRA, BOMMASANDRA INDUSTRIAL AREA, BANGALORE, KARNATAKA 560099	Mr. H.Jaishanker +919845039081, 080 - 27833102 , 080 - 27833103 : +91 80 41460985 'cycloelectric@gmail.com	
	IND.POWER & WLDG SOCKETS	3	B04	BCH	20/4, MATHURA ROAD, FARIDABAD - 121006, HARYANA, INDIA	0(129)-4063000, 9015800189(Ramesh Giri) 'ramesh.giri@bchindia.com	
	IND.POWER & WLDG SOCKETS	4	B02	BEST & CROMPTON	Best & Crompton Engineering Ltd	Ph : +91 44 4551 4724 , MRKT DGM	BEST &
	IND.POWER & WLDG SOCKETS	5	A03	AJMERIA INDUSTRIES & ENGG. WORKS	AJMERIA INDL AND ENGG. WORKS. AJMERIA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL AREA, NAVI MUMBAI - 400705.	Tel : 022 27620299 / 97 / 96 'mail@ajmeria.net	
ES34	INTERPOSING RELAY	1	A24	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
	INTERPOSING RELAY	2	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
	INTERPOSING RELAY	3	E1075	JYOTI LTD.	JYOTI LIMITED, E&CS DIVISION,3/15, BIDC, GORWA,VADODARA - 390 016, E-MAIL ID: ECS@JYOTI.COM	Ph. No.:+91-265-2281214 , Fax No.:+91-265-2281214	
	INTERPOSING RELAY	4	E1099	OEN INDIA LTD	29/1479, VYTILLA, COCHIN - 682 019 KERALA, INDIA	Phone : +91 484 2301132, 2303709 Fax : +91 484 2302287, 2302221 sales@oenindia.com	
	INTERPOSING RELAY	5	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
ES35	INDICATING LAMPS	1	B04	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	
	INDICATING LAMPS	2	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	6832259,6918834-37	
	INDICATING LAMPS	3	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
	INDICATING LAMPS	4	E1153	VAISHNO(HOTLINE SWGR.& CONTROL)	G-19, SECTOR - 11, NOIDA - 201301, UTTAR PRADESH, INDIA	8377805157 9818338922	
	INDICATING LAMPS	5	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	9818338922	
	INDICATING LAMPS	6	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
	INDICATING LAMPS	7	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
ES36	JUNCTION BOXES (NON FLAME PROOF)	1	J01	JASPER ENGINEERS PVT. LTD.	A-23, SECTOR - 8, NOIDA-201301	0120-4033520/533	
	JUNCTION BOXES (NON FLAME PROOF)	2	EC05	Electro Controls & Devices	M/S ELECTRO CONTROLS & DEVICES, F-41, SITE-C, SURAJPUR INDUSTRIAL AREA GREATER NOIDA, UTTAR PRADESH :201308	Mr. Sanjay Sharma (Chief Promoter) 0120-2569487, 2560100,2560300	
	JUNCTION BOXES (NON FLAME PROOF)	3	SRC01	M/s Shrenik & Co.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR, AHMEDABAD - 382 213	020-026708100	
	JUNCTION BOXES (NON FLAME PROOF)	4	PME-01	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	Awasthi(09971119006) Tel: ++91 20 6674 5103, Mobile: +91 90499 95985, Fax: ++91 20 6674 5126 contact person : Vishwa bandhu	
	JUNCTION BOXES (NON FLAME PROOF)	5	ACE01	Adroit Control Engineers Pvt.Ltd.	M/S ADROIT CONTROL ENGINEERS PVT.LTD. PLOT-3, KRISHNA INDL. AREA, SECTOR-25 FARIDABAD - 121004	011-47600700, 0129-4251400	
	JUNCTION BOXES (NON FLAME PROOF)	6	PME-01	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	Tel: ++91 20 6674 5103, Mobile: +91 90499 95985, Fax: ++91 20 6674 5126 contact person : Vishwa bandhu E-mail:d.gupta@pmipl-online.com ;admin@pmipl-online.com	
	JUNCTION BOXES (NON FLAME PROOF)	7	MK01	MIKA ENGINEERS	BRANCH OFFICE : 'D'-101, DHEERAJ HERITAGE RESIDENCY II, SHASTRI NAGAR, SANTACRUZ (W), MUMBAI 400 054.	Director : Mr. Asgar Karimi Email: asgar@mikaengineers.com E-mail : mika@mtnl.net.inTelfax : 022-26610081/82/83/84Tel : 02527-249066/70 Cell : 099230 74373	TYPE-S ONLY
	JUNCTION BOXES (NON FLAME PROOF)	8	PME-01	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	TEL- +912066745000 Awasthi(09971119006) Tel: ++91 20 6674 5103, Mobile: +91 90499 95985, Fax: ++91 20 6674 5126 contact person : Vishwa bandhu E-mail:d.gupta@pmipl-online.com ;admin@pmipl-online.com	

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
	JUNCTION BOXES (NON FLAME PROOF)	9	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/8-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srabans@bajajelectricals.com;	
	JUNCTION BOXES (NON FLAME PROOF)	10	A03	AJMERIA INDUSTRIES & ENGG. WORKS	AJMERIA INDL. AND ENGG. WORKS. AJMERIA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	Tel : 022 27620299 / 97 / 96 'mail@ajmera.net	
	JUNCTION BOXES (NON FLAME PROOF)	11	SB02	S.B. ELECTRICAL ENGINEERING CORPORATION	03, SARDAR GRIHA BUILDING, LOHAR CHAWAL, MUMBAI-400002	022- 22069831; 022-66637259	
	JUNCTION BOXES (NON FLAME PROOF)	12	RT13	RITTAL INDIA PVT. LTD.	Espire Building ,Level -1 A-41, Mohan Co-Operative Industrial Estate ,Mathura Road, New Delhi -110044	Amit Bansal Phone: 011-42004000, D: 011-42004033 · Mobile: +91 9717772245 · mailto:amit.b@rittal- india.com www.rittal-india.com	
ES37	JUNCTION BOXES (FLAME PROOF)	1	SS01	SUDHIR SWITCHGEAR	305/6, APEEJAY HOUSE, 130, BOMBAY SAMACHAR MARG, MUMBAI - 400 023. INDIA	Telephone Nos. : 40460000 (100 lines) Fax Nos. : ++91-22-22049381 Email : md@sudhirschwitchgears.com ; works@sudhirschwitchgears.com ;scud@vsnl.com	
ES38	LIGHTING DISTRIBUTION BOARDS	1	E1007	ADVANCE ENGG. COMPANY	38,SETHI IND. ESTATE 10/E,SUREN RD,ANDHERI MUMBAI-400097	91 - 22 - 24360086	
	LIGHTING DISTRIBUTION BOARDS	2	STRG01	Sterling Generators Pvt. Ltd.	C-56/38, INSTITUTIONAL AREA, SECTOR-62, NOIDA -201307, U.P.	Nityanand Engineer-Sales & Marketing (Panel Division) Noida, UP 201307, India Mobile:+91-8510022170	
	LIGHTING DISTRIBUTION BOARDS	3	E1091	MIKA ENGINEERS	BRANCH OFFICE : 'D'-101, DHEERAJ HERITAGE RESIDENCY II, SHASTRI NAGAR, SANTACRUZ (W), MUMBAI 400 054.	Director : Mr. Asgar Karimi E-mail : mika@mtnl.net.inTelfax : 022- 26610081/82/83/84Tel : 02527- 249066/70 Cell : 099230 74373 ; Email: asgar@mikaengineers.com	
	LIGHTING DISTRIBUTION BOARDS	4	F04	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
	LIGHTING DISTRIBUTION BOARDS	5	KM1	KMG ATOZ SYSTEMS	"ATOZ HOUSE" C-49, SECTOR-81, GAUTAM BUDDH NAGAR, NOIDA – 201 305 U. P. (INDIA)	Tel : +91-120-4207920 Fax : +91-120-4207921, 4327958 Phone:098 10 802710	
	LIGHTING DISTRIBUTION BOARDS	6	E05	UNILEC ENGINEERS PVT. LTD.	BEHRAMPUR INDUSTRIAL AREA, BEGAMPUR KHATOLA ROAD, GURGAON-122001	0124-4030247,248, 4559700, 9911087173	
	LIGHTING DISTRIBUTION BOARDS	7	AVA01	AVAIODS TECHNOVATORS LTD.	PLOT NO.25 ,SECTOR-3,IMT-MANESAR, GURGEON- 122050 (HARYANA)	KRISHNA KALRA- 09958096168	
	LIGHTING DISTRIBUTION BOARDS	8	ACE01	Adroit Control Engineers Pvt.Ltd.	M/S ADROIT CONTROL ENGINEERS PVT.LTD. PLOT-3, KRISHNA INDL. AREA, SECTOR-25 FARIDABAD – 121004	011-47600700, 0129-4251400	
	LIGHTING DISTRIBUTION BOARDS	9	JC01	JACKSON ENGINEERS	A-43, HOSEIRY COMPLEX, OPPOSITE NSEZ, NOIDA- 201305	0120-4302600, 2568923,27	
	LIGHTING DISTRIBUTION BOARDS	10	ADL01	Adlec Systems Private Limited	PLOT NO-277, SWARN PARK, UDYOG NAGAR, MUNDKA, MAIN ROHTAK ROAD, UDYOG NAGAR, NEW DELHI, DELHI 110041	011 2834 5061	
	LIGHTING DISTRIBUTION BOARDS	11	POP01	Popular Switchgears Pvt Ltd	712, ARUN CHAMBERS, TARDEO MAIN ROAD, TARDEO, NEAR TARDEO AIRCONDITIONER MARKET, MUMBAI - 400034	-9362634406	
	LIGHTING DISTRIBUTION BOARDS	12	CS01	CANDS	1/202, ANSA INDUSTRIAL ESTATE, SAKI VIHAR ROAD, SAKINAKA, ANDHERI (EAST), MUMBAI-72	022-28570858	
	LIGHTING DISTRIBUTION BOARDS	13	PYRE01	Pyrotech Electronics Pvt. Ltd.	M/s Pyrotech Electronics Pvt. Ltd(Unit -1) Led Light, Sensor Division F-16A, Road No.3 Mewar Industrial Area, Madri Udaipur -313003, Rajasthan,	Concern Person – Mr. Praveen sisodiya (psisodiya@pyrotechlighting.com) Ankit Kumar Sr. Engineer(North Region -Sales & Marketing) # +91- 7340061769, 8287897309	
	LIGHTING DISTRIBUTION BOARDS	14	PCS01	Positronics Pvt. Ltd.	POSITRONICS HOUSE ,882/ 2, G.I.D.C. MAKARPURA,VADODARA 390010 GUJARAT	+91 265 2642496 Fax: +91 265 264 7033 / 234 0944 E- mail : info@positronicsindia.com Website:www.positronicsindia.com	
	LIGHTING DISTRIBUTION BOARDS	15	ISC01	Industrial Switchgears & Control Pvt Ltd	S-02 AMARDEEP MAHAL, NANDA PATKAR RD, VILE PARLE EAST, MUMBAI - 400057	(91)-22-26182011	
	LIGHTING DISTRIBUTION BOARDS	16	VC01	M/s Vidhyut Control (I) Pvt.Ltd.	D-12 & 13, SECTOR-17, KAVI NAGAR INDL.AREA, GHAZIABAD – 201002 (DELHI NCR) U.P. INDIA		
	LIGHTING DISTRIBUTION BOARDS	17	MIL01	MILESTONE SWITCHGEARS PVT. LTD.	MILESTONE SWITCHGEARS PVT. LTD. 97, UDYOG VIHAR, PHASE-1, GURGEON HARYANA - 122016	Phone Nos.: 0124-4994900 (30 Lines) Fax: 0124-4002973 Email: jaideep.ahuja@milestonesindia.com URL: www.milestonesindia.com	

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
E539	LIGHTING FIXTURES (NON LED)	2	E1206	BALIGA LIGHTING EQPT PVT LTD	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	44-24995505,22680990-4	
	LIGHTING FIXTURES (NON LED)	3	F04	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
	LIGHTING FIXTURES (NON LED)	4	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srbans@bajajelectricals.com;	
	LIGHTING FIXTURES (NON LED)	5	CO2	CROMPTON GREAVES	3RD FLOOR, EXPRESS BUILDING,9-10, BAHADUR SHAH ZAFAR MARG, NEAR ITO CROSSING,NEW DELHI-110002, INDIA	91 11 23460700 - 999 Sunil.Das@cggglobal.com	
	LIGHTING FIXTURES (NON LED)	6	E1051	EVERGREEN ENGG. CO.	EVERGREEN ENGG COMPANY WORKS-5, PLOT NO. 9,10,11,12, SURVEY NO. 242, CHINCH PADA, VASAI EAST-401208	(0250) 6458250	
	LIGHTING FIXTURES (NON LED)	7	P01	PHILIPS	9TH FLOOR,DLF 9B, DLF CYBER CITY, DLF PHASE-III,GURGAON-122002	01244606001, Sharad (+919871150447)	
	LIGHTING FIXTURES (NON LED)	8	WP01	WIPRO LTD.	WIPRO CONSUMER CARE AND LIGHTING, 5TH FLOOR, GODREJ ETERNIA -C, OLD PUNE-MUMBAI ROAD, SHIVAJINAGAR, PUNE -411005	020-66098700	
	LIGHTING FIXTURES (NON LED)	9	HP01	M/S HPL ELECTRIC & POWER PVT. LTD	M/S HPL ELECTRIC & POWER PVT. LTD. PLOT NO. 76-B,PHASE-IV, SEC-57, HSIIDC, INDL. AREA , KUNDLI, DIST.- SONEPAT (HARYANA) - 131028	mohitsharma@hplindia.com'	
	LIGHTING FIXTURES (NON LED)	10	SR01	SURYA ROSHNI LIMITED	PADMA TOWER, RAJENDRA PLACE, RAJENDRA PLACE NEW DELHI	011-25810093 ; 9810071832 (Akhilesh Agrawal) aagrawal@sroshni.com	
	LIGHTING FIXTURES (NON LED)	11	HI02	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	GIRISH KUMAR SHRIVASTAVA +91-9810528922	
	LIGHTING FIXTURES (NON LED)	12	HN13	M/s Halonix Technologies Limited	M/s Halonix Technologies Limited B-31 , Phase –II, Noida Distt. Gautam Budh Nagar (U.P.) Pin- 201305	Mr. Mohit Gautam ' 'Tel: +919568152111 'mohit.gautam@halonix.co.in'; 'rahul.singh@halonix.co.in'	
E540	LIGHTING FIXTURES (LED)	1	NE01	Neev Luminaries	D-115 , OKHLA INDUSTRIAL AREA, PHASE-1 NEW DELHI – 110020	Phone: +91 11 4060 4830 Fax: +91 11 4060 4831 info@neevenergy.in	
	LIGHTING FIXTURES (LED)	2	HI01	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	GIRISH KUMAR SHRIVASTAVA +91-9810528922	
	LIGHTING FIXTURES (LED)	3	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srbans@bajajelectricals.com;	
	LIGHTING FIXTURES (LED)	4	SR01	SURYA ROSHNI LIMITED	PADMA TOWER, RAJENDRA PLACE, RAJENDRA PLACE NEW DELHI	011-25810093 ; 9810071832 (Akhilesh Agrawal) aagrawal@sroshni.com	
	LIGHTING FIXTURES (LED)	5	P01	PHILIPS	9TH FLOOR,DLF 9B, DLF CYBER CITY, DLF PHASE-III,GURGAON-122002	01244606001, Sharad (+919871150447)	
	LIGHTING FIXTURES (LED)	6	HP01	M/S HPL ELECTRIC & POWER PVT. LTD	M/S HPL ELECTRIC & POWER PVT. LTD. PLOT NO. 76-B,PHASE-IV, SEC-57, HSIIDC, INDL. AREA , KUNDLI, DIST.- SONEPAT (HARYANA) - 131028	mohitsharma@hplindia.com	
	LIGHTING FIXTURES (LED)	7	INS1	INSTA POWER	PLOT NO. - 457 PHASE - V, UDYOG VIHAR, GURGAON - 122016	124-4124000	
	LIGHTING FIXTURES (LED)	8	PT13	Pyrotech Electronics Pvt. Ltd.	M/s Pyrotech Electronics Pvt. Ltd(Unit -1) Led Light, Sensor Division F-16A, Road No.3 Mewar Industrial Area, Madri Udaipur -313003, Rajasthan,	Concern Person – Mr. Praveen sisodiya (psisodiya@pyrotechlighting.com) Ankit Kumar Sr. Engineer(North Region -Sales & Marketing) # +91- 7340061769, 8287897309	
	LIGHTING FIXTURES (LED)	9	HN13	M/s Halonix Technologies Limited	M/s Halonix Technologies Limited B-31 , Phase –II, Noida Distt. Gautam Budh Nagar (U.P.) Pin- 201305	Mr. Mohit Gautam ' 'Tel: +919568152111 'mohit.gautam@halonix.co.in'; 'rahul.singh@halonix.co.in'	
	LIGHTING FIXTURES (LED)	10	JA13	M/s JAQUAR & COMPANY PVT. LTD.	M/s JAQUAR & COMPANY PVT. LTD. Plot No.3 , Sector M-11, IMT Manesar. Gurgaon- 122050 Haryana	Mr. Dhruv Kumar ' 'Tel: +919350043727 dhruv.kumar@jaquar.com ; gaurav.bhalla@jaquar.com	
E541	LIGHTING FIXTURES (FLAME PROOF)	1	HI01	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	GIRISH KUMAR SHRIVASTAVA +91-9810528922	
	LIGHTING FIXTURES (FLAME PROOF)	2	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srbans@bajajelectricals.com;	
	LIGHTING FIXTURES (FLAME PROOF)	3	E1206	BALIGA ELECTRICALS	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	44-24995505,22680990-4	
	LIGHTING LAMP (NON LED)	1	WP01	WIPRO LTD.	WIPRO CONSUMER CARE AND LIGHTING, 5TH FLOOR, GODREJ ETERNIA -C, OLD PUNE-MUMBAI	020-66098700	

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
ES42	LIGHTING LAMP (NON LED)	2	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	9818338922	
	LIGHTING LAMP (NON LED)	3	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srbans@bajajelectricals.com;	
	LIGHTING LAMP (NON LED)	4	INS1	INSTA POWER	PLOT NO. - 457 PHASE - V, UDYOG VIHAR, GURGAON - 122016	124-4124000	
	LIGHTING LAMP (NON LED)	5	P01	PHILIPS	9TH FLOOR,DLF 9B, DLF CYBER CITY, DLF PHASE-III,GURGAON-122002	01244606001, Sharad (+919871150447)	
	LIGHTING LAMP (NON LED)	6	H101	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	GIRISH KUMAR SHRIVASTAVA +91-9810528922	
	LIGHTING LAMP (NON LED)	7	HP01	HPL	M/S HPL ELECTRIC & POWER PVT. LTD. PLOT NO. 76-B,PHASE-IV, SEC-57, HSIIDC, INDL AREA , KUNDLI, DIST- SONEPAT (HARYANA) - 131028	mohitsharma@hplindia.com'	
	LIGHTING LAMP (NON LED)	8	SR01	SURYA ROSHNI LIMITED	PADMA TOWER, RAJENDRA PLACE, RAJENDRA PLACE NEW DELHI	011-25810093 ; 9810071832 (Akhilesh Agrawal) aagrawal@sroshni.com	
	LIGHTING LAMP (NON LED)	9	HN13	M/s Halonix Technologies Limited	M/s Halonix Technologies Limited B-31 , Phase –II, Noida Distt. Gautam Budh Nagar (U.P.) Pin- 201305	Mr. Mohit Gautam 'Tel: +919568152111 'mohit.gautam@halonix.co.in'; 'rahul.singh@halonix.co.in'	
ES43	LIGHTING LAMP (LED)	1	NE01	Neev Luminaries	D-115 , OKHLA INDUSTRIAL AREA, PHASE-1 NEW DELHI – 110020	Phone: +91 11 4060 4830 Fax: +91 11 4060 4831 info@neevenergy.in	
	LIGHTING LAMP (LED)	2	H101	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	GIRISH KUMAR SHRIVASTAVA +91-9810528922	
	LIGHTING LAMP (LED)	3	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srbans@bajajelectricals.com;	
	LIGHTING LAMP (LED)	4	SR01	SURYA ROSHNI LIMITED	PADMA TOWER, RAJENDRA PLACE, RAJENDRA PLACE NEW DELHI	011-25810093 ; 9810071832 (Akhilesh Agrawal) aagrawal@sroshni.com	
	LIGHTING LAMP (LED)	5	P01	PHILIPS	9TH FLOOR,DLF 9B, DLF CYBER CITY, DLF PHASE-III,GURGAON-122002	01244606001, Sharad (+919871150447)	
	LIGHTING LAMP (LED)	6	HP01	M/S HPL ELECTRIC & POWER PVT. LTD	M/S HPL ELECTRIC & POWER PVT. LTD. PLOT NO. 76-B,PHASE-IV, SEC-57, HSIIDC, INDL AREA , KUNDLI, DIST- SONEPAT (HARYANA) - 131028	mohitsharma@hplindia.com	
	LIGHTING LAMP (LED)	7	INS1	INSTA POWER	PLOT NO. - 457 PHASE - V, UDYOG VIHAR, GURGAON - 122016	124-4124000	
	LIGHTING LAMP (LED)	8	PT13	Pyrotech Electronics Pvt. Ltd.	M/s Pyrotech Electronics Pvt. Ltd(Unit -1) Led Light, Sensor Division F-16A, Road No.3 Mewar Industrial Area, Madri Udaipur -313003, Rajasthan,	Concern Person – Mr. Praveen sisodiya (psisodiya@pyrotechlighting.com) Ankit Kumar Sr. Engineer(North Region -Sales & Marketing) # +91- 7340061769, 8287897309	
	LIGHTING LAMP (LED)	9	HN13	M/s Halonix Technologies Limited	M/s Halonix Technologies Limited B-31 , Phase –II, Noida Distt. Gautam Budh Nagar (U.P.) Pin- 201305	Mr. Mohit Gautam 'Tel: +919568152111 'mohit.gautam@halonix.co.in'; 'rahul.singh@halonix.co.in'	
ES44	LIGHTING POLES	1	E1033	BOMBAY TUBE & POLES CO.	BOMBAY TUBES & POLES CO. 2ND LANE, DARUKHANA, PLOT NO. 100, MAZGAON, MUMBAI – 10	Tel. : +91 22 23729802, email ID: btpc1954@hotmail.com	
	LIGHTING POLES	2	E1118	RIDHDHI POLES	4/5 INDUSTRIAL ESTATE, GORWA, VADODRA-390016	0265 - 2283768	
	LIGHTING POLES	3	MK01	MIKA ENGINEERS	BRANCH OFFICE : 'D'-101, DHEERAJ HERITAGE RESIDENCY II, SHASTRI NAGAR, SANTACRUZ (W), MUMBAI 400 054. WORKS : AT POST AGHAI, SHED NO. 2, VILLAGE AGHAI JILLA, SHAHPUR, DIST. THANE 421 601 TEL : 02527-249066/70 CELL : 099230 74373	Director : Mr. Asgar Karimi Email: asgar@mikaengineers.com;mika@mt nl.net.in Telfax : 022-26610081/82/83/84 Tel : 02527-249066/70 Cell : 099230 74373	
	LIGHTING POLES	4	K02	KL INDUSTRIES	B1 1001 LOK GAURAV, LBS MARG, VIKHROLI WEST, MUMBAI - 400083	(91)-9821013736 (91)-22-25774272	
	LIGHTING POLES	5	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srbans@bajajelectricals.com;	
	LIGHTING POLES	6	TL01	TLL	M/S TRANSSAIL LIGHTING LIMITED (TLL), GAMMON INDIA LIMITED 2ND FLOOR , CENTRIC PLAZA, PLOT NO.8 POCKET-4, SECTOR-11 DWARKA , NEW DELHI -110075	hemant.jain@transrailtd.com'	
	LIGHTING SWITCH , SOCKET & S/F UNIT	1	F04	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
ES45	LIGHTING SWITCH , SOCKET & S/F UNIT	2	E1012	ANCHOR	STEEL HOUSE, B WING, PLOT NO. 24, MAHAL INDUSTRIAL ESTATE, MAHAKALI CAVES ROAD, NEAR PAPER BOX, ANDHERI (E), MUMBAI, MAHARASHTRA - 400093	022-30418888.	
	LIGHTING SWITCH , SOCKET & S/F UNIT	3	E1076	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELHI-110014	Rajiv Sharma-9312004687	
	LIGHTING SWITCH , SOCKET & S/F UNIT	4	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
	LIGHTING SWITCH , SOCKET & S/F UNIT	5	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadoria@siemens.com	
	LIGHTING SWITCH , SOCKET & S/F UNIT	6	E1068	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
ES46	LIGHTING TRANSFORMER	1	E1021	AUTOMATIC ELECTRIC LTD.	ADDRESS : 96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
	LIGHTING TRANSFORMER	2	E1066	INDCOIL	PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	
	LIGHTING TRANSFORMER	3	E1103	POWER PACK ENTERPRISES	POWER PACK ENTERPRISES MR. NEHAL SHAH / MR. SHARAD SHAH (PARTNER) NO. 3, JAYSHREE SADAN, 1ST FLOOR, OLD NAGARDAS ROAD, ANDHERI EAST MUMBAI - 400069, MAHARASHTRA, INDIA	Call Us:08447573761 Mobile: +(91)-9821787821 +(91)-9821035604	
	LIGHTING TRANSFORMER	4	E1155	VIJAY ELECTRICALS LTD.	6-3-648/1&2, OFF RAI BHAVAN ROAD, SOMAJIGUDA, HYDERABAD - 500 082. ANDHRA PRADESH, INDIA.	Vijay Electricals Mr. Bharat Giri / Ajay Giri (CEO) B 79, Gali No. 60, Sanjay Colony, Sector- 23 Faridabad - 121005, Haryana, India Call Us: 09953353612 websales@vijayelectricals.com	
	LIGHTING TRANSFORMER	5	E1057	GILBERT & MAXWELL	WORKS PLOT G-28 , M.I.D.C., AMBAD NASHIK - 422010, MAHARASHTRA, INDIA	Mr. Sanjeev Kulkarni, (Marketing Manager) Cell: 9822586724 sanjeevkulkarni@gilbert-maxwell.in Phone : + 91 - 253 - 238 25 51 Fax : + 91 - 253 - 238 25 52	
	LIGHTING TRANSFORMER	6	K18	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., SOUTHERN ELECTRIKS 14, CART TRACK ROAD, MADUVANKARAI, CHENNAI 600 042, INDIA.	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795 FAX: +91 - 44 - 22351662, 22451693 - E-MAIL: mira@kappaelectricals.com sales@kappaelectricals.com	
	LIGHTING TRANSFORMER	7	AIE01	Ames Impex Electricals Pvt. Ltd	C-1B/1207, PHASE IV, GIDC NARODA, AHMEDABAD, GUJARAT 382330	Phone:079 2282 1648	
ES47	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	8	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	9	E1019	ASIATIC	A-58 NARAINA IND. AREA, PHASE-I , NEW DELHI 110028	011 - 25796330, 25796617	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	10	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011 - 25793021	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	11	E1051	EVERGREEN ENGG. CO.	EVERGREEN ENGG COMPANY WORKS-5, PLOT NO. 9,10,11,12, SURVEY NO. 242, CHINCH PADA, VASAI EAST-401208	(0250) 6458250	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	12	E1143	TECKNIC CONTROLS	703, MADHAVA, BANDRA, KURLA COMPLEX, BANDRA EAST, MUMBAI, MAHARASHTRA 400051	022-42532507/00 022-24451648	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	13	E1053	EX-PROTECTA LIGHTING EQUIPMENT	305-306, GIDC ESTATE, VITHAL UDYOGNAGAR - 388121 DIST. ANAND, GUJARAT 388121 INDIA	02692-237823	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	14	E1206	BALIGA ELECTRICALS	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	44-24995505,22680990-4	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	15	E1210	ENPRO ENGG.	NO.995P, DIAMOND PLAZA, 2ND FLOOR, 12TH MAIN ROAD, ANNA NAGAR, CHENNAI-40	044 – 42611526 / 42170338 / 26262716 enproengg@enproengineering.com	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	16	E1132	STERLING SWGR CONTROL PVT.LTD.	P.O. BOX NO. 17023, SORAB HOUSE, 2ND FLOOR, 555, S.B. MARG, DADAR, MUMBAI - 400028, MAHARASHTRA, INDIA	91-22-24222297/24222298/242224236	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	17	F04	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	18	E1153	VAISHNO(HOTLINE SWGR & CONTROL)	G-19, SECTOR - 11, NOIDA - 201301, UTTAR PRADESH, INDIA	8377805157 9818338922	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	19	J01	JASPER ENGINEERES PVT. LTD.	A-23, SECTOR - 8, NOIDA-201301	0120-4033520/533	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	20	KM1	KMG ATOZ SYSTEMS	C-49, SECTOR-81-NOIDA-201305	120-4207920, 08527897328	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	21	E05	UNILEC ENGINEERS PVT. LTD.	BEHRAMPUR INDUSTRIAL AREA, BEGAMPUR KHATOLA ROAD, GURGAON-122001	0124-4030247,248, 4559700, 9911087173	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	22	B04	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	23	E1035	CANDS	J/202, ANSA INDUSTRIAL ESTATE, SAKI VIHAR ROAD, SAKINAKA, ANDHERI (EAST), MUMBAI-72	022-28570858	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	24	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadoria@siemens.com	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	25	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	26	E1143	TECKNIC CONTROLS	703, MADHAVA, BANDRA, KURLA COMPLEX, BANDRA EAST, MUMBAI, MAHARASHTRA 400051	022-42532507/00 022-24451648	

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	27	E1148	UNITED ELECTRIC	97 UDYOG VIHAR PHASE-I, GURGAON 122015, HARYANA	124 4002970 72	
	LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	28	SRC01	M/s Shrenik & Co.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR, AHMEDABAD – 382 213		
	LOCAL PUSH BUTTON STATION (FLAME PROOF)						
ES48							
ES50	LIGHTING PANEL (NON FLAME PROOF)	1	E1091	MIKA ENGINEERS	D'-101, DHEERAJ HERITAGE RESIDENCY II, SHASTRI NAGAR, SANTACRUZ (W), MUMBAI 400 054.	Director : Mr. Asgar Karimi E-mail : mika@mtnl.net.inTelfax : 022-26610081/82/83/84Tel : 02527-249066/70 Cell : 099230	
	LIGHTING PANEL (NON FLAME PROOF)	2	F04	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
	LIGHTING PANEL (NON FLAME PROOF)	3	VC01	Vidhyut Controls (India) Pvt. Ltd.	M/S VIDHYUT CONTROL (I) PVT.LTD. D-12 & 13, SECTOR-17,KAVI NAGAR INDL.AREA,GHAZIABAD – 201002 (DELHI NCR) U.P. INDIA	0120-4186400, 0120-4186423, 8527005590(DK GUPTA)	
	LIGHTING PANEL (NON FLAME PROOF)	4	KM1	KMG ATOZ SYSTEMS	"ATOZ HOUSE" C-49, SECTOR-81, GAUTAM BUDDH NAGAR, NOIDA – 201 305 U. P. (INDIA)	Tel : +91-120-4207920 Fax : +91-120-4207921, 4327958 Phone:098 10 802710	
	LIGHTING PANEL (NON FLAME PROOF)	5	E05	UNILEC ENGINEERS PVT. LTD.	BEHRAMPUR INDUSTRIAL AREA, BEGAMPUR KHATOLA ROAD, GURGAON-122001	0124-4030247,248, 4559700, 9911087173	
	LIGHTING PANEL (NON FLAME PROOF)	6	AVA01	AVAIODS TECHNOVATORS LTD.	PLOT NO.25 ,SECTOR-3,IMT-MANESAR, GURGEON-122050 (HARYANA)	KRISHNA KALRA- 09958096168	
	LIGHTING PANEL (NON FLAME PROOF)	7	ACE01	Adroit Control Engineers Pvt.Ltd.	M/S ADROIT CONTROL ENGINEERS PVT.LTD. PLOT-3, KRISHNA INDL. AREA, SECTOR-25 FARIDABAD – 121004	011-47600700, 0129-4251400	
	LIGHTING PANEL (NON FLAME PROOF)	8	JC01	JACKSON ENGINEERS	A-43, HOSEIRY COMPLEX, OPPOSITE NSEZ, NOIDA-201305	0120-4302600, 2568923,27	
	LIGHTING PANEL (NON FLAME PROOF)	9	MIL01	MILESTONE SWITCHGEARS PVT. LTD.	MILESTONE SWITCHGEARS PVT. LTD. 97, UDYOG VIHAR, PHASE-1, GURGEON HARYANA - 122016	Phone Nos.: 0124-4994900 (30 Lines) Fax: 0124-4002973 Email: jaldeep.ahuja@milestonesindia.com URL: www.milestonesindia.com	
	LIGHTING PANEL (NON FLAME PROOF)	10	PCS01	Positronics Pvt. Ltd.	POSITRONICS HOUSE ,882/ 2, G.I.D.C. MAKARPURA,VADODARA 390010 GUJARAT	+91 265 2642496 Fax: +91 265 264 7033 / 234 0944 E- mail : info@positronicsindia.com Website:www.positronicsindia.com	
	LIGHTING PANEL (NON FLAME PROOF)	11	PYRE01	Pyrotech Electronics Pvt. Ltd.	M/s Pyrotech Electronics Pvt. Ltd(Unit -1) Led Light, Sensor Division F-16A, Road No.3 Mewar Industrial Area, Madri Udaipur -313003, Rajasthan,	Concern Person – Mr. Praveen sisodiya (psisodiya@pyrotechlighting.com) Ankit Kumar Sr. Engineer(North Region -Sales & Marketing) # +91- 7340061769, 8287897309	
ES51	MCB	1	E1088	MDS SWITCHGEAR LTD	314-317SHAH NAHAR ESTATE	011 - 25793021	
	MCB	2	E1068	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
	MCB	3	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
	MCB	4	E1120	S&S POWER SWITCHGEAR LTD,	NEW NO. 67, OLD NO. 19, DR. RANGA ROAD, MYLAPORE, CHENNAI - 600004	044 - 24988056, 044 - 24988057, 044 - 24988058	
ES55	MODULAR SWITCH BOARD	1	E1012	ANCHOR	STEEL HOUSE, B WING, PLOT NO. 24, MAHAL INDUSTRIAL ESTATE, MAHAKALI CAVES ROAD, NEAR PAPER BOX, ANDHERI (E), MUMBAI, MAHARASHTRA - 400093	022-30418888.	
	MODULAR SWITCH BOARD	2	F04	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
	MODULAR SWITCH BOARD	3	HI01	HAVELLS INDIA LIMITED	QRG TOWERS , 2D SECTOR-126, NOIDA- 201301	GIRISH KUMAR SHRIVASTAVA +91-9810528922	
ES61	SWITCH BOX	1	E1012	ANCHOR	STEEL HOUSE, B WING, PLOT NO. 24, MAHAL INDUSTRIAL ESTATE, MAHAKALI CAVES ROAD, NEAR PAPER BOX, ANDHERI (E), MUMBAI, MAHARASHTRA - 400093	022-30418888.	
	SWITCH BOX	2	F04	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
	SWITCH BOX	3	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srbans@bajajelectricals.com;	
	SWITCH BOX	4	A03	AJMERIA INDUSTRIES & ENGG. WORKS	AJMERIA INDL AND ENGG. WORKS. AJMERIA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL AREA, NAVI MUMBAI – 400705.	Tel : 022 27620299 / 97 / 96 'mail@ajmeria.net	
	SWITCH BOX	5	S802	S.B. ELECTRICAL ENGINEERING CORPORATION	03, SARDAR GRIHA BUILDING, LOHAR CHAWAL, MUMBAI-400002	022- 22069831; 022-66637259	
	TERMINAL BLOCKS	1	C01	WAGO-CONTROLS	C 27, GREATER NOIDA, SECTOR 58, C BLOCK, SECTOR 58, NOIDA, UTTAR PRADESH 201307	0120-2580409/10	
	TERMINAL BLOCKS	2	E1038	CONNECT WELL	309A/4, 3RD FLOOR, KALKAJI, OKHLA IND AREA PH-2, GOVINDPURI, NEW DELHI, DL 110019	9811881085 09871419996 011-65908877	

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
ES62	TERMINAL BLOCKS	3	E1047	ELMEX CONTROLS PVT. LTD.	12,G.I.D.C.ESTATE,MUKARPURA ROAD,VADODARA-390010	9374631074	
	TERMINAL BLOCKS	4	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
	TERMINAL BLOCKS	5	E1142	TECHNOPLAST	OPP.I.M.INTER COLLEGE, BEGUM SARAI KHURD ROAD, AMROHA - 244221, U.P.	PH:- 05922 264006 CELL NO:- 9012676000, 9319520799, 9319582467	
	TERMINAL BLOCKS	6	PME-01	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	TEL - +912066745000 Awasthi(09971119006) Tel: ++91 20 6674 5103, Mobile: +91 90499 95985, Fax: ++91 20 6674 5126 contact person : Vishwa bandhu E-mail:d.gupta@pmipl-online.com ;admin@pmipl-online.com	
	TERMINAL BLOCKS	7	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
ES63	TIMERS - PNEUMATIC	1	B04	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	
	TIMERS - PNEUMATIC	2	G01	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
	TIMERS - PNEUMATIC	3	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
	TIMERS - PNEUMATIC	4	E1144	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
	TIMERS - PNEUMATIC	5	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
	TIMERS - PNEUMATIC	6	E01	ELECTRONIC AUTOMATION PVT. LTD.	20, KHB INDUSTRIAL AREA YELAHANKA BANGLORE-560064	080 -28567561 / 080 -28567562 / 080 -42802345	
ES64	TIMERS - ELECTRONIC	1	E1050	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
ES65	TRANSDUCERS	1	E1021	AUTOMATIC ELECTRIC LTD.	ADDRESS : 96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
	TRANSDUCERS	2	E1202	SOUTHERN TRANSDUCERS	INTERTECH B-83, FLATTED FACTORY COMPLEX, NEAR MODI MILLS, OKHLA, NEW DELHI-110020	Mr. Gurmohit Singh 011-41020365 / 9891402128	
ES67	RECEPTACLE (FLAME PROOF)	1	E1206	BALIGA ELECTRICALS	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	44-24995505,22680990-4	
	RECEPTACLE (FLAME PROOF)	2	SS01	SUDHIR SWITCHGEAR	305/6, APEEJAY HOUSE, 130, BOMBAY SAMACHAR MARG, MUMBAI - 400 023. INDIA	Telephone Nos. : 40460000 (100 lines) Fax Nos. : ++91-22-22049381 Email : md@sudhirschwitchgears.com ; works@sudhirschwitchgears.com ; scud@vsnl.com	
	RECEPTACLE (FLAME PROOF)	3	FFP01	FCG FLAME PROOF CONTROL GEAR	A1/53, SHAH & NAHAR INDUSTRIAL ESTATE, SITARAM JADHAV ROAD, LOWER PAREL (W), MUMBAI-400 013	Mr. N. G. Patel CMD Office No: +91-22-43443200 Fax No: +91-22-24960313	
ES68	RECEPTACLE (NON FLAME PROOF)	1	A03	AJMERIA INDUSTRIES & ENGG. WORKS	AJMERIA INDL. AND ENGG. WORKS. AJMERIA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI - 400705.	Tel : 022 27620299 / 97 / 96 'mail@ajmeria.net	
	RECEPTACLE (NON FLAME PROOF)	2	C02	CROMPTON GREAVES	3RD FLOOR, EXPRESS BUILDING,9-10, BAHADUR SHAH ZAFAR MARG, NEAR ITO CROSSING,NEW DELHI-110002, INDIA	91 11 23460700 - 999 'Sunil.Das@cgglobal.com	
	RECEPTACLE (NON FLAME PROOF)	3	E1207	CYCLO ELECTRIC DEVICE & SERV.CO.	: A-3, NEAR ANTHEM BIOSCIENCE, KSSIDC INDUSTRIAL AREA, BOMMASANDRA, BOMMASANDRA INDUSTRIAL AREA, BANGALORE, KARNATAKA 560099	Mr. H.Jaishanker +919845039081, 080 - 27833102 , 080 - 27833103 : +91 80 41460985 'cycloelectric@gmail.com	
	RECEPTACLE (NON FLAME PROOF)	4	B04	BCH	20/4, MATHURA ROAD, FARIDABAD - 121006, HARYANA, INDIA	0(129)-4063000, 9015800189(Ramesh Girij) 'ramesh.girij@bchindia.com	
	RECEPTACLE (NON FLAME PROOF)	5	B02	BEST & CROMPTON	BEST & CROMPTON ENGINEERING LTD 28C, AMBATTUR INDUSTRIAL ESTATE (NORTH) AMBATTUR, CHENNAI - 600 098	Ph : +91 44 4551 4724 , MRKT DGM Mr. VI Raj:- 9840593411 'bestcromptonviraj@gmail.com	
ES69	EMERGENCY LIGHTING UNIT (FIXED & PORTABLE TYPE)- NON FLAME PROOF	1	B05	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI - 110049	CONTACT PERSON : Mr. S. SREEMANY. SR. MANAGER (PROJECTS) CONTACT DETAILS : (+91) 9871025705. MAIL ID : srabans@bajajelectricals.com	
	EMERGENCY LIGHTING UNIT (FIXED & PORTABLE TYPE)- NON FLAME PROOF	2	PEP05	PROLITE AUTOGLO LIMITED,	PROLITE AUTOGLO LTD 25 SINGH INDUSTRIAL ESTATE NO. 3, RAM MANDIR ROAD., GOREGAON (W), MUMBAI, MAHARASHTRA 400104, INDIA	022-67868100 sales@prolite.com	
ES70	EMERGENCY LIGHTING UNIT (FIXED & PORTABLE TYPE)- FLAME PROOF	1					
ES71	24V SUPPLY MODULE WITH COMPLETE ACCESSORIES	1	E1103	POWER PACK ENTERPRISES	POWER PACK ENTERPRISES MR. NEHAL SHAH / MR. SHARAD SHAH (PARTNER) NO. 3, JAYSHREE SADAN, 1ST FLOOR, OLD NAGARDAS ROAD, ANDHERI EAST MUMBAI - 400069, MAHARASHTRA, INDIA	Call Us:08447573761 Mobile: +(91)-9821787821 +(91)-9821035604	
	24V SUPPLY MODULE WITH COMPLETE ACCESSORIES	2	E1066	INDCOIL	ADDRESS: PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	

ITEM CODE	ITEM DESCRIPTION	SL NO.	VENDOR CODE	VENDOR NAME	ADDRESS	PHONE	REMARKS
	24V SUPPLY MODULE WITH COMPLETE ACCESSORIES	3	AIE01	Ames Impex Electricals Pvt. Ltd	C-18/1207, PHASE IV, GIDC NARODA, AHMEDABAD, GUJARAT 382330	Phone:079 2282 1648	
ES74	AMMETER	1	E1009	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
	AMMETER	2	R01	RISHABH INST.PVT LTD	RISHABH INSTRUMENTS PVT. LTD. F-31, MIDC, SATPUR NASHIK - 422007 MAHARASHTRA INDIA	marketing@rishabh.co.in 91-253 2202202/203 Fax: 91 253 2351064	
ES75	VOLTMETER	1	E1009	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
	VOLTMETER	2	R01	RISHABH INST.PVT LTD	RISHABH INSTRUMENTS PVT. LTD. F-31, MIDC, SATPUR NASHIK - 422007 MAHARASHTRA INDIA	marketing@rishabh.co.in 91-253 2202202/203 Fax: 91 253 2351064	
ES79	RCCB	1	C01	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
	RCCB	2	S03	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
	RCCB	3	S01	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
	RCCB	4	A35	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
	RCCB	5	L01	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
	RCCB	6	C02	CROMPTON GREAVES	RAIL TRANSPORTATION SYSTEMS,VANDANA BUILDING, 11, TOLSTOY MARG, TOLSTOY MARG, NEW DELHI, DL 110001	011 3041 6300	
ES80	PVC WIRES				BIS APPROVED MAKE		
ES81	PEDESTAL FAN & CEILING FAN				REPUTED MAKE		
ES82	EXIT SIGN (FLAME PROOF)				REPUTED MAKE		
ES83	EXIT SIGN (NON FLAME PROOF)				REPUTED MAKE		
ES84	LADDER				REPUTED MAKE		
ES85	HUME PIPE				REPUTED MAKE		
ES86	PHOTOELECTRIC SWITCH				REPUTED MAKE		
ES88	HAND LAMP UNIT				REPUTED MAKE		



**TECHNICAL SPECIFICATION FOR
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1.0 SCOPE

1.1 GENERAL

- a) This specification covers the design, manufacture, assembly, testing and inspection at vendor's / sub-vendor's works, packing and despatch to site of lighting system and low voltage power services equipment.
- b) The "design" shall broadly cover the selection of components, materials, sizes etc. for the equipment of supply in vendor's scope. Complete responsibility of establishing the correctness of equipment design rests with the vendor.
- c) It is not the intent to specify here 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 the required duties in a manner acceptable to Engineer / 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.
- d) Make of all equipment and components shall be to the approval of purchaser.

1.2 ENGINEERING

- a) Specification also covers the aspect of System Design Engineering generally termed as "Engineering". Engineering shall be the purchaser to the successful bidder shall furnish the responsibility of vendor if indicated in Data Sheet A. Engineering inputs.
- b) Engineering, if covered in vendor's scope, shall include 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.
- c) Complete engineering shall be as per the guidelines of purchaser and shall be subject to the purchaser's approval.

1.3 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.

1.4 The requirements given in enclosed drawings, documents and Data Sheet A form part of this specification and shall be fully complied with. In case any discrepancy arises, the requirements of Data Sheet A shall prevail.

1.5 In case of any deviation, the bidder shall indicate the same clause-by-clause in the enclosed "Schedule of Deviations". In the absence of duly filled schedules it will be construed that the bid conforms strictly to the specification.



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2.0 CODES & STANDARDS

2.1 Unless specified otherwise, the latest revisions of standards, codes and other applicable statutory rules and regulations specified in Annexure-I are applicable and shall be referred to.

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 Normal and DC Emergency supply to achieve the desired reliability.

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

4.0 SYSTEM DESIGN ENGINEERING

Engineering shall be done by the vendor only during the contract engineering stage if 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.

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



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- 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. Preferred pole heights / mounting height
 - iv. AC Emergency lighting requirement
 - v. DC lighting requirements
- c) Requirement of sockets

4.1.3 Other inputs

- a) Suggestive location of LDBs
- b) Suggestive power distribution scheme (SLDs)
- c) Control schemes
- d) Single phase feeder details
- e) No. of sockets / criteria for computation of no. of sockets / location of sockets etc.

4.2 DESIGN CRITERIA :

4.2.1 General Requirements of Design

4.2.1.1 Lighting system shall be provided to ensure adequate visual performance, safety and amenity 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.

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



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

4.2.2 Sources of Power Supply

4.2.2.1 The lighting system shall be provided with the power from the following sources :

- a) AC - normal
- b) AC - emergency
- c) DC - normal
- d) DC - emergency

4.2.2.2 AC emergency supply is made available from purchaser's AC emergency Board. This board in turn has two incomers; one from the normal supply source i.e. station supply and other from emergency source i.e. diesel generator supply which is available upon failure of normal supply.

4.2.2.3 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.

4.2.2.4 Power from the purchaser's supply sources shall be brought upto the Lighting Distribution Boards (LDBs) of various types. Each LDB shall in turn feed power to various Lighting Panels (LPs).

4.2.2.5 Power to the AC normal luminaires shall be available through AC normal LDB & LP. Power to the AC emergency luminaires shall be available through AC emergency LDB & AC emergency LP. Power to DC normal luminaires shall be available through DC normal LP, which in turn shall be fed directly from DCDB / Sub-DCDB. However power to the DC emergency luminaires shall be available through DC emergency LDB & LP.

4.2.2.6 Complete power distribution system shall be designed keeping following criteria in view :

- a) Simplicity
- b) Controlled voltage drop
- c) Cost effectiveness

4.2.2.7 Area Classification

The detailed requirements of luminaires depending upon type of power supply source for each area shall be as per the details to be furnished by purchaser during contract engineering. Area classification on the basis of type of luminaires to be provided shall be as under :

- a) Area A: AC normal, AC emergency, DC normal and DC emergency luminaires.
- b) Area B: AC normal, AC emergency and DC emergency luminaires.
- c) Area C: AC Normal and AC emergency luminaires
- d) Area D: AC Normal luminaires.
- e) Area E: AC Normal luminaires and portable emergency lighting.



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4.2.3 Lighting Philosophy

4.2.3.1 In the normal course, for areas A, B and C, all the AC luminaires shall remain switched on through two different sources of supply i.e. AC normal and AC emergency. DC normal luminaires shall also remain switched on for areas A.

4.2.3.2 In case of failure of AC normal supply the following shall apply :

- a) Areas A shall remain lit through DC normal luminaires.
- b) Areas A & B shall automatically get illuminated from DC emergency luminaires. This supply shall be available till AC emergency power is restored and stabilised.
- c) Areas C shall remain temporarily dark till the AC emergency supply is restored from diesel generator set.
- d) Areas D shall remain dark till the AC normal supply is restored.

4.2.3.3 As soon as the AC emergency supply is restored, the AC emergency luminaires shall come into operation. DC emergency luminaires shall have time delayed switching off after a specified duration to ensure that the AC emergency supply is stabilised.

4.2.3.4 When the AC normal supply is restored, the following shall apply :

- a) DC emergency luminaires shall be switched off immediately, if they are switched on.
- b) AC emergency luminaires shall switch off momentarily when AC emergency board incoming supply is changed over from diesel generator to the AC normal supply.

4.2.3.5 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:

- a) Manual
- b) Automatic through 00 - 24 hrs time switch
- c) 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

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



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4.2.4.2 Total AC luminaires

Indoor Areas: Total number of AC luminaires shall be calculated by the Lumen Method for average light intensity.

Outdoor Areas: Total number of AC luminaires for 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.

4.2.4.3 AC Normal & AC Emergency Luminaires

Area A, B & C: A specified percentage of total AC luminaires shall be considered as AC emergency luminaires. The percentage shall be as specified in Data Sheet A. The remaining luminaires shall be AC normal luminaires.

Area D : All the luminaires shall be considered as AC normal luminaires.

4.2.4.4 DC Normal & DC Emergency Luminaires

Where specified, DC normal luminaires shall be provided for areas A. The vendor shall consider the quantities of DC emergency luminaires as suggested by purchaser for Area A & B types. Unless otherwise indicated, DC luminaires are for the functional purpose only and no design calculations are to be done. Vendor shall ensure that adequate number of DC emergency lights are provided for essential operations of the plant and shall suggest the changes in purchaser's DC lighting stipulations, if required.

4.2.4.5 Independent DC Luminaires

In areas comparatively remote from power house building, emergency illumination, where required will be provided by rechargeable emergency units. Such units will be installed at suitable location without plug and socket and will be permanently connected to normal AC supply. These emergency units will automatically light-up upon failure of normal AC supply.

4.2.5 Layout Considerations

4.2.5.1 General Layout Considerations

a) Layout of equipment such as LDBs and LPs shall be on the basis of following criteria :

- i. Ease of operation
- ii. Maintainability
- iii. Aesthetics

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

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



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

4.2.5.2 Conduit System

- a) Unless indicated otherwise, conduits shall originate from respective lighting panels and shall continue upto the luminaires for all indoor areas.
- b) Conduits shall run in straight runs, parallel to building columns, walls etc. as far as practicable.
- c) Unnecessary bends and crossings shall be avoided.
- d) In the corrosive environment, conduit installations shall be made with corrosion proof conduits. Such requirements shall be clearly indicated while preparing BOQ.

4.2.5.3 Wiring

- a) Each circuit starting from LP shall be taken in a separate conduit.
- b) Receptacle wiring conduits shall be distinct from lighting conduits.
- c) All wiring shall be of PVC insulated copper conductors. The following conductor sizes shall be applicable :
- i. Luminaires 2.5 sq.mm.
 - ii. 5A plug and socket 2.5 sq.mm.
 - iii. 5A-15A plug and socket 4.0 sq.mm.
- d) 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 that there is generally uniform light intensity in the event of failure of one or two phases.
- e) Luminaires located in the offices, stores, laboratories, toilets etc. shall be individually or group controlled.

4.2.5.4 Cabling

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



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- a) Lighting calculations for indoor areas covering details such as room dimensions (length, width, height), illumination level, reflection factors (walls, ceiling, floor), maintenance factor, type of luminaire, mounting height of luminaire, room index, coefficient of utilisation, no. of luminaires (AC Normal & AC Emergency), lumen output of each luminaire, reference drawings and remarks.
- b) Lighting calculations for outdoor areas covering average illumination level, type of luminaire, chart for illumination level at various points in the area; location (coordinates), number and height of poles; type, number (normal + emergency) and orientation of luminaires etc. Calculated values of average and minimum illumination level as obtained through computer package shall also be furnished. Dot density plots for lux level shall be furnished if available in the computer package.
- c) Single line diagrams of power distribution upto Lighting Panels. Separate drawing for complete lighting distribution shall also be prepared by vendor.
- d) Control schemes for DC and street lighting.
- e) Loads on each phase of LP and LDB with consideration of diversity factor for sockets.
- f) 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.
- g) 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 Normal and DC Emergency). Bill of Material shall also be covered for various types of luminaires.
- h) 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.
- i) Wiring and load distribution details for outdoor areas.
- j) Master Bill of Material (to be submitted at regular intervals).

5.0 LUMINAIRES, ACCESSORIES AND LAMPS

5.1 GENERAL REQUIREMENTS OF LUMINAIRES

- 5.1.1 All luminaires and accessories shall be designed for continuous operation and shall be suitable for the system design data given in Data Sheet A.
- 5.1.2 Luminaires shall be complete with accessories mounted inside the luminaire assembly. Lamps shall be supplied separately as per BOQ.
- 5.1.3 All luminaires and accessories shall be suitable for operation in the atmospheric conditions prevailing at site.



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- 5.1.4 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.
- 5.1.5 Luminaires shall be designed for minimum glare. No bright spots should appear from the lamp or from the reflectors.
- 5.1.6 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.
- 5.1.7 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.
- 5.1.8 All luminaires and accessories including the breathing holes shall be vermin proof.
- 5.1.9 Surface Treatment:
- a) 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.
 - b) Finish of surfaces shall be non-porous, smooth and unfaded.
- 5.1.10 All metal parts of the luminaires shall be bonded and connected to the earthing terminal. Earthing terminal shall be suitable for connecting 16 SWG GI wire.
- 5.1.11 Flood lights shall be provided with base frame / base plate for mounting on structural steel members / wall.
- 5.1.12 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
- General requirements depending upon type of luminaire are listed below. Specific requirements of each luminaire are indicated in "Luminaire Details" enclosed as Annexure-II.
- 5.2.1 Channel Mounted Luminaires (Fluorescent Luminaires)
- 5.2.1.1 Channel mounting luminaires, except the special purpose luminaires, shall have CRCA sheet steel base plate / rail / channel / box / side panels / housing as per "Luminaire Details". Sheet shall be completely stove enameled unless mentioned vitreous enameled in "Luminaire Details". Colour of enamel shall be grey on all non-reflecting surfaces and white on reflecting surfaces.
- 5.2.1.2 Twin fluorescent luminaires shall be wired in lead-lag circuit to minimise stroboscopic effect.
- 5.2.1.3 Luminaires suitable for surface mounting shall also be suitable for pendant mounting. Knockouts of 20mm ET conduit fixation shall be provided for this purpose.



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5.2.1.4 Decorative Fluorescent Luminaires

- a) Decorative luminaires shall be provided with one of the following as per “Luminaire Details” :
- Perspex acrylic diffuser.
 - High purity, anodised aluminium, mirror optic reflectors with anodised aluminium matt finish transverse fins to control glare.
 - Opal polystyrene louvers and sheet steel side panels.
 - Vertical metallic louvers finished in stove enamelled white and with sheet steel side panels.
- b) End plates of decorative luminaires shall be of high impact polystyrene or sheet metal finished in black colour.
- c) 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.
- d) Recessed type decorative luminaires shall be suitable for mounting with gypsum boards / luxalon / plaster of paris false ceiling of standard size as per Data Sheet A and “Luminaire Details”.

5.2.1.5 Industrial Fluorescent Luminaires (General Purpose)

- a) Industrial luminaires shall be provided with vitreous enameling, if specified in “Luminaire Details”.
- b) Additional reflectors, wherever provided, shall be easily removable type.

5.2.1.6 Industrial Fluorescent Luminaires (Special Purpose)

- a) 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.
- b) 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.
- c) Luminaires for highly corrosive environment shall have fiberglass reinforced polyester 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.
- d) 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



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IP : 54 unless mentioned otherwise in Data Sheet A. Luminaire shall be suitable for side entry mounting with the pole bracket arm.

5.2.2 Bay Type Luminaires

5.2.2.1 Luminaires shall be designed for following indoor applications:

- a) High bay above 8 metres
- b) Medium bay 6 - 8 metres
- c) Low bay below 6 metres

High bay fixtures shall have provision for vibration damper to ensure rated lamp life.

5.2.2.2 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.

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

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

5.2.2.5 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.

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

5.2.2.7 Side mounted controlgear box shall be provided for low bay luminaires, if mentioned in "Luminaire Details".

5.2.3 Well Glass Luminaires

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

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

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

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

5.2.3.5 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.

5.2.3.6 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.

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



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5.2.3.8 Flame Proof Well Glass Luminaires

- a) Housing material shall be cast aluminium alloy LM6. Housing outer surface shall be provided with cooling fins.
- b) Flame proof luminaires shall be provided with heavy toughened well glass cemented in a retaining ring.
- c) Zinc-coated / chrome-plated MS chain connected to the main body and glass retaining ring shall be provided.
- d) A detachable terminal box at the top shall be provided.
- e) Neoprene gaskets, where needed, shall be provided for weather proof construction and indoor and outdoor application.
- g) Two cable entries of 20mm ET conduit shall be provided with one flame proof plug.
- h) Mounting shall be through eye-bolt or MS galvanised strap as per Data Sheet A.
- i) 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.

5.2.4 Street Lighting Luminaires (Other than Fluorescent Luminaire)

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

5.2.4.2 Luminaire housing shall be one piece cast aluminium alloy to accommodate lamp housing and controlgear in two different compartments for lamp wattage upto 125 Watts. For lamp wattage above 125 Watts, controlgear housing shall be of cast aluminium alloy whereas lamp housing shall be of deep drawn aluminium.

5.2.4.3 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.

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

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

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

5.2.5 Flood Lighting Luminaires

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

5.2.5.2 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.



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- 5.2.5.3 Reflector shall be closed from the front by heat resistant toughened glass and synthetic “S” type weather proof gasket.
- 5.2.5.4 Luminaire shall be provided with special lamp centering and focussing device ensuring good beam control.
- 5.2.5.5 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”
- 5.2.5.6 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.
- 5.2.5.7 Halogen Flood Lighting Luminaire
- a) Luminaires shall be compact in design with aluminium alloy housing and three piece highly polished and anodised reflector assembly.
 - b) Toughened glass panel in the front shall be provided with silicon gaskets.
 - c) Lamp replacement from the front is also acceptable.
- 5.2.6 Post Top Lanterns
- 5.2.6.1 Luminaire shall comprise of a spun aluminium canopy, opal acrylic diffuser and a cast aluminium spigot.
- 5.2.6.2 Controlgear shall be integral type and shall be housed in the spigot.
- 5.2.6.3 Luminaire shall be supplied without mounting pole.
- 5.2.7 Bulk Head Luminaires
- 5.2.7.1 Bulk Head (Flame Proof)
- a) Bulk head luminaires shall be used for the locations where explosion or fire hazard exists.
 - b) Luminaire shall be made of cast iron housing with integral terminal box.
 - c) Front of the luminaire shall be covered with flat toughened glass cemented into a retaining ring.
 - d) Lamp replacement shall be from the front.
 - e) Controlgear box for HPMV lamps shall be integral to the housing.
 - f) MS fixing straps shall be provided for mounting.
 - g) Luminaire shall be stove enameled grey outside and white inside.



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- h) Terminal box shall be provided with 20 mm ET conduit entry.
- i) 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.

5.2.7.2 Bulk Head (Weather Proof)

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

5.2.8 Emergency Lighting Luminaires

- 5.2.8.1 The luminaire shall be automatic, 40W incandescent bulb unit having in-built battery.
- 5.2.8.2 Battery shall have integral charging unit. Battery rating shall be 4 hours i.e. during AC supply failure emergency lighting shall operate for 4 hours without recharging.
- 5.2.8.3 Charger shall be suitable for operation as per system design data.
- 5.2.8.4 Battery shall be maintenance free sealed lead-acid type unless mentioned otherwise in Data Sheet A as Ni-Cd battery.
- 5.2.8.5 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)

- 5.3.1 Non-integral controlgear boxes shall be of 1.6 mm thick CRCA sheet steel construction unless specified otherwise in Data Sheet A.
- 5.3.2 Boxes shall have weatherproof construction and shall be provided with one piece neoprene gasket. Unless mentioned otherwise in Data Sheet A, degree of protection shall be IP:55.
- 5.3.3 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.



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- 5.3.4 Boxes shall be suitable for mounting on structures, walls and columns.
- 5.3.5 Unless mentioned otherwise in Data Sheet A, boxes shall be galvanised.
- 5.3.6 Suitable number of terminals shall be provided for looping-in and looping-out of cable connections and also connections to the luminaire(s).
- 5.3.7 Cable / conduit knock-outs shall be for each loop-in and loop-out connection and also connection to the luminaire(s).
- 5.4 REFLECTORS
- 5.4.1 Reflectors shall be made of sheet steel or aluminium as applicable, minimum 20SWG thick, securely fixed by fastening device of captive type.
- 5.4.2 The aluminium reflectors shall be made of high purity aluminium sheet. Sheet will be polished, electrochemically brightened and anodised.
- 5.4.3 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
- 5.5.1 Holders shall be resistant to wear and shall be smooth in operation.
- 5.5.2 Contacts shall be of durable quality.
- 5.5.3 Holders shall hold the lamp under condition of shock and vibration.
- 5.5.4 Lamp holders for fluorescent lamp shall be spring loaded, bi-pin, rotor type with low contact resistance.
- 5.5.5 Live parts of the holder shall not be exposed when the lamp is inserted or removed in case of fluorescent luminaires.
- 5.5.6 Lamp holders for HPMV & HPSV lamps shall be of porcelain material.
- 5.5.7 Holders shall be screw type for HPSV & HPMV lamps. Holders for incandescent lamps shall be screw type, unless mentioned otherwise in Data sheet A.
- 5.5.8 Lamp holders for incandescent lamps shall be of brass or porcelain.
- 5.6 STARTER HOLDERS
- 5.6.1 Starter holders shall be designed and manufactured as per the applicable standard.
- 5.7 BALLASTS



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- 5.7.1 Fluorescent fixtures, installed in other than control room areas shall have electronic ballasts. For control room, the ballast shall be copper wound, inductive, heavy duty type, filled with thermosetting insulating moisture repellent polyester and designed for long service life and low power loss.
- 5.7.2 Ballasts shall be totally enclosed type.
- 5.7.3 Ballasts shall be easily removable type.
- 5.7.4 Core shall be made of low loss, electrical grading stampings.
- 5.7.5 Coils shall be annealed copper wire wound, inductive, heavy duty type. Ballast windings shall have maximum operating temperature of 120°C without rated temperature rise marking.
- 5.7.6 The core and coil assembly shall be impregnated with suitable insulating material of high thermal stability and integrally encapsulated in thermosetting polyester compound. The compound shall be insulating and moisture resistant filled under pressure or vacuum.
- 5.7.7 End connections shall be made available in a terminal block, rigidly fixed to the ballast enclosure.
- 5.7.8 Ballasts shall be free from humming.
- 5.7.9 Ballast shall be provided separately for each lamp in a multi-lamp luminaire.
- 5.7.10 Tappings shall be provided to set the voltage within range for HPMV & HPSV luminaires.
- 5.7.11 It shall be Flicker-free warm start, ideal for areas with high switching frequency.
- 5.7.12 Electronic Ballast shall be of such design that minimum 25% reduction in energy consumption at constant luminous flux compared with conventional gear.
- 5.7.13 Electronic Ballast shall not be caused to high harmonic distortion.
- 5.7.14 Electronic Ballast shall provide constant light independent of mains voltage fluctuation.
- 5.8 STARTERS
- 5.8.1 Starters shall be made of aluminium material. Plastic or any other material if used shall be subject to purchaser's approval.
- 5.8.2 Starters shall have bi-metal electrodes.
- 5.8.3 Starter shall be replaceable without the use of any tool and without disturbing any accessory or lamp.
- 5.8.4 Starters shall have high mechanical strength.
- 5.8.5 Starters shall be provided with radio interference suppressing capacitors.
- 5.8.6 Starters shall have brass contacts.



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5.9 CAPACITORS

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

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

5.10 LAMPS

5.10.1 Lamps shall be suitable for use in any position.

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

5.10.3 Type of Lamps

a) Fluorescent Lamp

i. They shall be of the “cool daylight” type, unless mentioned otherwise in Data Sheet A.

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

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

b) Incandescent (GLS) Lamps

i. Incandescent lamps shall be “clear” type.

ii. Lamp caps shall be screw type , unless mentioned otherwise in Data sheet A.

c) Mercury Vapour Lamps

i. Lamps shall have outer envelope with colour corrected fluorescent powder, unless mentioned otherwise in Data Sheet A.

ii. 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.



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

6.0 DESIGN REQUIREMENTS (MAIN EQUIPMENT EXCEPT LUMINAIRES AND LAMPS)

6.1 LIGHTING DISTRIBUTION BOARD (LDB)

6.1.1 General Requirements of LDBs

6.1.1.1 LDBs shall be totally enclosed, modular in construction, indoor type and suitable for electrical system data as specified in Data Sheet A. The LDB shall be free standing type suitable for installation on cable trenches / floor.

6.1.1.2 LDBs shall be constructed from CRCA sheet and structural sections. Sheet thickness for load bearing members shall be 2.0 mm and that for non-load bearing members shall be 1.6 mm, unless specified otherwise in Data Sheet A. The design and construction of LDBs shall ensure adequate rigidity.

6.1.1.3 Vertical cable chambers / alleys of adequate width but not less than 250 mm shall be provided for incoming / outgoing cables of each panel.

6.1.1.4 LDBs shall have only one operational front. Door shall be provided at the front of each module to give full access to all the components.

6.1.1.5 LDBs shall consist of dust and vermin proof cubicles without the use of louvers (except the transformer compartment, where applicable).

6.1.1.6 Good quality synthetic rubber / neoprene gaskets shall be put around the door, cover edges and cutout edges for pushbutton, lamps etc. for protection against dust. The door when closed, shall compress the gasket uniformly.

6.1.1.7 Cutout edges for instruments, relays etc. shall have sufficient overlap surface to minimize the dust entry. The arrangement for the front mounting of switch handles shall render the LDB reasonably dust free such that the normal operations are not affected.

6.1.1.8 Degree of protection for completed LDBs (Distribution Board) shall be IP:52 unless mentioned otherwise in Data Sheet A.

6.1.1.9 The LDBs shall be designed to prevent contact with live parts both within the modules and in the cable alley.

6.1.1.10 The ratings of all components shown in the enclosed drawings are indicative only. The bidder shall be responsible to check and coordinate the MCB characteristic with back up fuses etc. provided. Any change in size / ratings of components required for final arrangement may be complied with and provided by the vendor at no extra cost.

6.1.1.11 All equipment shall be constructed of non-hygroscopic and non-inflammable materials.

6.1.1.12 All components mounted in the LDBs shall be accessible and shall not impede access to wiring or terminals. All faults except busbar fault which may occur within any individual unit shall be confined within that unit only and shall not cause shutdown of any section of the board



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other than the affected unit itself. Maintenance and inspection shall be possible in any individual unit without affecting other units.

- 6.1.1.13 Incoming unit shall comprise of either switch-fuse / composite fuse-switch unit or MCCB as per scheme / Data Sheet A. Outgoing units shall be a switch-fuse / composite fuse-switch unit / MCB.
- 6.1.1.14 The rated continuous current of the equipment and components shall be as given in the schemes. These ratings shall be obtained with the components mounted in their housing as in service without exceeding the permissible temperature rise.
- 6.1.1.15 Interlock between compartment door and modules shall be provided such that the door cannot be opened without switching off the power supply to the module.
- 6.1.1.16 Defeat interlock shall be provided for the units comprising of switch or moulded case circuit breaker as a means of isolation device, such that it is possible to open the door with device ON. It shall not be possible to close the door till the interlock has been reinstated.
- 6.1.1.17 Each LDB shall be fitted with base frame made of angle or channel.
- 6.1.1.18 All fixing nuts and bolts together with grounding bolts shall be provided.
- 6.1.1.19 Lifting lugs shall be provided for each shipping section of LDB. Removal of such lugs or hooks shall leave no opening in the LDB.
- 6.1.2 LDBs with transformers (Additional Features)
- 6.1.2.1 The lighting distribution board shall be arranged in two adjacent but separate compartments, one compartment for the lighting transformer and the other for the incoming & outgoing feeders etc.
- 6.1.2.2 The transformer shall be mounted on the base channel and it shall be possible to easily remove the transformer from the cubicle after opening the door. Necessary portable ramp made of mild steel shall be supplied along with each LDB.
- 6.1.2.3 Independent gasket hinged door with operating handle shall be provided for access to transformer & its taps. Operating handle shall have built-in key locking arrangement.
- 6.1.2.4 Suitable ventilation arrangement for the transformer compartment to dissipate the heat of the transformer shall be provided. The arrangement shall be in the form of louvers and the same shall be provided with galvanised wire mesh with dust catchers on the inside.
- 6.1.2.5 The degree of protection for transformer compartment shall be IP:42 unless mentioned otherwise in Data Sheet A.
- 6.1.2.6 Connections between transformer secondary terminals and the busbars shall be made by using PVC insulated flexible copper cables or busbars.
- 6.1.2.7 Warning plate shall be provided on transformer enclosure. The inscription of warning plate shall be as given below :



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- DO NOT OPEN DOORS WHEN ENERGISED
- KEEP TAPS AT SAME POSITION FOR ALL PHASES

6.1.2.8 Transformer enclosure shall be provided with a danger plate.

6.1.3 Lighting Transformer

6.1.3.1 Lighting transformer, where specified, shall form an integral part of lighting distribution board.

6.1.3.2 Lighting transformer shall be dry type, natural air cooled and suitable for mounting inside the lighting distribution board. Transformer shall be non-encapsulated type, unless specified otherwise in Data Sheet A.

6.1.3.3 Rating of transformer shall be 50 kVA or 100 kVA as per type of LDB.

6.1.3.4 Voltage rating shall be as given in Data Sheet A.

6.1.3.5 Percentage impedance shall be 3% for 50 kVA and 4% for 100 kVA transformers, unless specified otherwise in Data Sheet A.

6.1.3.6 Off circuit tap changers / links shall be provided for +5% in steps of 2.5%.

6.1.3.7 Transformer winding insulation shall be class "F" or better.

6.1.3.8 Transformer shall be of vector group Dyn1.

6.1.3.9 Winding shall be of copper material and maximum winding temperature at full load and under site conditions shall not exceed 120 oC.

6.1.3.10 Transformer shall be suitable for cable connections on the primary side and flexible cable or busbar connection on the secondary side.

6.1.3.11 The secondary neutral of the transformer shall be brought out for getting a grounded 4 wire supply system.

6.1.3.12 The transformer neutral shall be brought outside the LDB for earthing. The neutral bus bar shall be insulated from the LDB enclosure.

6.1.3.13 Transformers shall be provided with the rollers, pulling holes, lifting lugs, jacking positions etc.

6.1.4 Busbars, Connections and Joints

6.1.4.1 Busbars shall be made of aluminium grade E 91E or high conductivity copper (ETC). Busbar material shall generally be aluminium unless mentioned otherwise in Data Sheet A.

6.1.4.2 Busbars shall be supported on non-hygroscopic and non-inflammable insulators of material such as glass reinforced moulded plastic material, epoxy cast resin etc. Separate supports shall be provided for each phase of the busbars. Insulation level of neutral busbar shall be same as that of phase busbars.



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- 6.1.4.3 Busbars shall be contained in a separate vermin-proof compartment within the LDB and shall have bolted sheet steel covers for providing suitable access.
- 6.1.4.4 Busbar clearances in the air shall be as per applicable standard for 500V, 3 phase system.
- 6.1.4.5 Temperature for busbars, droppers and connections shall not exceed 90°C for an ambient of 50°C while carrying maximum continuous current.
- 6.1.4.6 The busbar, busbar connections and supports shall have sufficient strength to withstand thermal and electromechanical stresses produced by the specified short circuit level of the system.
- 6.1.4.7 Busbars (including neutral busbar) shall be capable of carrying the short-time current specified in Data Sheet A. The duration of short-time current shall be 1 sec unless mentioned otherwise in Data Sheet A. For the specified current and duration, there shall be no damage to the equipment.
- 6.1.4.8 The neutral bus shall be rated same as phase bus.
- 6.1.4.9 Main busbars and connections shall be prominently marked and displaced for standard sequence counting from rear to front, top to bottom, or left to right as viewed from the switching device operating mechanism side.
- 6.1.4.10 Busbars and connections shall be provided with colour coded PVC sleeves. All live parts shall be properly shrouded with insulating material.
- 6.1.4.11 Earth busbar shall be provided separately. Material of earth busbar shall be GI unless mentioned otherwise in Data Sheet A.
- 6.1.4.12 Busbar Joints
- a) Busbar and tap off joints shall be bolted type.
 - b) Busbars shall be thoroughly cleaned before jointing. Suitable contact grease shall be applied to remove oxide film just before jointing.
 - c) For copper busbars, the connecting portion shall be tinned or silver plated.
- 6.1.5 Wiring and Terminals
- 6.1.5.1 All internal wiring for connections to remote equipment shall be brought to terminal boards. Spare contacts of devices shall also be wired upto terminal board as per schemes. Wires shall not be jointed or teed-off except at terminal points.
- 6.1.5.2 Wiring shall be made by 1000 volt grade three / seven strand PVC insulated copper wire having a cross-sectional area of not less than 1.5 sq.mm. All connections from CT leads upto instruments, terminals shall be made by copper wires of minimum 2.5 sq.mm. size.
- 6.1.5.3 All wiring shall be made with the Colour Codes specified below :
- a) 3 phase AC Connections



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Phase 1 (R)	Red
Phase 2 (Y)	Yellow
Phase 3 (B)	Blue
Neutral	Black

b) 1 phase AC Connections

Phase Red / Yellow / Blue (as per associated circuit)	
Neutral	Black

c) DC Connections

Positive	White
Negative	Grey

d) Earth Connection Green

6.1.5.4 Where wiring passes from one compartment to another, the aperture shall be 'Bushed' to prevent damage to wires against sheet metal edges. Bushes may comprise of good quality rubber / PVC grommets.

6.1.5.5 Every wire end shall be fitted with numbered ferrules of white or yellow colour having glossy finish with identification number engraved in black. Ferrules shall be made of moisture and oil resisting insulating material. Ferrules shall be of interlocked type or tight fitting type. Ferrules shall be so fitted that they will not get detached, when the wire is removed from the terminal.

6.1.5.6 System of marking of wiring shall be as per applicable standard.

6.1.5.7 All wires used internally shall have crimped on tinned copper lugs for terminations.

6.1.5.8 Terminal boards shall be stud type with insulating barriers of adequate height.

6.1.5.9 Terminal boards shall have separate terminals for incoming and outgoing wires with not more than two wires connected to any one terminal.

6.1.5.10 Terminal boards shall be mounted vertically or in the horizontal rows and properly spaced to have clean wiring arrangement, adequate access for putting ferrules, making terminations etc. It shall be possible to read the ferrule numbers when the wiring is complete. Where terminals may be live when the equipment is isolated from the main supply, these shall be clearly marked near the terminal boards.

6.1.6 Controls

The controls shall be provided as per purchaser's requirements covered in the specification and control schemes.

6.1.7 Switch Fuse Units



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Refer clause 7.0 (COMPONENTS OF MAIN EQUIPMENT)

6.1.8 Cable Terminations

6.1.8.1 All cables, either incoming or outgoing to the LDB, shall be terminated in a cable chamber. For each panel, there shall be a cable chamber on the side. The door of cable chamber should open or be locked with the help of a tool. Unless stated otherwise in Data Sheet A, all cables shall enter from the bottom.

6.1.8.2 Removable undrilled gland plates of sheet steel shall be provided in the cable chamber for entry of cables. Minimum thickness of gland plate shall be 3mm. The gland plate shall be of adequate size for connecting requisite number of cable glands for power and control cables.

6.1.8.3 Heavy duty bolt-on termination tinned copper lugs of compression type shall be used in for power cable termination.

6.1.8.4 For supporting and clamping of cable cores at regular interval in cable alleys, suitable slotted angle upto the respective terminal blocks shall be provided.

6.1.8.5 The supply of tinned copper cable lugs for power cables forms part the supply of equipment.

6.1.9 Earthing

6.1.9.1 An earth busbar of adequate size of galvanised MS shall be provided at the bottom for the entire length of the LDB.

6.1.9.2 Every metal part other than those forming parts of an electrical circuit shall be connected to the earth bus by means of high conductivity copper wire of size not less than 2.5 sq. mm. cross-sectional area.

6.1.9.3 Doors shall have a flexible copper wire for earth connection to fixed unit.

6.1.9.4 Each LDB shall be fitted with two earthing studs located in accessible position on sides for connection of internal earth busbar to the external earthing connection.

6.1.9.5 Earth busbar shall be brought outside LDB for making external connections.

6.1.10 Types of LDBs

The LDBs shall be of following type :

- a) LDB-H (n) - AC LDB with 100 kVA transformer
- b) LDB-F (n) - AC LDB with 50 kVA transformer
- c) LDB-N (n) - AC LDB with no transformer
- d) LDB-D (n) - DC LDB

NOTE : (n) indicates number of outgoing feeders.



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6.1.10.1 AC LDBs (LDB-H, LDB-F, LDB-N)

Each LDB shall comprise of the following and comply with the enclosed single line diagrams :

- a) One lighting transformer (LDB-H & LDB-F).
- b) One incomer of TP / TPN switch-fuse unit or MCCB / MCCB with neutral link as per Data Sheet A. It shall be provided on the primary side of transformer for LDB type LDB-H & LDB-F.
- c) Set of busbars with 3 phase and neutral.
- d) TPN switchfuse units for each outgoing circuit.
- e) Three indicating lamps with fuses for indicating bus supply ON.
- f) CT operated ammeter with selector switch.
- g) VT operated voltmeter with selector switch.
- h) Power & control terminals, earth-stud, earth busbar, designation labels, internal wiring, power cable lugs, glands etc. shall be provided to complete the LDB in all respects.

6.1.10.2 DC LDBs (LDB-D)

Each LDB shall comprise of the following and comply with the enclosed single line diagrams :

- a) One incomer of two pole switch-fuse unit.
- b) Two pole DC contactor on the incoming circuit for changeover to DC in case of AC normal supply failure.
- c) One under voltage relay of suitable range, if specified in Data Sheet A.
- d) One ON delay timer.
- e) One test push button.
- f) Set of busbars for positive and negative.
- g) Two pole switch-fuse units / MCB for outgoing feeders.
- h) Two indicating lamps with fuses for indicating bus supply ON.
- i) Power & control terminals, earth-stud, earth busbar, designation labels, internal wiring, power cable lugs, glands etc. shall be provided to complete the LDB in all respects.

6.2 LIGHTING PANELS (LPs)

6.2.1 General Requirements of Lighting Panels



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- 6.2.1.1 LPs shall be totally enclosed, suitable for electrical system data as specified in Data Sheet A. The LP shall be suitable for mounting on wall / column / structure.
- 6.2.1.2 Panels shall be suitable for indoor / outdoor application as per Data Sheet A and BOQ. Outdoor panels shall have a sloping canopy.
- 6.2.1.3 LPs shall be constructed from CRCA sheet. Sheet thickness shall be 2.0 mm, unless mentioned otherwise in Data Sheet A. The construction of LPs shall ensure adequate rigidity.
- 6.2.1.4 All components of the LP shall be fully mounted inside the panel. LPs shall have only one operational front. Door shall be provided to give full access to all the components. Door shall have padlocking arrangement.
- 6.2.1.5 LPs shall consist of dust and vermin proof cubicles without the use of louvers.
- 6.2.1.6 Good quality synthetic rubber / neoprene gaskets shall be put around the door. The door when closed, shall compress the gasket uniformly.
- 6.2.1.7 Unless mentioned otherwise in Data Sheet A, degree of protection for completed LPs shall be IP:52 for indoor LPs and IP:55 for outdoor LPs.
- 6.2.1.8 The LPs shall be designed to prevent contact with live parts when the front door is open.
- 6.2.1.9 All busbars (phase, neutral, positive, negative as applicable) within a panel shall be of the same size.
- 6.2.1.10 All control wiring inside the panels shall be carried out with 1100 V grade, PVC insulated flexible copper wire of 2.5 sq. mm size.
- 6.2.1.11 The rated continuous current of the equipment and components shall be as given in the single line diagrams. These ratings shall be obtained with the components mounted in their housing as in service without exceeding the permissible temperature rise.
- 6.2.1.12 Each LP shall be fitted with M.S. mounting brackets.
- 6.2.1.13 Panel shall be suitable for top / bottom cable / conduit entries. However, outdoor LPs shall have bottom cable / conduit entry. Removable undrilled gland plate of sheet steel shall be provided for entry of cables. Minimum thickness of gland plate shall be 3 mm. The gland plate shall be of adequate size having knock-outs for requisite number cable connections. Gland plate shall be provided with gasket.
- 6.2.1.14 The lighting panel shall be complete with copper busbars, and shall incorporate switch fuse or MCB on the incoming side, single pole miniature circuit breakers (MCBs) for AC outgoing circuits and double pole MCBs for DC outgoing circuits. Number of outgoing circuits shall be as per BOQ.
- 6.2.1.15 Each lighting panel shall be fitted with two GI earth studs located in accessible position on the outside of the panel on opposite sides.



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- 6.2.1.16 All metal parts of the panel except current carrying parts shall be bonded together electrically to the earthing stud.
- 6.2.1.17 Each panel shall be fitted with phase barriers of fireproof insulating material in such a manner that it is not readily possible for personnel to touch the phase busbars. Insulating sheet shall be fitted around the MCBs such that only the surface and toggle of the MCBs are available on the front.
- 6.2.1.18 The supply of cable lugs for power and control cable connections forms part the supply of equipment.
- 6.2.1.19 Each panel shall be provided with a circuit directory plate with inscriptions neatly typed and laminated, fitted on the inside of door.
- 6.2.2 Type of Lighting Panels
- a) LP-A (n) - AC Lighting Panel
 - b) LP-D (n) - DC Lighting Panel
 - c) LP-F (n) - Fancy Lighting Panel (Decorative)
 - d) LP-S (n) - Street Lighting Panel
- NOTE : (n) indicates number of outgoing circuits.
- 6.2.3 AC Lighting Panel (LP-A)
- 6.2.3.1 LPs shall be provided with TPN switch as incomer.
- 6.2.3.2 Requisite number of single pole MCBs shall be provided for outgoing circuits.
- 6.2.3.3 Separate neutral shall be available at terminal block for each outgoing circuit.
- 6.2.3.4 Construction of AC Normal and AC Emergency panels shall be same.
- 6.2.4 DC Lighting Panels (LP-D)
- 6.2.4.1 LPs shall be provided with double pole switch as incomer.
- 6.2.4.2 Requisite number of double pole MCBs shall be provided for outgoing circuits.
- 6.2.5 Decorative Type Lighting Panels (LP-F)
- 6.2.5.1 Decorative lighting panels shall be designed for use in areas like administrative building, service building, canteen, residential premises etc.
- 6.2.5.2 Thickness of sheet steel shall be as per manufacturer's practice.
- 6.2.5.3 LPs shall be of tone colour with elegant finish.



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- 6.2.5.4 LPs shall be provided with TPN switch as incomer and requisite number of MCBs shall be provided for outgoing circuits.
- 6.2.5.5 LPs shall be suitable for either surface or flush mounting as per Data Sheet A and BOQ. Flush mounted panels shall have the collared door suitable for matching with the wall.
- 6.2.5.6 Lighting Panels may be provided with transparent acrylic cover for operation of MCBs, if asked for in Data Sheet A.
- 6.2.5.7 LPs shall be provided with knockouts on the top, bottom and sides.
- 6.2.6 Street Lighting Panel (LP-S)
- 6.2.6.1 Street Lighting Panels shall be provided for feeding power supply to luminaires of street light poles, flood lighting poles, lighting masts etc.
- 6.2.6.2 Each Street Lighting Panel shall comprise of the following :
- a) One TPN door interlocked switch-fuse unit. Interlock defeat feature shall also be provided.
 - b) Three pole AC Contactor
 - c) 00 - 24 hrs timer and a photo-electric switch for automatic switching of contactor
 - d) Three phase & neutral busbars
 - e) Single pole or three pole MCBs for each outgoing circuit as per Data Sheet A
 - f) Two lamps for bus supply ON & OFF indications
 - g) Complete wiring arrangement as per control scheme.
 - h) Auto-Manual selector switch
 - i) ON push button
 - j) OFF push button
 - k) Photo switch
- 6.2.6.3 Switching ON and switching OFF shall be through both 00 - 24 hrs timer and light sensor in automatic mode.
- 6.2.6.4 One number light sensor in weather proof enclosure having IP:55 degree of protection shall be supplied loose along with each SLP.
- 6.2.6.5 Internal power wiring shall be done with PVC insulated Cu wire of suitable size. All control wiring inside the panel shall be carried out with 1100 V grade, PVC insulated flexible copper wires.
- 6.3 LIGHTING POLES



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- 6.3.1 Lighting poles as required for street lighting and flood lighting shall be of swaged/stepped tubular steel of swan neck construction as per applicable standard. As an alternative RCC tubular pole construction as per applicable standard can also be quoted.
- 6.3.2 Unless mentioned otherwise in Data Sheet A, lighting poles shall be painted type provided with following surface treatment:
- The poles shall be coated with black bituminous paint, conforming to applicable standard, throughout on the inside surface and on the outside surface up to the level which is embedded in ground.
 - Exposed outside surface shall be painted with two coats of red lead oxide primer and followed by two coats of aluminium paint.
- 6.3.3 Where galvanization of poles is specified;
- All inside and outside surfaces of the pole and base plate shall be hot dip galvanised as per manufacturer's practice.
 - Base plate shall be galvanised after welding to the pole base.
 - Manufacturer's procedure for galvanisation shall be submitted for purchaser's approval during detailed engineering stage.
- 6.3.4 Each street lighting pole shall be supplied with necessary pipe-reducer / fixing-bracket for fixing the luminaire. The details of bracket arm are indicated in enclosed drawing.
- 6.3.5 Each street lighting pole shall be suitably provided with weather proof, galvanised steel junction box and two numbers fixing brackets suiting the diameter of the pole. The requirements of junction box are stipulated elsewhere. The fixing brackets shall be supplied loose.
- 6.3.6 Street lighting pole shall be provided with wiring hole. The location shall be coordinated with mounting position of street lighting pole JB. The diameter of hole shall be 20 mm. The hole shall be provided with a rubber / PVC grommet.
- 6.3.7 Flood lighting pole shall be provided with painted MS plate and shall be suitable for the number of flood lighting luminaires and controlgear boxes as per enclosed drawings.
- 6.3.8 Provision for earthing shall be provided for flood / street lighting poles at a height 1 metre above the ground.
- 6.3.9 Types of Lighting Poles
- Exact type and designation of lighting pole is as given in Data Sheet A. Basic types are as follows :
- PS1 - Street Lighting Pole for one luminaire with 1200mm bracket arm.
 - PS2 - Street Lighting Pole for one luminaire with 1800mm bracket arm.



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- c) PS3 - Street Lighting Pole for one luminaire with 2500mm bracket arm.
- d) PS4 - Street Lighting Pole for two luminaires with 1800mm bracket arm each.
- e) PS5 - Street Lighting Pole for two luminaires with 2500mm bracket arm each.
- f) PS6 - Street Lighting Pole for four luminaires with 1800mm bracket arm each.
- g) PS7 - Street Lighting Pole for four luminaires with 2500mm bracket arm each.
- h) PF1 - Flood Lighting Pole for one luminaire.
- i) PF2 - Flood Lighting Pole for two luminaires.
- j) PF3 - Flood Lighting Pole for three luminaires.
- k) PF4 - Flood Lighting Pole for four luminaires.

6.4 LIGHTING MASTS

- 6.4.1 The lighting mast (tower) shall be of steel sections having lattice structure construction with ladder, cage and top platform.
- 6.4.2 Lighting mast design shall be suitable for following :
 - a) Height of the lighting mast as per type.
 - b) Maximum number of luminaires as per Data Sheet A.
 - c) Additional load of 500 kg towards the weight of maintenance crew.
- 6.4.3 Permissible design parameters should be according to relevant standard. The deflection under the maximum wind pressure of 150 kg/sq.m shall not exceed 1 in 360.
- 6.4.4 All steel sections, members and hardware used shall be hot dip galvanised as per applicable standard.
- 6.4.5 The mast shall be provided with a platform at the top, a steel cage ladder connecting to the ground and a midway landing. Height of the platform provided on the top of the mast shall be 2.0 metre and mid-way landing platform height shall be minimum 1.0 metre.
- 6.4.6 The span of rung shall not be less than 300mm and spacing between two adjacent rungs shall not be more than 300mm. Diameter of cage for ladder shall not be less than 1000 mm. Ladder shall be supported to give adequate rigidity.
- 6.4.7 Necessary mounting facilities for mounting of luminaires and controlgear boxes shall be provided at top platform. This shall include provision of holes in the fixing bracket for movable fixing plate. Adequate number of movable plates affixed to the bracket shall also be provided. Size of movable plates and the position of holes shall match with the luminaire fixing arrangement.



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- 6.4.8 Mast shall be provided with 600mm long air termination for the lightning protection. Suitable arrangement for connection of down comer (not in the scope of vendor) shall be provided. Provision of earth connection of GI strip shall also be kept at an height of one metre from the ground.
- 6.4.9 Provision shall be made for supporting cables, down conductors etc. at regular intervals on lighting tower. Hot dip galvanised brackets of required size shall be provided for the same.
- 6.4.10 Height of lighting tower shall be the height of tower above the ground and upto the top of the top platform. Other members such as foundation members and lightning arrester shall not be considered for defining the height of tower.
- 6.4.11 Types of Lighting Masts
- a) LM25 - Lighting Mast with 25 m height
 - b) LM28 - Lighting Mast with 28 m height
 - c) LM30 - Lighting Mast with 30 m height
 - d) LM32 - Lighting Mast with 32 m height
 - c) LM35 - Lighting Mast with 35 m height
- 6.5 JUNCTION BOXES
- 6.5.1 Junction boxes with terminals shall be supplied for branching and terminating lighting wires/cables whenever required, as specified.
- 6.5.2 Construction Features
- The junction boxes shall be fabricated out of MS sheet of thickness not less than 2.0mm 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.
- 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.
- The junction boxes shall be weather proof type conforming to IP-55 of IS:2147. Junction boxes for street light poles and lighting/lightning masts shall be provided with hinged doors and allen keys with bolts as locking arrangement.
- The boxes and cover shall be hot dip galvanised. Junction boxes for corrosive areas like DM Plant, water treatment plant etc. shall have additional epoxy/acrylic coating of thickness not less than 50microns on outer surface.
- The junction boxes shall be suitable for mounting on wall, columns, lighting poles, mast structures etc. The brackets, bolts, nuts, screws and any other erection accessories required



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for erection shall be included in the erection price. Circuit number, number of street lighting panel and pole/mast at site by the contractor after their installation.

6.5.3 Terminals

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.

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.

6.5.4 The junction boxes shall be of following types:

Type of junction boxes:

Type	Description
JB-F	Provided with four (4) way stud type terminals for terminating upto 2Nos. 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 50micron thickness.
JB-S	Provided with four (4) way stud type terminals, each terminal suitable for terminating upto two nos. of 16mm ² stranded aluminium conductors & with one no.6A HRC fuse and link.
JB-M	Provided with four (4) way stud type terminals, each terminal suitable for terminating upto two nos. of incoming 35mm ² stranded aluminium conductors, with three nos. 25A HRC fuses, one link, and one number 32A TPN switch, and four way stud type terminals each suitable for terminating 16sq.mm. Al conductor outgoing cable.
JB-M1	6way stud type terminal block for three phases and three neutrals of adequate size to receive 4C-16mm ² incomer cables and three nos. 2Cx2.5mm ² Cu conductor outgoing cables.
JB-SW1	Provided with four (4) way stud type terminals each terminal suitable for terminating to 10mm ² stranded aluminium conductor.
JB-SW2	Similar to the JB-SW1 but provided with ten (10) way terminals.
JB-SW3	Similar to JB-SW1 but provided with eighteen (18) way terminals.

6.6 FUSE BOXES

6.6.1 Boxes shall be suitable for accommodating fuses, neutral links and termination of cables on each side.



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- 6.6.2 Boxes shall be of rectangular shape and fabricated out of sheet steel, hot dip galvanised and of weather proof construction.
- 6.6.3 Sheet steel thickness shall be 1.6 mm, unless mentioned otherwise in Data Sheet A.
- 6.6.4 Unless specified otherwise in Data Sheet A, degree of protection of fuse boxes shall be IP:55.
- 6.6.5 Galvanisation shall be done corresponding to the sheet thickness and as per the applicable standard.
- 6.6.6 Boxes shall be provided with a hinged lockable door with neoprene gasket lining all over. Lock shall be operable with an allen key.
- 6.6.7 Terminals shall be stud type suitable for ring type lugs. The size of cable shall be intimated during detailed engineering.
- 6.6.8 Boxes shall be provided with suitable knock outs for conduit / cable connections.
- 6.6.9 Two earthing terminals suitable for GI earthing wire shall be provided for each box.
- 6.6.10 Boxes shall be suitable for mounting on walls, structural members etc. Suitable welded fixing brackets shall be provided for this purpose.
- 6.6.11 Fuse boxes shall be provided with a danger plate for the rated line to line voltage.
- 6.6.12 Types of Fuse Boxes
- a) FB - 1 Fuse Box with 1 fuse and 1 link
 - b) FB - 2 Fuse Box with 2 fuses and 2 links
 - c) FB - 3 Fuse Box with 3 fuses and 3 links
 - d) FB - 4 Fuse Box with 3 fuses and 1 link
- 6.7 RECEPTACLES
- 6.7.1 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.
- 6.7.2 Receptacle boxes shall be fabricated from CRCA sheets or made of heavy duty cast aluminium alloy as per Data Sheet A. Thickness of sheet steel shall be 1.6 mm, unless mentioned otherwise in Data Sheet A.
- 6.7.3 Steel boxes shall be hot dip galvanised as per the requirements of applicable standard corresponding to the sheet thickness.
- 6.7.4 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.



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- 6.7.5 The boxes shall be provided with neoprene rubber gaskets to make them moisture and dust proof.
- 6.7.6 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.
- 6.7.7 The receptacle units shall be of the following types:
- i) Type RA: It shall have the following:
 - a) 20A, 250V, 1-phase, 2 pole, 3-pin (third pin scrapping earth) porcelain, metal clad socket with a metallic cover tied to it, similar to 'Crompton Greaves' type AS20 or equivalent.
 - b) Rotary, heavy duty 20A switch conforming to applicable standard.
 - c) Shrouded, die-cast aluminium plug similar to 'Crompton Greaves' type AS20 or equivalent. Combined interlocked weather proof industrial unit.
 - d) Mechanical interlock shall be provided as follows :
 - i) Switch can be put ON only when plug is fully engaged.
 - ii) Plug can be withdrawn only when switch is in OFF position.
 - iii) Cover can be opened only when switch is in OFF position.
 - e) The arrangement should ensure that water does not enter tyhe plug when socket is ON.
 - f) 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:
 - a) Combination of 5A & 15A, 240V, 1-phase, 2 pole, 3-pin, third pin grounded socket with integral piano key type 15A switch, flush mounted on decorative backelite (6 mm thick)/ perspex (3 mm thick) sheet as cover of the boxes.
 - b) 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:
 - a) 63A, 415V, 3-phase-neutral earth, metal clad socket with cover, similar to 'Crompton Greaves' type CS63.
 - b) Rotary, heavy duty 63A switch conforming to applicable standard.
 - c) Shrouded, die-cast aluminium plug similar to 'Crompton Greaves' type CP63



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- d) It shall be combined, interlocked weather proof industrial unit.
- e) Mechanical interlock shall be same as that are applicable for RA type receptacles
- f) 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.

6.8 CEILING FAN & REGULATORS

- 6.8.1 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
- 6.8.2 The fan motor shall be totally enclosed. The motor winding shall be of copper wire provided with double or reinforced class-E insulation.
- 6.8.3 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.
- 6.8.4 The regulator shall be conventional/electronic type with stepped/smooth (stepless) control of approved make.
- 6.8.5 The ceiling fans shall generally conform to relevant IS.

6.9 LIGHTING CONTROL SWITCH-BOXES

- 6.9.1 The switch-boxes shall be of bent steel construction, fabricated of 14SWG MS steel, with 6 mm thick decorative bakelite or 3 mm thick perspex sheet cover. The boxes shall be hot-dip galvanised.
- 6.9.2 The switch-boxes shall be suitable for surface mounting as well as flush mounting in brick walls. In the office areas where false ceiling is provided, they shall be flush mounted type on the walls with only the switch knob projecting outside.
- 6.9.3 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.
- 6.9.4 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.
- 6.9.5 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.



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6.9.6 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 with JB type SW2.
- iii) Type SWB3 - 7 nos. 5A switches and 3 nos. fan regulator with JB type SW3.

7.0 COMPONENTS OF MAIN EQUIPMENT (OTHER THAN LUMINAIRES)

7.1 MOULDED CASE CIRCUIT BREAKERS

7.1.1 Moulded case circuit breakers (MCCBs) shall be provided when called for in Data Sheet A for use in lieu of switch fuse for LDB incomer. MCCB shall meet the requirements stipulated in Data Sheet A.

7.1.2 MCCBs in AC circuits shall be of triple pole construction arranged for simultaneous three pole manual closing and opening and for automatic tripping at short circuit and overload. Neutral link shall be provided for LDBs without transformers.

7.1.3 Operating mechanism shall be quick make, quick break and trip free type.

7.1.4 The ON, OFF & TRIP positions of the MCCB shall be clearly indicated so as to be visible to the operator when mounted as in service. Operating handle shall be provided on front of the LDB.

7.1.5 MCCBs shall be capable of withstanding the thermal stresses caused by overloads and short circuits. The maximum tripping time under short circuit shall not exceed 20 milli seconds.

7.1.6 MCCB terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.

7.1.7 Under voltage release and other releases shall be provided as specified in Data Sheet A / BOM / schemes.

7.2 SWITCH-FUSE UNITS

7.2.1 These units shall preferably comprise of switches having integral fuses, called composite units. Alternatively, combination units of separate switch and fuse may also be acceptable.

7.2.2 These units shall be provided for general purpose i.e. incoming or outgoing units.

7.2.3 The units shall be of the air break air insulated type and designed to ensure safety to operating personnel.

7.2.4 Composite units shall have integral fuses i.e. fuse carrier with fuse link (fuse link forming the moving contact). The design shall ensure that the moving contact is not live when switch is open i.e. in OFF position, so as to facilitate removal of fuse.

7.2.5 The switch shall be capable making and carrying the system prospective fault current, but limited in magnitude and duration by the cut off characteristics of the largest HRC fuse link that may be fitted to that unit.



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- 7.2.6 The fixed contact shall be so shrouded that maintenance of the unit can be carried out in safety with the busbars live.
- 7.2.7 Where one isolating switch is used as the incoming device, the incoming side fixed contacts shall be shrouded to ensure that maintenance can be carried out with the remote fuse and switch closed.
- 7.2.8 Composite switch-fuse or the combination of switch and fuse shall meet the requirements of its components as follows:
- 7.2.9 Isolating Switch
- a) Switches shall be air-break, quick make, quick break heavy duty type conforming to applicable standard.
 - b) All switches shall have visible ON / OFF position indication and shall be padlockable in any (ON / OFF) position.
 - c) Switches shall be door interlocked such that it shall not be possible to gain access to inside the unit unless the isolating switch is in OFF position.
 - d) The switches shall be suitable for independent manual operation.
 - e) The switch contacts shall be of silver alloy or silver plated copper and springs of non-corrosive material.
 - f) Inter-phase barriers shall be provided to prevent possibilities of phase to phase fault in the switch. The switch shall also be shrouded from all sides to prevent access to live parts on the switch after opening the unit door. The barriers and shrouding shall extend upto the height of switch to fully enclose both side terminals of the device. The arrangement shall permit easy maintenance.
- 7.2.10 High Rupturing Capacity (HRC) Fuses
- a) The fuse serving as the short-circuit protective device in isolating fuse-switch units shall be of HRC cartridge, current limiting and plug-in non-deteriorating type.
 - b) The fuse carriers shall be easily withdrawable for replacement of fuse. Insulated fuse pullers shall be provided where fuses are not mounted in insulating carriers to remove and replace fuses in live conditions.
 - c) Fuses shall preferably be fitted with a device to indicate operation (i.e. when the fuse has blown).
 - d) Live terminals of fuse bases shall be shrouded to prevent contact with personnel where fuse links are not mounted in carriers and are directly plugged into the fuse base. Inter-phase barriers extending throughout the length of the fuse base shall be provided to prevent inter-phase short circuit. They shall be shrouded from all sides to prevent accidental contact.



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- e) Fuse carriers and bases shall be of good quality moulded insulating material. Porcelain fuse bases and carriers will not be accepted.
- f) The rating and characteristics of fuse links shall be chosen appropriately for short circuit protection of circuits down stream.

7.3 INDICATING METERS

7.3.1 Meters shall be panel mounted, flush type and suitable for rear terminal connection.

7.3.2 Meters and instruments shall be enclosed in dust proof, moisture resistant black finished cases and shall be suitable for tropical use. Instruments shall be suitable for operation from the secondary windings of CTs and VTs.

7.3.3 All instruments shall be calibrated to enable direct reading of primary quantities. Instruments shall be adjusted and calibrated at manufacturer's works and shall have means of calibration, checking and zero adjustment at site.

7.3.4 Instruments pointer shall have 90° movement. All the divisions and the quantity to be measured shall be clearly marked. Instruments shall conform to applicable standard and shall have accuracy class 1.5 or better having black numerals and lettering on white anti-parallax dial with knife edge pointer. Indicating instruments shall be of moving iron type for AC and moving coil type for DC circuits.

7.3.5 Ammeter, voltmeter etc. shall be of 96mm x 96mm (minimum) size.

7.3.6 Instruments having metallic cases shall be fitted with earthing terminals.

7.4 CONTACTORS

7.4.1 Contactors shall be of the air break type fitted with arc shields.

7.4.2 The operating coil shall be suitable for satisfactory operation in the range of 85% - 110% of nominal voltage specified under the Data Sheet A. The coil shall be tropicalized having insulation not less than class 'E'.

7.4.3 Electrically independent auxiliary contacts not less than 2NO + 2NC for interlocking and indication shall be fitted to individual power contactor.

7.4.4 All springs shall be made out of a corrosion proof material.

7.5 RELAYS

7.5.1 Relays shall be provided on the various circuits as per schemes. Relays shall be flush mounted on front of the board. Relay case shall be painted with dull black or egg shell black enamel and with back connected terminals. Metal cases and frames of relay shall be earthed.



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- 7.5.2 All relays shall be of withdrawable type with built-in testing facilities, with provision for inspection, maintenance and replacement. Where built-in test facility is not provided for a particular relay, separate suitable test block shall be provided on the board for this purpose.
- 7.5.3 Relay performance shall not alter due to mechanical shock or vibration or external magnetic field which may be present at the place of mounting.
- 7.5.4 Each relay shall not have less than two independent pairs of contacts.

7.6 CURRENT TRANSFORMERS

- 7.6.1 CTs shall be air insulated having insulation class E or better, cast resin type and shall be capable to withstand the thermal and mechanical stresses resulting from maximum short circuit.
- 7.6.2 The short time current duration for CTs shall be one second.
- 7.6.3 CT primary current shall not be less than the full load thermal rating of the associated circuit. CT secondary shall have 5Amp rating unless specified otherwise in Data Sheet A. Polarity shall be marked in a suitable manner. The ratings shall be adequate to cater for the burden of connected instruments.
- 7.6.4 Measuring CTs shall have accuracy class 1.0 and instrument security factor less than 5.
- 7.6.5 CTs shall be of bar primary / wound primary / ring type capable of carrying the rated primary current.

7.7 VOLTAGE TRANSFORMER

- 7.7.1 Voltage transformers (VT) shall be dry, cast resin type comprising of single phase or three phase units. They shall have their primary windings protected by current limiting fuses with interrupting capacity corresponding to that of the lighting board / panel.
- 7.7.2 VT secondary windings shall be earthed in LDB / LP through link, which can be removed for insulation testing.
- 7.7.3 Three phase voltage transformers shall have 110 V secondary voltage unless mentioned otherwise in Data Sheet A. Single phase VTs shall have voltage rating of :

$$(\text{Nominal System Voltage} / \sqrt{3}) \text{ V} / (110 / \sqrt{3}) \text{ V}$$

So that secondary voltage shall be 110 volts phase to phase when the secondary winding is star connected. The accuracy class of VTs shall be 1.0. VTs shall have an output rating adequate to cater to the burden connected to them.

7.8 MINIATURE CIRCUIT BREAKERS

- 7.8.1 The use of miniature circuit breakers (MCBs) combining thermal overload and magnetic short circuit protection shall be application for the outgoing circuits of Lighting Panels.



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- 7.8.2 MCBs shall have suitable rating but not less than 20A, 9kA.
- 7.8.3 MCBs shall be suitable for housing in the lighting panel and for connection of copper link bus bar at the incoming and copper lugs at the outgoing ends.
- 7.8.4 The terminals of MCB and ON / OFF positions shall be clearly and indelibly marked.
- 7.9 SELECTOR SWITCHES
- 7.9.1 The rating and other features of the switches shall be suitable for the application. The number of positions and the number of contacts required for each switch shall be as indicated in the schemes enclosed.
- 7.9.2 Selector switches shall be stay put type, provided with properly designated escutcheon plates clearly marked to show operating position.
- 7.9.3 Terminals carrying potential above 120 Volts shall be shrouded to prevent accidental contact with personnel.
- 7.9.4 Ammeter selector switches shall have make before break contacts.
- 7.9.5 The switches shall be suitable for semi-flush mounting with the front plate and operating handle projecting out. All connection to the switches shall be from the back.
- 7.9.6 The arrangement for front mounting of these devices shall be such as to make them reasonably dust free so as not to interfere with normal operation.
- 7.10 INDICATION LAMPS
- 7.10.1 Indication lamps shall be complete with lens covers and holders.
- 7.10.2 Each lamp shall be fitted with a durable resistance integrally wired in series with the lamp. Alternatively, lamps with built in transformers are acceptable.
- 7.10.3 The lamp cover (lens) shall be translucent of appropriate colour.
- 7.10.4 Bulbs and covers shall be interchangeable, easily replaceable from the front without the need for any special means.
- 7.10.5 Terminals having potential above 120V shall be shrouded to prevent contact with personnel.
- 7.11 PUSH BUTTONS
- 7.11.1 Push button shall be heavy duty, flush mounted suitable for the application.
- 7.11.2 Push button shall be provided with integral escutcheon plates marked with its function identified as per schemes.
- 7.11.3 Colour shall be appropriate to the function.



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7.11.4 Minimum number of contacts shall be 1 NO + 1 NC or as per the requirements of control scheme.

7.12 TERMINALS

7.12.1 Terminals shall be stud type of copper material.

7.12.2 Terminals shall be provided with transparent cover(s).

7.12.3 Separate terminals shall be available for each termination of loop-in and loop-out power connections.

7.12.4 Terminals shall be suitable for ring type copper cable lugs of size depending upon the circuit rating.

7.13 CABLE GLANDS

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

7.13.2 Cable glands shall be single compression type of brass material.

7.13.3 Cable glands shall be nickel plated, unless specified otherwise in Data Sheet A.

7.13.4 Rubber components used in the gland shall be of neoprene.

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

7.14 CABLE LUGS

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

7.14.2 Cable lugs shall be of tinned copper.

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

7.15 TIMERS

7.15.1 Time Switch

a) Time switch shall be suitable for automatic switching ON and OFF of street lighting / flood lighting circuits.

b) Time switch have 00 - 24 hrs clock base.

c) Time switch shall indicate actual time and shall permit accurate time setting.

d) Time switch shall be rugged, independent of normal fluctuations of voltage / frequency and free from maintenance.



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- e) Contact rating, clock accuracy, rated voltage rating and frequency rating of timer shall be suitable to its application.
- f) Time switch shall be provided with Ni-Cd battery.
- g) Time switch shall be suitable for mounting inside the panel.

7.15.2 On Delay Timer

- a) On delay timer shall be required for continuation of DC supply for a limited duration when the AC Emergency supply has been restored and DG set is under stabilisation.
- b) Timer shall be fully static and suitable for operation on normal frequency and system voltage.
- c) Timer shall have high setting accuracy, high repeat accuracy, low reset time and low power consumption.
- d) Timer shall have the time setting range of 24 - 240 seconds, unless mentioned otherwise in Data Sheet A.
- e) Timer shall be suitable for mounting inside the panel.

8.0 LABELING

- 8.1 Labels to identify all the Main assemblies, Sub-assemblies and components of the LDBs and LPs shall be provided.
- 8.2 Name and rating plate / marking shall be provided as required by relevant standard applicable to each component / assembly to be identified.
- 8.3 Labels shall be of two colour, three layer plastic material with matt or semi matt finish or of the anodised aluminium sheet.
- 8.4 All labels other than "Danger" or "Warning" labels shall have black lettering on a white background. Danger labels shall be as per applicable standard and shall not be affixed on to removable parts.
- 8.5 All labels shall be securely fixed on to the equipment by means of self tapping screws or other approved means.
- 8.6 Stick-on type labels of good quality and permanent mounting shall be acceptable for internally mounted components only.
- 8.7 A list of all such items to be labeled and text and type of labels to be provided is given below :
 - a) BOARD DESIGNATION (MAIN EQUIPMENT LABEL)
 - i. Inscription : Designation & LDB number for LDBs.
Designation and LP number for LPs.



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- ii. Location : Top centre in the front of the LDB.
Top centre in the front of the LP.
- iii. Material : 3 Layer plastic material, fixation by self tapping, non-rusting screws, black inscription on white back ground.

b) OUTGOING - FEEDER DESIGNATION

- i. Inscription : Module number, LP number / purpose.
- ii. Material : Black engraving on white anodised aluminium plate of thickness 1.6 mm or more. Plate to be secured with screws.

c) COMPONENT DESIGNATION

- i. Inscription : Letter symbol / Legend as assigned in schemes.
- ii. Location : Near or on the component
- iii. Material : Stick-on type

8.8 CIRCUIT DIAGRAM / DIRECTORY PLATE

- 8.8.1 A diagram is to be prepared for fixing to the inside cover of every lighting panel giving details of the points controlled by each circuit.
- 8.8.2 The circuit list shall be typed or printed stating the location of the equipment served, rating of the protective unit and the circuit loadings.
- 8.8.3 The list shall be mounted on the inside of the cover door and shall be protected by an acrylic sheet cover to be easily removable to permit circuit modifications.

9.0 SURFACE TREATMENT

- 9.1 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.
- 9.2 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.
- 9.3 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.



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- 9.4 All parts shall then be subjected to a coat of red oxide primer paint.
- 9.5 All inside and outside surfaces of panel shall be spray painted with synthetic enamel of the shade as per Data Sheet A.
- 9.6 Paint thickness shall be minimum 80 microns unless specified otherwise in Data Sheet A.
- 9.7 Electrostatic or powder painting shall be acceptable subject to purchaser's approval.
- 9.8 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.
- 10.0 PACKING
- 10.1 Packing procedure shall conform to the General Technical Conditions (Volume IIC).
- 10.2 Specification for the sea worthy packing, if enclosed, for the export jobs shall form part of the specification.
- 11.0 GUARANTEED PERFORMANCE REQUIREMENTS
- 11.1 The vendor shall guarantee satisfactory performance of the equipment supplied under all conditions and requirement as laid down by this specification.
- 11.2 For the general requirements of performance guarantees refer to other parts of the specification.
- 12.0 INSPECTION & TESTING
- 12.1 Inspection and testing of Lighting equipment shall be performed as per BHEL standard Quality Plans. Bidder shall sign and stamp the Quality Plans for conforming compliance. The equipment which are not covered in the Quality Plan shall be tested as per the QP to be submitted by bidder. Purchaser's comments shall be incorporated and final QPs shall be submitted for purchaser's approval during contract engineering stage. Modifications in the QP shall be incorporated without any cost implication to the purchaser.
- 12.2 All the components and completely assembled equipment shall be tested as per the latest edition of standards indicated in Annexure-I.
- 12.3 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.
- 12.4 Functional testing shall be carried out for Lighting Distribution Boards.



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- 12.5 All manufacturing processes viz. machining, sheet forming, electroplating, wire routing, cleating & crimping, assembly, surface preparation shall conform to good manufacturing practices.
- 12.6 Inspection for dimensional & visual checks especially of the following, with respect to contract drawings, documents & standards shall be conducted:
- a) General sturdiness & rigidity of equipment.
 - b) Surface finishing.
 - c) Gasketting.
 - d) Inter-changeability.
 - e) Constructional features viz. location, accessibility & marking of components, segregation, accessibility to live parts (shrouding) etc.
 - f) Completeness of scope.
- 12.7 Safety interlocking verification shall be done.
- 12.8 Each lighting transformer shall be routine tested and one transformer of each rating shall be type tested in accordance with relevant standard in case type test certificates of similar transformers are not available / not acceptable to the purchaser.
- 12.9 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.
- 13.0 DOCUMENTATION
- 13.1 Purchaser's documents as part of tender
- Purchaser's single line diagrams, schematic drawings, documents etc. being enclosed in the specification are listed in Data Sheet A.
- 13.2 Documents to be submitted by the Bidder along with the bid.
- a) Complete technical literature on luminaires, accessories and lamps.
 - b) Deviations from the technical specification, if any, brought out in the enclosed "Schedule of Deviations".
 - c) Unpriced Price Schedules, signed & stamped.
 - d) Signed copy of 'Compliance Certificate' enclosed in Volume II, Section I.



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13.3 Documents to be submitted by the vendor immediately after award of contract (Along with Data Sheet B).

a) General arrangement drawings for all types of LDBs with following details :

- i. Dimensions of each panel and overall dimensions.
- ii. Arrangement of panels / modules.
- iii. Floor mounting details and cut-out details.
- iv. Single Line Diagram.
- v. Rating of components.
- vi. Bill of quantities.

b) General arrangement drawing of Lighting Transformer.

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

13.4 Documents to be submitted during detailed engineering of contract

13.4.1 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) Control schemes for DC and street lighting
- e) Power load on each LP & LDB
- f) Layout drawings for indoor areas
- g) Layout drawings for outdoor areas.
- h) Conduit layout drawings.
- i) Wiring and load distribution details for outdoor areas.
- j) Master Bill of Material.

13.4.2 Other documents :

- a) Final Quality Plans
- b) Polar curves, zonal flux diagram and CoU charts of luminaires.
- c) Complete design calculations for arriving at number of luminaires.



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- d) Fixing / mounting details of luminaires and other items.
- e) General arrangement drawings of following :
 - i. Luminaires
 - ii. Controlgear boxes
 - iii. LPs
 - iv. Lighting Poles
 - v. Lighting Masts
 - vi. Street Lighting Pole JBs
 - vii. Fuse Boxes
 - viii. Receptacles
 - ix. 24 V Supply module
- f) Field Quality Plan as per General Technical Conditions.
- g) Rating and diagram plate drawing for lighting transformer.
- h) Structural design calculations for lighting tower.
- i) Foundation design calculations for lighting tower.
- j) Control Scheme for fluorescent, HPMV and HPSV luminaires.
- k) Schematic drawings for LDBs / LPs.
- l) Type test certificates.
- m) Catalogues / leaflets

13.4.3 Operation and maintenance (O&M) manual :

13.4.3.1 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.



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- 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) Characteristic curves of HRC fuses, MCCBs, MCBs etc.
- d) Technical leaflet of various items / components.
- e) Copies of the type, acceptance and routine test certificates in bound volume.
- f) Details of all components liable to be replaced during the life of the equipment.
- g) List of maintenance tools required.
- h) List of testing equipment required.

13.4.3.2 Draft O & M manual shall be submitted for approval

13.4.3.3 Final O&M shall be submitted in bound volume.

13.5 AS BUILT DRAWINGS

13.5.1 In case Engineering is the scope of vendor, the preparation of As Built Drawings shall be the scope of vendor.

13.5.2 The As Built Drawings shall be prepared on the basis of marked up copies received from the erection contractor.

13.5.3 Entire work of As Built Drawings shall be to the satisfaction of purchaser. Requisite number of prints and RTFs shall be submitted by vendor.

13.6 Number of copies of documents to be submitted by vendor shall be as per section-C of specification.



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ANNEXURE-I

LIST OF APPLICABLE STANDARDS

ILLUMINATION

1. Code of practice for interior illumination [] IS 3646
2. Code of practice for industrial lighting [] IS 6665
3. Code of practice for design of electrical street lighting installations [] IS 1944

LUMINAIRES

4. General and safety requirement for electric lighting fittings [] IS 1944
5. Luminaires [] IS 10322
6. Industrial lighting fittings with metal reflector [] IS 1777
7. Industrial lighting fittings with plastic reflectors [] IS 3287
8. Decorative lighting outfits [] IS 5077
9. Water proof electric lighting fittings [] IS 3528
10. Water tight electric lighting fittings [] IS 3553
11. Dust proof electric lighting fittings [] IS 4012
12. Dust tight electric lighting fittings [] IS 4013
13. Flame proof electric lighting fittings well glass & bulk head types [] IS 2206
14. Electric lighting fittings for division 2 areas [] IS 8224

LAMPS

15. Electric lamps, tungsten filament general service [] IS 418
16. Tubular fluorescent lamps for general lighting service [] IS 2418



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17. High pressure mercury vapour lamps [] IS 9900
18. High pressure sodium vapour lamps [] IS 9974

LUMINAIRE COMPONENTS

19. Ballast for fluorescent lamps for switch start circuits [] IS 1534
20. Ballast for high pressure mercury vapour lamps [] IS 6616
21. Capacitors for electric discharge lamps (fluorescent and MV) [] IS 1569
22. Bi-pin lamp holders for tubular fluorescent lamps [] IS 3223
23. Methods of measurement of lamp cap temp. rise [] IS 8913
24. Starters for fluorescent lamps [] IS 2215
25. Holders for starters for tubular fluorescent lamps [] IS 3324
26. Cast acrylic sheets for use in luminaires [] IS 7569

ASSEMBLED EQUIPMENT AND COMPONENTS

27. General requirements for swgr. and control gear for voltage not exceeding 1000 V AC or 1200 V DC [] IS 4237
28. Code of practice for selection, installation & maintenance of switchgear & control gear [] IS 10118
29. Flame proof enclosures for electrical apparatus [] IS 2148
30. Classification of hazardous areas for electrical installations [] IS 5572
31. Degree of protection provided by enclosures for LV switchgear & control gear [] IS 2147
32. Dry type transformers [] IS 11171



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- | | | |
|-----|---|-------------|
| 33. | Air break switches, disconnectors etc. and fuse combinations units | [] IS 4064 |
| 34. | Miniature air break circuit breaker for voltages not exceeding 1000 V | [] IS 8828 |
| 35. | Low voltage Fuses | [] IS 9224 |
| 36. | Contactors for voltages not exceeding 1000 V AC or 1200V DC | [] IS 2959 |
| 37. | Indicator lamps (visual) | [] IS 1901 |

POLES, SOCKETS AND OTHER MISCELLANEOUS

- | | | |
|-----|--|-------------|
| 38. | Tubular steel poles for overhead power lines | [] IS 2713 |
| 39. | Three pin plugs and sockets | [] IS 1293 |
| 40. | Switch socket outlets (non-interlocking) | [] IS 4615 |
| 41. | Interlocking switch socket outlet | [] IS 4160 |
| 42. | Structural steel (Standard quality) | [] IS 226 |
| 43. | Danger notice plates | [] IS 2551 |
| 44. | Boxes for enclosure of electric accessories steel & cast iron boxes | [] IS 5133 |
| 45. | Code of practice for general construction in steel | [] IS 800 |
| 46. | Wrought aluminium and aluminium alloy bars, rods, tubes and sections for electrical purposes | [] IS 5082 |
| 47. | Code of practice for phosphating of iron and steel | [] IS 6005 |
| 48. | Colour for ready mixed paints & enamels | [] IS 5 |
| 49. | Recommended practice for hot dip galvanising of iron & steel | [] IS 2629 |
| 50. | Method of testing uniformity of coating on zinc coated articles | [] IS 2603 |



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3.0	DESIGN REQUIREMENTS AND CONSTRUCTIONAL FEATURES
4.0	INSPECTION
5.0	TESTING
6.0	PACKING
7.0	DRAWING, DATA AND DOCUMENTS REQUIRED
8.0	TECHNICAL DETAILS OF CONDUITS



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1.0 GENERAL

- 1.1 This specification covers the manufacture, inspection & testing at vendor's works and delivery to site of conduits, pipes and their fittings for electrical installation.

2.0 CODES AND STANDARDS

- 2.1 The material, constructional features and various processes involved in manufacture shall comply with currently applicable Indian Standards.

- 2.2 The following Indian Standards shall be applicable, in general. However, if Data Sheet A specifies conformance to other international standards, the equivalent IEC/BS/other standards shall be considered.

- a) IS:9537 (All Parts) Conduits for electrical installation.
- b) IS:3480 Flexible steel conduits for electrical wiring.
- c) IS:6946 Flexible non-metallic conduits for electrical installation.
- d) IS:1239 Mild steel tubes, tubulars and other wrought steel fittings (for size above 63mm dia of rigid conduits).
- e) IS:2667 Fittings for rigid steel conduits for electrical wiring.
- f) IS:3837 Accessories for rigid steel conduits for electrical wiring.
- g) IS:3419 Fittings for rigid non-metallic conduits.
- h) IS:6005 Code of practice for phosphating iron & steel.
- i) IS:2629 Recommended practice for hot dip galvanizing on iron and steel.
- j) IS:4759 Specification for hot dip zinc coatings on structural steel and allied products.
- k) IS:6745 Methods for determination of mass of zinc coating on zinc coated iron and steel articles.

3.0 DESIGN REQUIREMENTS AND CONSTRUCTIONAL FEATURES

The conduit and conduit accessories shall include conduit plugs & caps, gaskets and box cover etc in addition to any specific requirement given in Data Sheet A. The diameter of conduits and accessories shall be uniform throughout the length.



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3.1 Rigid Conduits and Fittings

3.1.1 Rigid conduits shall generally conform to the requirements of IS:9537 (Part I & Part II). However, conduits above 63mm diameter shall conform to the requirements of IS:1239. Unless specified otherwise in Data Sheet A, all conduits and pipes shall be of medium duty.

3.1.2 The rigid conduits shall be hot dip galvanized inside and outside. Weight of zinc shall be as per IS:4759. Conduits shall be thoroughly cleaned and pretreated, conforming to IS:6005.

3.1.3 Conduits shall be supplied in approximate length as specified below

- a) Rigid Conduits 3 - 4 metres
- b) Flexible Conduits 10 - 30 metres

3.1.4 Each end of conduit length shall be threaded. The ends of conduits shall be sealed with protective caps to prevent damage to threaded portions and entrance of moisture and foreign material.

3.1.5 The inside surface of all conduits shall be smooth and suitable for pulling insulated cables and wires without damage.

3.1.6 Conduit fittings shall be made out of tube or cast to the shape as to match with corresponding conduit sizes and meet their purpose without any special adjustment.

3.1.7 All fittings shall be screwed type and hot dip galvanized inside and outside.

3.2 Flexible Metallic Conduits and Fittings

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

3.2.2 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.

3.2.3 The strip shall be electro galvanized to a minimum thickness of 25 microns as specified in IS:3480. The surface of the strip shall be thoroughly cleaned before application of protective coating. Pretreatment, before galvanization, shall conform to IS:6005.

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

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

3.2.6 The conduit shall have uniform diameter throughout its length. The internal surface of all conduits shall be smooth and suitable for pulling insulated cables and wires without damage.

3.3 PVC Conduits

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



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4.0 INSPECTION

4.1 The following stages of manufacture shall be stage inspected by Purchaser or his duly authorized representative.

4.1.1 Inspection of manufacturing processes such as shearing, punching, bending, welding, galvanizing etc.

4.1.2 Inspection of packing material and procedure.

4.1.3 Inspection of finished product.

4.2 The inspection will be carried out as per agreed quality plan.

5.0 TESTING

5.1 Rigid Conduits

a) Acceptance Tests: As per IS: 9537 Part 1 & 2 upto 63mm OD and IS:1239 above 63mm OD.

- i) Dimension checks
- ii) Bending test (below 32mm OD)
- iii) Compression test

b) Special Tests (as acceptance test) as applicable to galvanizing.

5.2 Flexible Steel Conduits

a) Acceptance Tests: As per IS: 3480.

- i) Dimension checks
- ii) Linear breaking test
- iii) Test for flexibility
- iv) Bend fracture test
- v) Crushing test

b) Special Tests (as acceptance test) as applicable to galvanizing.

5.3 Sampling for the tests shall be done as per applicable standards mentioned above.

5.4 The testing shall be carried out as per agreed quality plan.

6.0 PACKING

6.1 The material shall be packed as per manufacturer's standard. Packing procedure shall be to the purchaser's approval.



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7.0 DRAWING, DATA AND DOCUMENTS REQUIRED

7.1 The following information shall be furnished within two weeks of award of contract, for purchaser's approval.

a) Data Sheet-B

b) Final quality plan

8.0 TECHNICAL DETAILS OF CONDUITS

Refer Annexure-1 as "TECHNICAL DETAILS OF CONDUITS".



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SHEET 7 OF 9

ANNEXURE-1 TECHNICAL DETAILS OF CONDUITS

- 1.0 APPLICABLE STANDARDS : IS
- 2.0 RIGID STEEL CONDUITS & STEEL PIPES
 - a) Material : Hot rolled mild steel
 - b) Applicable standard
 - i) Upto 63mm OD : IS:9537 Part I & II
 - ii) Above 63mm OD : IS:1239
 - c) Surface treatment : Hot dip galvanizing inside & outside as per IS:2629
 - d) Min. Weight of zinc coating (gm/m²) : 340 upto 32 mm dia
460 above 32 mm & upto 50 mm dia
 - e) Duty : Heavy duty type
 - f) Fittings : Screw type as per IS:2667
- 2.1 Sheet thickness : 1.6 mm upto 32 mm dia
2.0mm above 32 mm & upto 50 mm dia
- 2.2 Min. Thickness of zinc coating (microns) [By Elcometer] : 48 upto 32 mm dia
65 above 32 mm & upto 50 mm dia
- 2.3 Standard length approximate : 3 - 5 meters
- 3.0 FLEXIBLE CONDUITS:
 - a) Material : Strip steel cold rolled and annealed
 - b) Standard applicable : IS: 3480
 - c) Surface treatment : Electro galvanized as per IS: 3480
 - d) Whether lead coated : YES
 - e) Minimum thickness : 25 microns of zinc coating



TECHNICAL SPECIFICATION FOR LIGHTING SYSTEM (CONDUIT)

SPECIFICATION NO. PE-SS-999-558-E001

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SECTION II

REVISION 0

SHEET 8 OF 9

4.0 SALIENT PARAMETERS OF CONDUIT ACCESSORIES

4.1 LOCKNUTS

Size of Conduit	Thickness	Width Across Flat (mm)
20 mm	5 mm	27
25 mm	5mm	33
32 mm	5 mm	41
40 mm	5 mm	50

4.2 SADDLES

Size of Conduit	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)	F(mm)	G(mm)
20mm	53	20	-	22	4	15.5	40
25mm	60	25	-	22	4	18	46
32mm	68	32	-	18	5	17.5	55
40mm	65	40	-	18	5	20	67

4.3 COUPLER (ELECTRO GALVANISED)

Nominal Size of Coupler	L(min).(mm)
20 mm	35
25mm	43
32mm	43
40mm	43



TECHNICAL SPECIFICATION FOR LIGHTING SYSTEM (CONDUIT)

SPECIFICATION NO. PE-SS-999-558-E001

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REVISION 0

SHEET 9 OF 9

4.4 CIRCULAR BOXES (Refer IS)

DIMENSIONS OF SMALL CIRCULAR BOXES

Size of Conduit	B(mm)	C(mm)	D(mm)	E(mm)	F(mm)	G(mm)	H(mm)	I(Cixmm)
20mm	25	-	18	16.5	25	60	50	3mm
25mm	30	-	19	18	28	60	50	3mm
32mm	38	-	14	13	35	75	60	2.5
40mm	45	-	19	18	44	75	64	2.5

4.5 NORMAL BEND

Size of Conduit	Straight Length (mm)	Radius (mm)
20mm	30	60
25mm	50	69.5
32mm	60	90
40mm	60	130

4.6 INSPECTION BENDS

The main criteria is for the threaded portion which has to be taken same as that of a normal bend.

Conduit Size	Threaded Portion (mm)
20mm	15.0
25mm	19.0
32mm	19.0
40mm	19.0

		QUALITY PLAN		CUSTOMER :		PROJECT : METTUR R&M		SPECIFICATION : PE-TS-458-558-E001						
				BIDDER/ :		TITLE		NUMBER :						
SHEET 1 OF 4				VENDOR		QUALITY PLAN NUMBER PED-558-00-Q-001, REV-02		SPECIFICATION : TITLE						
		SYSTEM		ITEM :ILLUMINATION				SECTION		VOLUME III				
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	MA	VISUAL	IS 10322 (PART5 SEC1)	IS 10322 / BHEL SPE	IS 10322 /BHEL SPE	TEST CERT	3/2	1	-	AFTER SUCCESSFUL COMPLETION OF 1a, 1b & 1c FURTHER TESTING OF 1d) TO BE DINE BY PAPER INSERTION METHOD. *: ONE NO. LUMINAIRE OF EACH TYPE TO BE WITNESSED BY BHEL. MAIN VENDOR TO WITNESS AS PER IS-10322		
		b) IR (Dry)	CR	ELECTRICAL	IS 10322	-DO-	-DO-	-DO-	3/2	1	-			
		c) HIGH VOLTAGE	CR	ELECTRICAL	-DO-	-DO-	-DO-	-DO-	3/2	1	-			
		d) DUST PROOF	CR	ELECTRICAL	-DO-	-DO-	-DO-	-DO-	3/2	1	-			
		e) PHOTOMETRIC	CR	ELECTRICAL	*	-DO-	-DO-	-DO-	3/2	1	-			
		2.0	LIGHTING PANELS AND LIGHTING DISTRIBUTION BOARDS	2. ROUTINE TEST										
				a) VISUAL	MA	VISUAL	100%	IS 10322 / BHEL SPE	IS 10322 /BHEL SPE	TEST CERT	3/2	-	1	TYPE TESTS CLEARANCE FROM BHEL/CUSTOMER
				b) IR (Dry)	CR	ELECTRICAL	-DO-	-DO-	-DO-	-DO-	3/2	-	1	
				c) HIGH VOLTAGE	CR	ELECTRICAL	-	-DO-	-DO-	-DO-	3/2	-	1	
1.DIMENSIONS	MA			MEASUREMENT	SAMPLE	BHEL DRG.	BHEL DRG.	INSPT. REPORT	3	2,1	-	COMPONENTS TO BE OF APPROVED MAKE		
2.PAINT SHADE/ THICKNESS	MA	VISUAL/ MEASUREMENT	-DO-	BHEL SPEC/DRG	BHEL SPEC/DRG	INSPT. REPORT	3	2,1	-					
3.DEGREE OF PROTECTION (INCLUDING EXPLOSION PROOF IF ANY)	MA	TESTS	1/SIZE	BHEL SPEC/ RELEVANT IS	BHEL SPEC/ RELEVANT IS	TEST CERT	-	-	2,1					
4.PERFORMANCE TESTS	MA	ELECT.	100%	BHEL SPEC.	BHEL SPEC.	INSPT. REPORT	3	2,1	-					
		5.HV/IR/HV	MA	ELECT	100%	2.5KV AC FOR 1 MINUTE	2.5KV AC FOR 1 MINUTE	INSPT. REPORT	3	2,1	-			
BHEL			PARTICULARS		BIDDER/VENDOR									
			NAME											
			SIGNATURE											
			DATE					BIDDER'S/VENDORS COMPANY SEAL						

		QUALITY PLAN SHEET 2 OF 4		CUSTOMER :		PROJECT : METTUR R&M			SPECIFICATION : PE-TS-458-558-E001			
				BIDDER/ :		TITLE			NUMBER :			
				VENDOR :		QUALITY PLAN NUMBER PED-558-00-Q-001, REV-02			SPECIFICATION : TITLE			
		SYSTEM		ITEM : ILLUMINATION			SECTION			VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
3.0	LIGHTING TRANSFORMER	6. TEMP. RISE TEST (FOR COMPLETE ASSEMBLED LDB)	MA	ELECT	1/RATING	BHEL SPEC.	BHEL SPEC.	-DO-	3	2	1	TYPE TESTS CLEARANCE FROM BHEL/CUSTOMER
		1. ROUTINE TEST										
		a) TYPE / RATING	CR	VISUAL	100%	IS 11171 / BHEL SPEC.	IS 11171 / BHEL SPEC.	INSPT. REPORT	3	2,1	-	
		b) WIND. RESISTANCE	CR	TEST	100%	IS 11171 / BHEL SPEC.	IS 11171 / BHEL SPEC.	INSPT. REPORT	3	2,1	-	
		c) V. RATIO / VECTOR	CR	TEST	100%	IS 11171 / BHEL SPEC.	IS 11171 / BHEL SPEC.	INSPT. REPORT	3	2,1	-	
		d) Z VOLT/ Z SCKT	CR	TEST	100%	IS 11171 / BHEL SPEC.	IS 11171 / BHEL SPEC.	INSPT. REPORT	3	2,1	-	
		e) LOAD LOSS/ CURRENT	CR	TEST	100%	IS 11171 / BHEL SPEC.	IS 11171 / BHEL SPEC.	INSPT. REPORT	3	2,1	-	
		f) NO LOAD LOSS	CR	TEST	100%	IS 11171 / BHEL SPEC.	IS 11171 / BHEL SPEC.	INSPT. REPORT	3	2,1	-	
		g) SOURCE WITHSTAND	CR	TEST	100%	IS 11171 / BHEL SPEC.	IS 11171 / BHEL SPEC.	INSPT. REPORT	3	2,1	-	
		h) INDUCED O/V	CR	TEST	100%	IS 11171 / BHEL SPEC.	IS 11171 / BHEL SPEC.	INSPT. REPORT	3	2,1	-	
4.0	CONDUITS	2. TYPE TEST	MA	TEST	1/RATING	IS 11171 / BHEL SPEC.	IS 11171 / BHEL SPEC.	TEST REPORT	3	2	1	
		1. MATERIAL	MA	VISUAL, MECH, & CHEMICAL	AS PER SPEC./ IS 9537	IS:9537	IS:9537	INSPT. REPORT	3	2	1	
		2. DIMENSIONS	MA	MEASUREMENT	AS PER SPEC./ IS 9537	IS:9537	IS:9537	INSPT. REPORT	3	2	1	
		3. MECH. PROPERTIES										
		a) BENDING TEST	CR	TEST	IS 9537-II	IS-9537	IS-9537	INSPT. REPORT	3	2	1	
		b) COMPRESSION	CR	TEST	IS 9537-II	IS-9537	IS-9537	INSPT. REPORT	3	2	1	
		c) BEND	CR	TEST	SPEC.	SPEC.	SPEC.	INSPT. REPORT	3	2	1	
		4. GALVANISATION TEST										
		a) ZINC COATING	CR	TEST	IS 9537-II	IS-2633	IS-2633	INSPT. REPORT	3	2	1	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN SHEET 3 OF 4		CUSTOMER :			PROJECT : METTUR R&M			SPECIFICATION : PE-TS-458-558-E001			
				BIDDER/ :			TITLE			NUMBER :			
				VENDOR :			QUALITY PLAN			SPECIFICATION :			
				SYSTEM			NUMBER PED-558-00-Q-001, REV-02			TITLE			
				ITEM : ILLUMINATION						SECTION		VOLUME III	
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	
5.0	JUNCTION BOXES & RECEPTACLES	b) MASS OF ZINC COAT.	CR	TEST	IS 9537-II	IS-6745/4759/SPEC	IS-6745/4759/SPEC	INSPT. REPORT	3	2	1	BY ELCOMETER	
		c) COATING THICKNESS	CR	TEST	IS 9537-II	IS-9537/ SPEC	IS-9537/ SPEC	INSPT. REPORT	3	2	1		
		d) EPOXY THICKNESS	MA	VISUAL/PHYSICAL	IS 9537-II	50 MICRONS	50 MICRONS	INSPT. REPORT	3	2	1		
		1.DIMENSIONS	MA	MEASUREMENT	100%	BHEL DRG.	BHEL DRG.	INSP. REPORT	3	-	2	COMPONENTS TO BE OF APPROVED MAKE	
		2.PAINT SHADE/ THICKNESS	MA	VISUAL/MEAS.	SAMPLE	BHEL SPEC/DRG	BHEL SPEC/DRG	-DO-	3	-	2		
		3.HV/IR/HV	MA	ELECT.TESTS	100%	2KV AC FOR 1 MINUTE	2KV AC FOR 1 MINUTE	-DO-	3	-	2		
		4.DEGREE OF PROTECTION	MA	TEST	1/SIZE	IS:2147	IS:2147	TEST CERT.	3	-	2,1		
		5.SPECIAL TESTS IF ANY,EXPLOSION PROOF ETC.	MA	TEST	1/SIZE	IS:2148	IS:2148	TEST CERT.	3	-	2,1		
		6. OPERATION CHECK	MA	TEST	SAMPLE	BHEL DRG	BHEL DRG	INSP. REPORT	3	-	2		
7. MECHANICAL INTERLOCK	MA	TEST	SAMPLE	BHEL DRG	BHEL DRG	INSP. REPORT	3	-	2				
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN SHEET 4 OF 4		CUSTOMER :		PROJECT METTUR R&M			SPECIFICATION : PE-TS-458-558-E001			
				BIDDER/ VENDOR :		QUALITY PLAN			NUMBER :			
				SYSTEM		NUMBER PED-558-00-Q-001, REV-02			SPECIFICATION : TITLE			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION VOLUME III			
									AGENCY	REMARKS		
									P	W	V	
1	2	3	4	5	6	7	8	9	10			
7.0	PVC WIRES	1.SURFACE DEFECTS	MA	VISUAL	SAMPLE	BHEL SPEC. IS:694 IS:1554	BHEL SPEC. IS:694 IS:1554	INSPN. REPORT & TEST REPORT FROM MANUFACTURER	3/2	2	1	TO BE PROCURED FROM BIS APPROVED SOURCE
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-DO-	-DO-	-DO-	3/2	2	1	
		3.TYPE TESTS	CR	ELEC.TESTS	ONE/TYPE & SIZE	BHEL SPEC. IS:694 IS:1554	BHEL SPEC. IS:694 IS:1554	TEST CERT.	3	2	1	
		4.ACCEPTANCE TESTS	MA	-DO-	SAMPLING	-DO-	-DO-	-DO-	3	2	1	
		5.ROUTINE TESTS	MA	-DO-	100%	-DO-	-DO-	-DO-	3	-	2,1	
		6.FRLS PROPS.	CR	FRLS TESTS	SAMPLES	BHEL SPEC	BHEL SPEC	-DO-	3	2	1	
		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 FLEXIBLE CONDUIT, EARTHING WIRE & FLATS, 24V SUPPLY MODULE, LADDERS, 5A SOCKETS, STRUCTURAL STEEL ETC. WILL BE CLEARED BASED ON COC (CERTIFICATE OF COMPLIANCE).										
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

ANNEXURE – 1

INSTRUCTIONS FOR QUALITY PLAN

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:

Column 1-	Serial Number
Column 2-	Component/Operation- The component and/or operation being checked shall be given here.
Column 3-	Characteristics check- The characteristics being checked shall be given here, e.g., chemical composition, mechanical properties, leak tightness, surface defects etc..
Column 4-	Category -'CR' stands for critical characteristic - affecting safety of equipment and personnel 'MA' stands for major Characteristic - affecting safety of equipment and personnel 'MI' stands for minor characteristic - affecting appearance etc.
Column 5-	Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.
Column 6-	Extent of check, such as, 100, 10, 1 percent etc.
Column 7-	Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done.
Column 8-	Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.
Column 9-	Format of Record - Formats, log sheets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.
Column 10-	Agency - The agency which performs the test/instruction shall be written in sub-column 'W' The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V'

The agencies are codified as 1,2 & 3

'1' stands for (BHEL)

'1' * means the operation shall be cleared by BHEL before the start of the next operation.

'2' Stands for Vendor

'3' stands for sub-Vendor of the Vendor and so on.

Example :

Entry '3' in column 'P' means test./inspection to be performed by sub-Vendor's QC

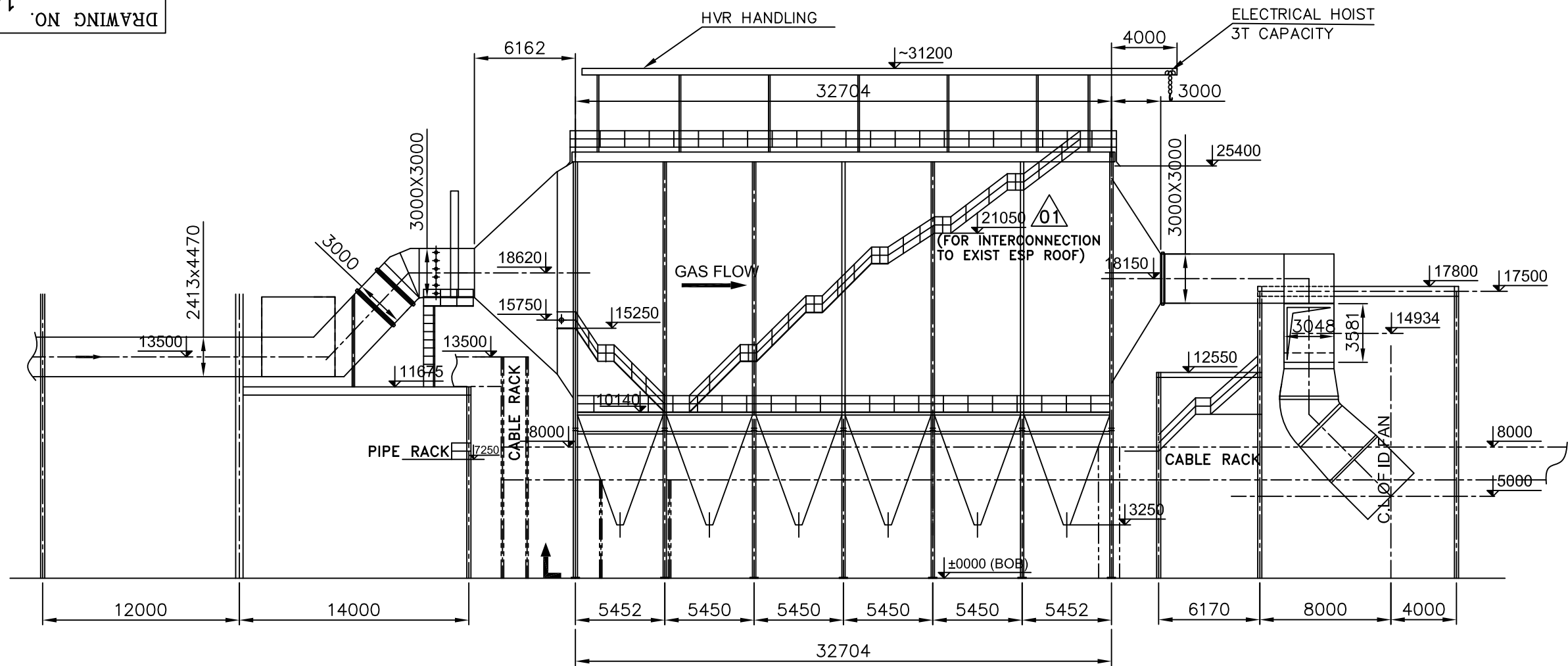
Entry '2' in column 'W' means test./inspection to be witnessed by Vendor's QC

Entry '1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL

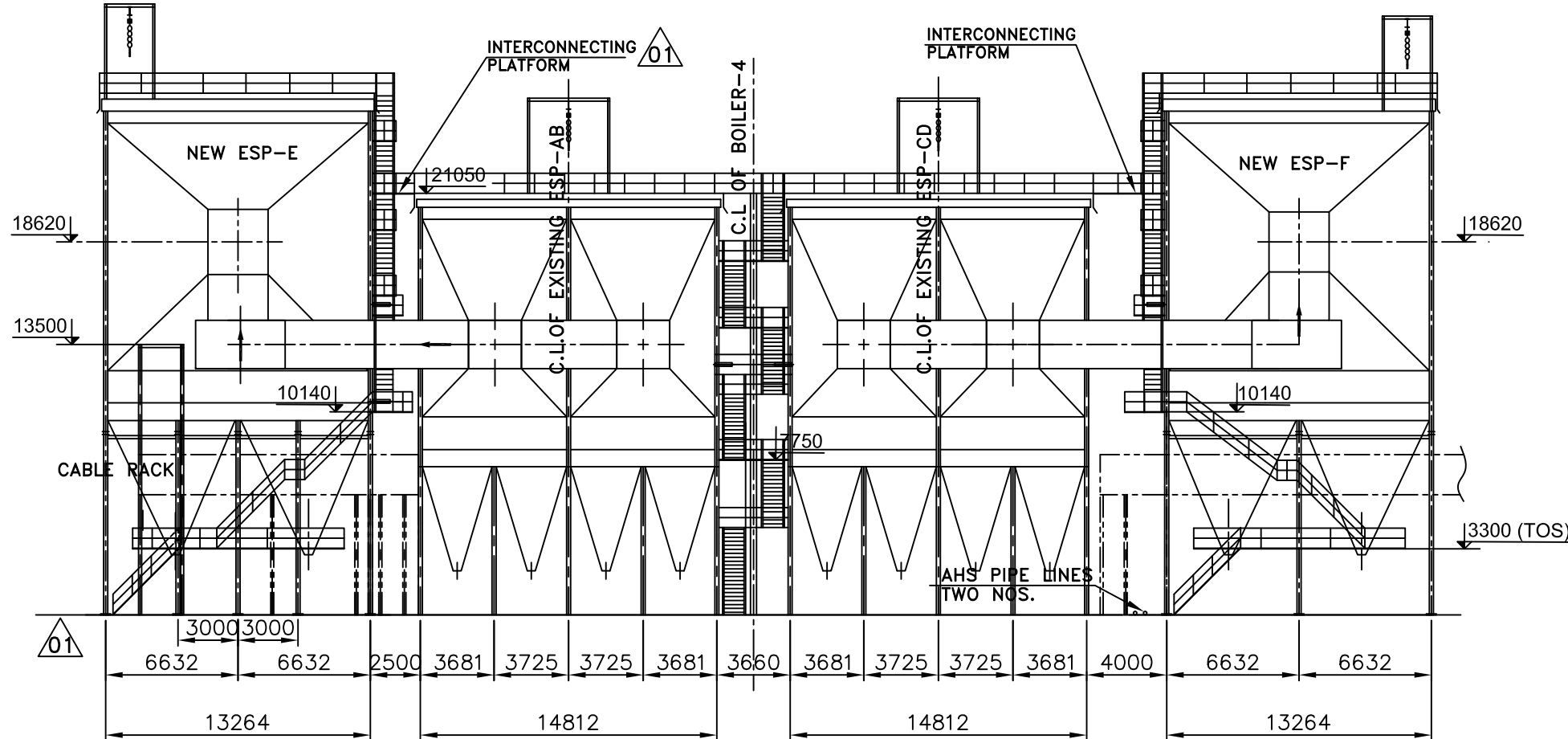
Column11- Remarks - Any special remarks shall be given here.

NOTES :

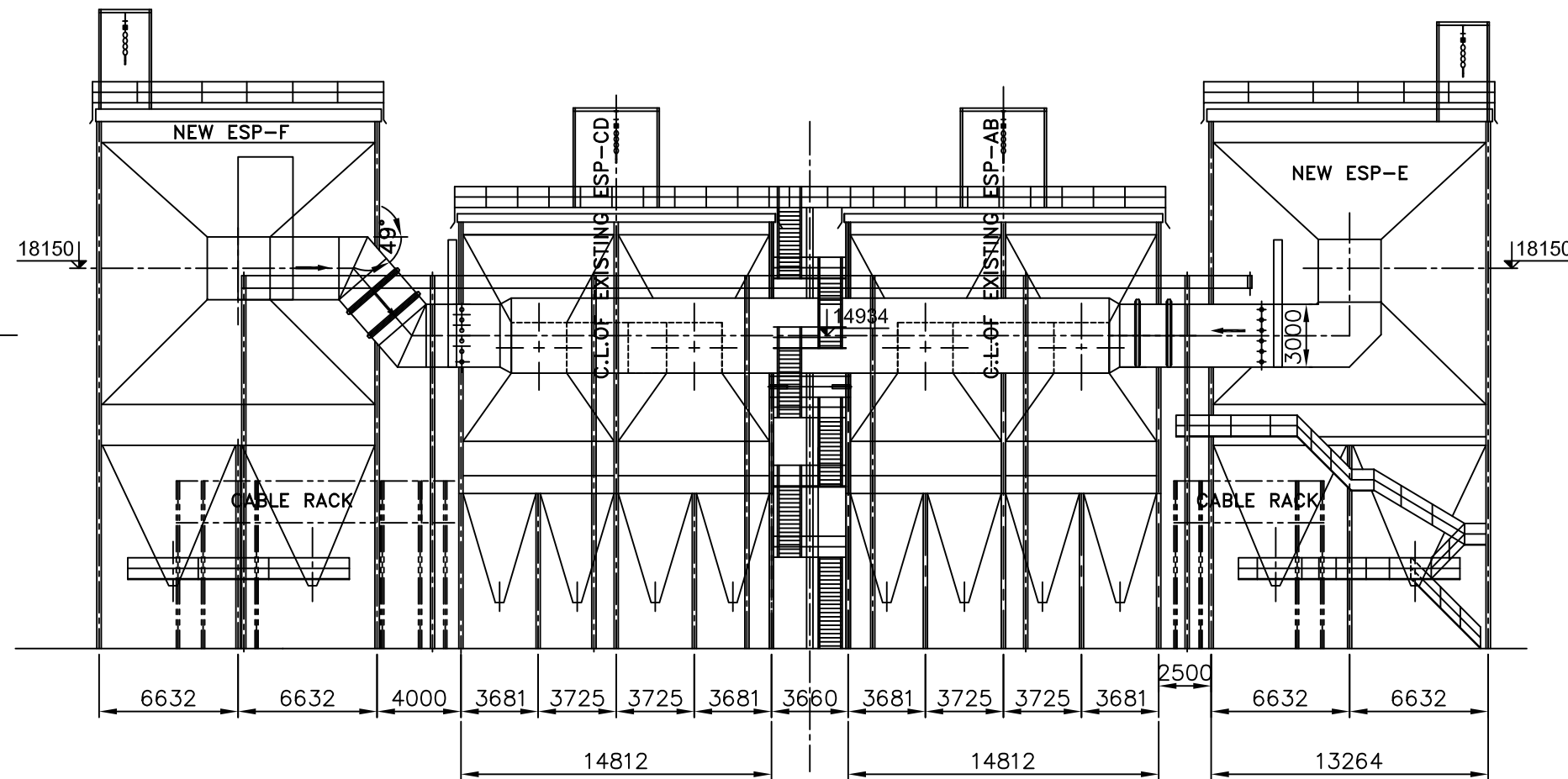
1. In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn by BHEL and all tests as per relevant specifications shall be carried out in their presence or in recognized Government Laboratory.
2. When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be preserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless otherwise agreed.
3. For castings and forgings integral test specimens shall be provided, When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
5. This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings. If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
6. Wherever inspection by BHELs Purchaser/Third Party/Statutory authorities are mandatory, this shall be complied with.
7. Inspection reports, log sheets, test reports/certificate. etc. shall be furnished to BHEL at the appropriate stages or at the time of final inspection, as required.
8. This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor.



ESP ELEVATION VIEW-AA (FOR NEW PARALLEL ESP-1)

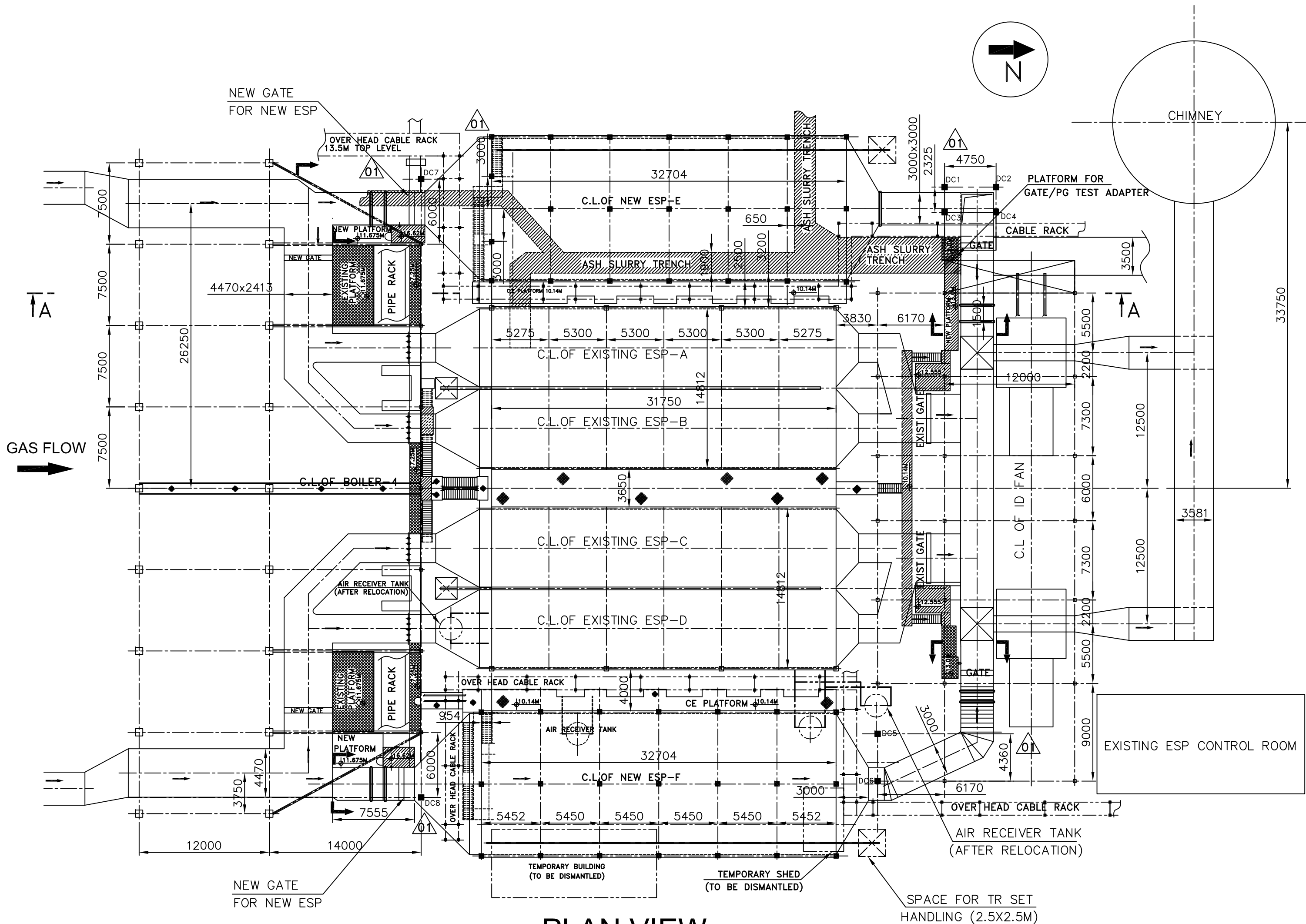


ESP INLET SIDE VIEW



ESP OUTLET SIDE VIEW

- NOTES:
- EXISTING ESP SIZE: 2 NOS. FAA-6X36H-2X72125-2 RETAINED.
NEW ADDITIONAL ESP WILL BE LOCATED IN PARALLEL TO EXISTING ESP ONE EACH AT L.H.S AND R.H.S
NEW ADDITIONAL ESP SIZE: FAA-6X37.5M-128150-2; NO. OF NEW ESP PER BOILER: TWO
 - ±0000 REFERS TO BOB LEVEL NEW ESP SUPPORTING STRUCTURE
INDICATES ESP TERMINAL POINTS AND SCOPE OF SUPPLY.
BOB - BOTTOM OF BASE PLATE.
TOF - TOP OF FLOOR GRILL. TOS - TOP OF STEEL
INDICATES NEW ESP COLUMN LOCATION
DC1 TO DC8 - INDICATES NEW ESP DUCT SUPPORT COLUMN
 - ESP REFURBISHMENT AND AUGMENTATION WORK TO ACHIEVE 80 MG/NM3 EMISSION ARE AS DESCRIBED AS BELOW:
A. TWO NUMBER NEW PARALLEL ESP IS LOCATED IN PARALLEL TO EXISTING ESP ONE ON L.H.S AND OTHER ONE ON R.H.S AS SHOWN IN THE LAYOUT DRAWING.
TWO NOS NEW ESP WILL HANDLE FLUE GAS FLOW OF 242 M3/S (EACH ESP 121 M3/S) OUT OF TOTAL GAS FLOW OF 460 M3/S.
B. EXISTING TWO NUMBER ESP WILL HANDLE REMAINING GAS FLOW OF 218 M3/S (EACH ESP 109 M3/S).
EXISTING ESP WILL BE REFURBISHED BY REPLACING THE INTERNALS, RAPPING MECHANISM, ELECTRICAL ITEMS SUCH AS GEAR MOTOR, INSULATOR, TRANSFORMER RECTIFIER, ELECTRICAL HOIST ETC AS SPECIFIED IN THE CONTRACT
C. EXISTING ESP LTMSB, ACP, CABLES, CABLE TRAYS & SUPPORTS, GATES AT ESP OUTLET, ID FAN INLET ARE RETAINED.
 - INLET DUCT OF NEW ESP IS TAPPED FROM EXISTING ESP INLET COMMON DUCT AS SHOWN IN LAYOUT. OUTLET DUCT OF NEW ESP WILL BE CONNECTED TO EXISTING ID FAN BUS DUCT.



PLAN VIEW

CUSTOMER NO. R4T9

CUSTOMER: M/S TANGEDCO
PROJECT: METTUR THERMAL POWER STATION-1 UNIT-4 (210MW),
REFURBISHMENT OF EXISTING ESP
AND AUGMENTAION OF ADDITIONAL ESP

NAME	SIGN	DATE
MRC/MADHU	-sd-	16.06.2018
M.RAVICHANDRAN		16.06.2018
S.S.MANI	-sd-	16.06.2018

TITLE: PLOT PLAN AND LAYOUT OF ESP & DUCTING
SCALE : 1:300

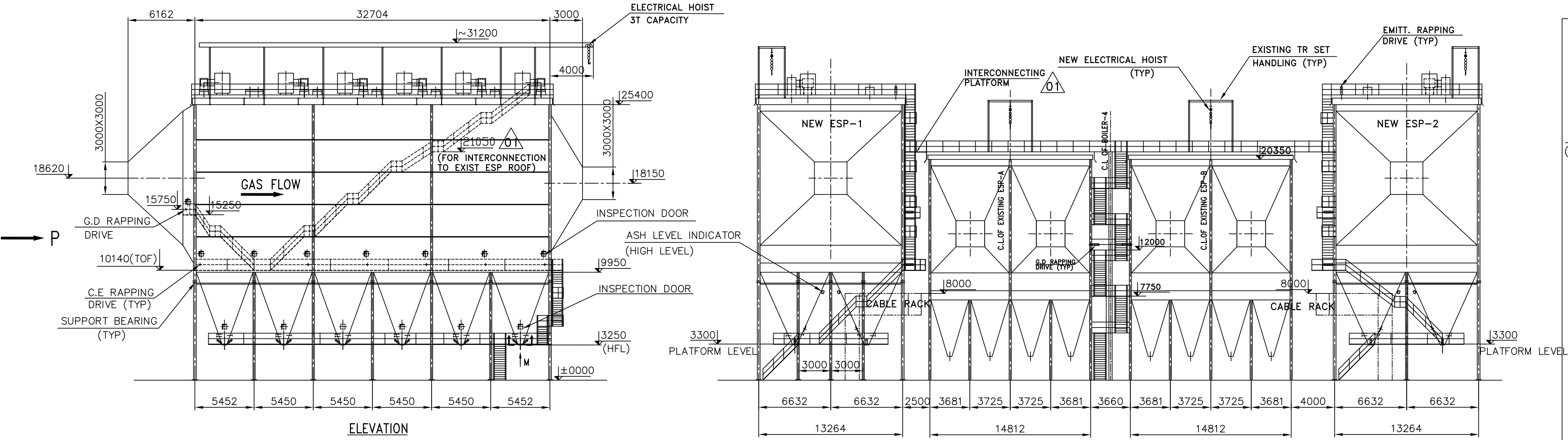
BHEL DRAWING NO. 1-00-111-29251
SHEET 01 OF 01
REV 01

REV	DATE	ALTERED:	CHECKED:
01	31.07.18	MADHU	M.RAVICHANDRAN
ZONE NORTH DIRECTION MARKED IN PLAN VIEW.			
A5,A8 INTERCONNECTING PLATFORM MARKED CONNECTING EXISTING ESP ROOF TO NEW ESP STAIR CASE.			
D4,F4 ESP PASS NUMBERING CHANGED			
D3,G3 NEW ESP INLET DUCT COLUMN DC7, DC8 MARKED IN PLAN VIEW.			
D5,F5 NEW ESP OUTLET DUCT COLUMN LOCATING DIMENSION MARKED IN PLAN VIEW.			

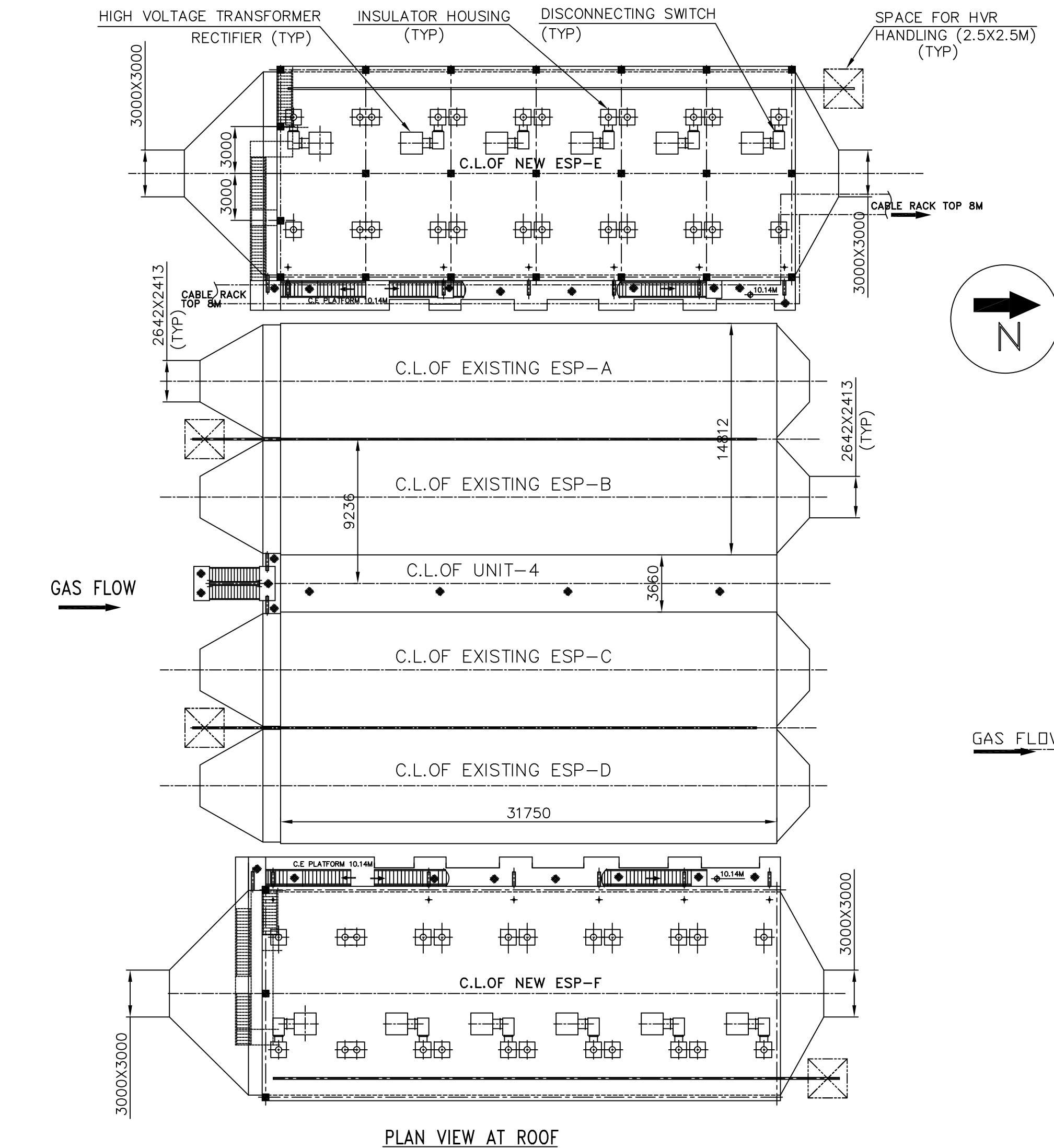
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. and is not to be used directly or indirectly in any way detrimental to the interest of the company.

1-00-111-29250
DRAWING NO.

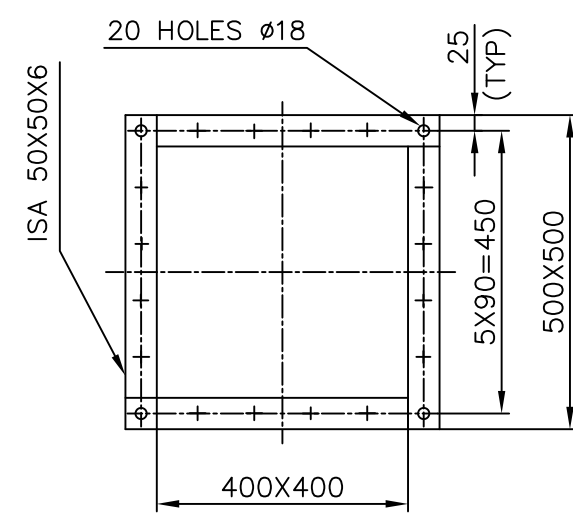
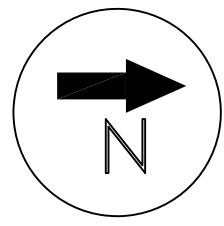
ALL DIMENSIONS ARE IN MILLIMETRES



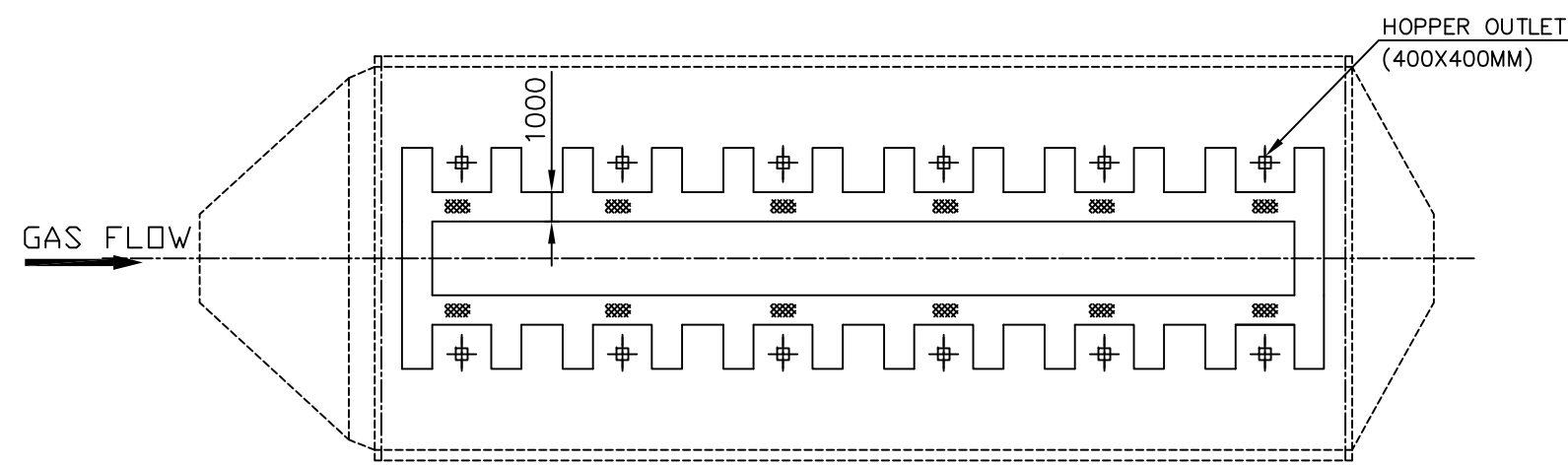
ESP INLET SIDE VIEW-P



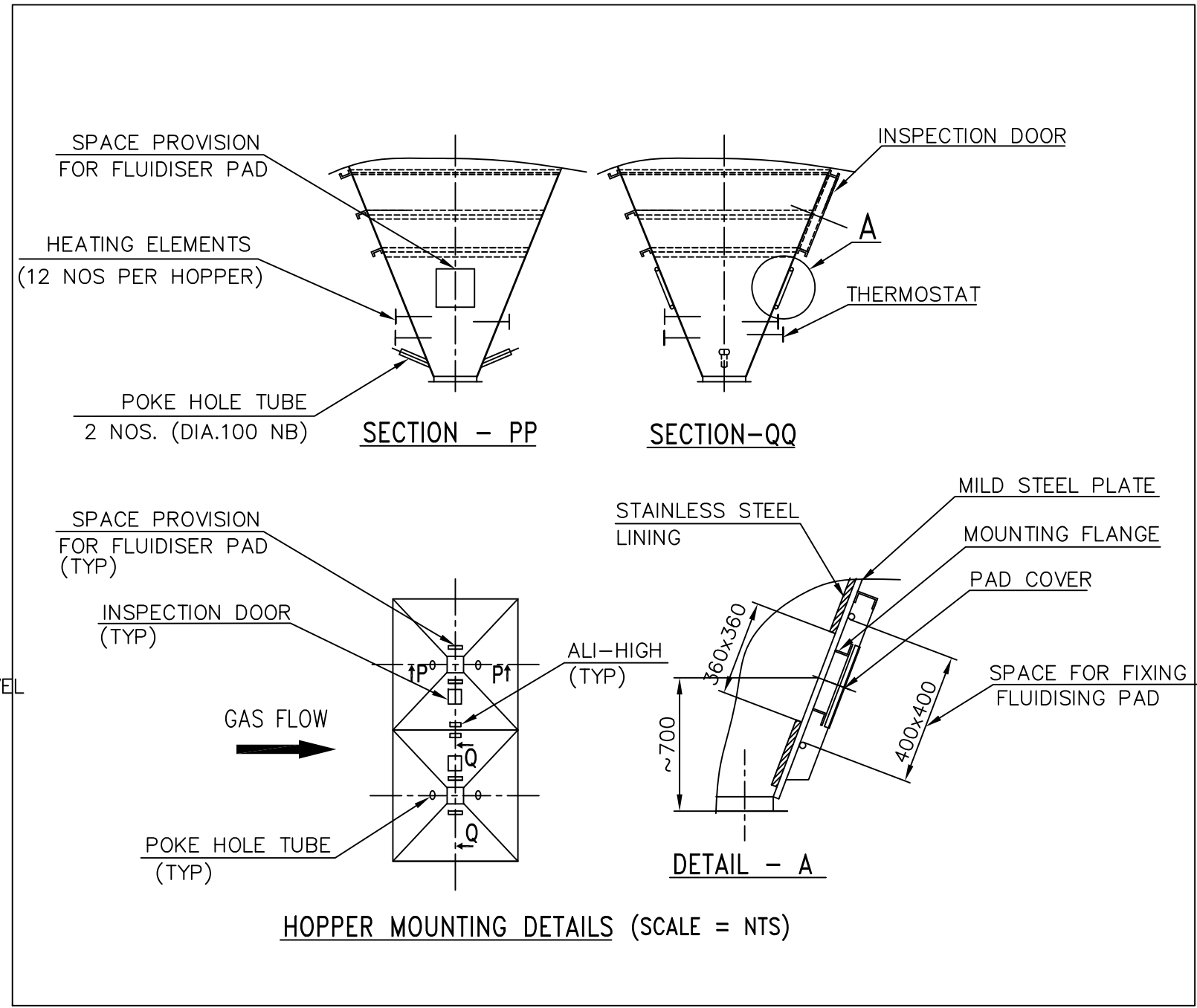
PLAN VIEW AT ROOF



VIEW-M
HOPPER BOTTOM FLANGE



NEW ESP HOPPER APPROACH PLATFORM



HOPPER MOUNTING DETAILS (SCALE = NTS)

- NOTES:
01. NEW ADDITIONAL ESP SIZE: FAA-6X37.5M-128150-2; TWO NOS PER BOILER. EXISTING ESP SIZE: FAA-6X36H-2X72125-2; TWO NOS PER BOILER RETAINED.
 02. ±0000 REFERS TO BOB LEVEL NEW ESP SUPPORTING STRUCTURE
BOB - BOTTOM OF BASE PLATE.
TOF - TOP OF FLOOR GRILL.
 03. ESP REFURBISHMENT AND AUGMENTATION WORK TO ACHIEVE 80 MG/NM3 EMISSION ARE AS DESCRIBED AS BELOW;

A. TWO NUMBER NEW PARALLEL ESP IS LOCATED IN PARALLEL TO EXISTING ESP ONE ON L.H.S AND OTHER ONE ON R.H.S TO EXISTING ESPS.
TWO NOS NEW ESP WILL HANDLE FLUE GAS FLOW OF 242 M3/S (EACH ESP 121 M3/S) OUT OF TOTAL GAS FLOW OF 460 M3/S

B. EXISTING TWO NUMBER ESP WILL HANDLE REMAINING GAS FLOW OF 218 M3/S (EACH ESP 109 M3/S).
EXISTING ESP WILL BE REFURBISHED BY REPLACING THE INTERNALS, RAPPING MECHANISM, ELECTRICAL ITEMS SUCH AS GEAR MOTOR, INSULATOR, TRANSFORMER RECTIFIER, ELECTRICAL HOIST ETC AS SPECIFIED IN THE CONTRACT

C. EXISTING ESP LTMSB, ACP, CABLES, CABLE TRAYS & SUPPORTS, GATES AT ESP OUTLET, ID FAN INLET ARE RETAINED.
 04. HOPPER MOUNTING DETAILS ARE SHOWN IN THIS DRAWING IN DETAIL.
SPACE PROVISION 400X400MM IS PROVIDED ON TWO OPPOSITE SIDE OF HOPPER TO ENABLE INSTALLATION OF FLUIDISING PAD AT LATER STAGE IF REQUIRED.
STAINLESS STEEL LINING 1.6 MM THICK FOR 1.5 M HEIGHT FROM HOPPER FLANGE WILL BE PROVIDED INSIDE HOPPER AND WELDED AT OUR WORKS.
 05. ASH LEVEL INDICATOR -HIGH LEVEL FOR EACH HOPPER WILL BE PROVIDED.
 06. INSULATION & CLADDING WILL BE OF LRB MINERAL WOOL 60 MM THICK, AND CLADDING SHEET 0.71 MM THICK, PLAIN ALUMINIUM SHEET WILL BE PROVIDED.
 07. FOR "PLOT PLAN & LAYOUT OF ESP & DUCTING DRAWING REFER DRAWING NO.1-00-111-29250.

CUSTOMER NO. R4T9

CUSTOMER: M/S TANGEDCO
PROJECT: METTUR THERMAL POWER STATION-1 UNIT-4 (210MW),
REFURBISHMENT OF EXISTING ESP
AND AUGMENTAION OF ADDITIONAL ESP

NAME	SIGN	DATE
MRC/MADHU	-sd-	12.06.2018
M.RAVICHANDRAN		12.06.2018
S.S.MANI	-sd-	12.06.2018

TITLE: GENERAL ARRANGEMENT OF
NEW PARALLEL ESP

SCALE : 1:250

BHEL DRAWING NO. 1-00-111-29250

SHEET 01 OF 01

REV 01

CAUTION: The information on this drawing is the property of Bharat Heavy Electricals Ltd. It is to be used directly or indirectly in any way detrimental to the interest of the company.

REV	DATE	ALTERED:	CHECKED:
01	31.07.18	MADHU	M.RAVICHANDRAN
ZONE	NORTH DIRECTION MARKED IN PLAN VIEW.		
B6,B8	INTERCONNECTING PLATFORM MARKED CONNECTING EXISTING ESP ROOF TO NEW ESP STAIR CASE.		
D3,E3,F3,G3	ESP PASS NUMBERING CHANGED		