

NATIONAL THERMAL POWER CORPORATION LIMITED

3X800MW PATRATU TPS

**TECHNICAL SPECIFICATION
FOR
*DISTRIBUTION BOARDS & LIGHTING PANELS***

SPECIFICATION NO: PE-TS-434-558-E002, R0



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



TECHNICAL SPECIFICATION FOR
DISTRIBUTION BOARDS & LIGHTING
PANELS

3 x 800 MW PATRATU STP

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SPECIFIC TECHNICAL REQUIREMENTS



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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 are no deviations 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

- 1.1 Design, manufacture, assembly, inspection & testing at vendor's/ sub-vendor's works, proper packing and delivery to site of LIGHTING DB/ WELDING DB & LIGHTING PANELS as mentioned in different sections of this specification, complete with all accessories for efficient and trouble-free operation.
- 1.2 Standard technical requirements of LIGHTING DBs/ WELDING DBs & LIGHTING PANELS are indicated in Section-II. Project specific requirements/changes are listed in Section-I.
- 1.3 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.
- 1.4 Review of sub-vendor's documents by the vendor shall not relieve the vendor from the responsibility of design & supply.
- 1.5 The documents shall be in English language and MKS system of units.

2.0 BILL OF QUANTITIES:

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

3.0 SPECIFIC TECHNICAL REQUIREMENTS

S . N o .	Referen ce clause No. of Section II (if any)	Specific Requirement/ Change
1	Clause no 3.1.3 Lighting transfor mer / Welding transfor mer	Add : Each AC Lighting Distribution Board (LDB) / Welding DB shall be fed from 415V / 415V, 100kVA / 50kVA isolating transformer (refer BOQ). The lighting / welding transformer may, preferably, be located inside the LDB / Welding DB panel itself. Otherwise, the same shall be located by the side of respective LDB / Welding DB. Lighting / Welding transformers shall be dry type, natural air cooled with class B insulation or better. Impedance of lighting / Welding transformer shall be so selected that the fault level of lighting /Welding system shall be reduced to 3 to 5 KA. Lighting / Welding transformers shall be tested as per IS: 2026. Off-circuit tap changer with $\pm 2.5\%$ and $\pm 5\%$ tapping shall be provided. In case the transformers are not mounted inside the LDB panels, the same shall be housed in a separate 2 mm thick CR sheet steel



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		enclosure with IP-42 degree of protection as per IS/IEC 60947. However, the transformer terminal box shall have IP-52 degree of protection.
2	Clause no 3.1.17 Earthing	Add : f) Earthing of LDB & LP shall be done using following sizes of flats : LDB : GS flat 50x6 mm. LP : GS flat 25x3 mm.
3	Clause no 3.2.1 : General require ments of lighting panel	Add : r) Lighting panels shall be constructed out of 2 mm thick CRCA sheet steel. The door shall be hinged and the panel shall be gasketed to achieve specified degree of protection s) All MCBs/Isolators/Switches/Contactors etc. shall be mounted inside the panel and a fibre glass sheet shall be provided inside the main door such that the operating knobs of MCBs etc., shall project out of it for safe operation against accidental contact. (t) Terminal blocks shall be 1100 V grade, clip-on stud type, made up of polyimide 6.6 or better suitable for terminating multicore 35 or 70 Sq. mm. stranded aluminium conductor incoming cable and 10 Sq. mm. stranded aluminium conductor for each outgoing circuits voltage. All terminals shall be shrouded, numbered and provided with identification strip for the feeders. (u) MCB's shall be current limiting type with magnetic and thermal release suitable for manual closing and automatic tripping under fault condition. MCB's shall have short circuit interrupting capacity of 9 KA rms. MCB knob shall be marked with ON/OFF indication. A trip free release shall be provided to ensure tripping on fault even if the knob is held in ON position. MCB terminal shall be shrouded to avoid accidental contact. (v) Contactors of AC lighting panels shall be 3 no's, 32 A, 3 pole continuous duty MCB, load make-break type suitable for 415 V, 3 phase 4 wire system. HRC fuses with suitable mounting base of 125A shall be provided in the incomer of Contactors in the LP. (w) DC switches shall be rotary type, 2 pole, continuous duty, load break type, quick make quick break, suitable for 220 V DC, 2 wire system. Switch knob shall be provided with ON/OFF indication. (h) Programmable Digital Timer shall be Electronic Astronomical Almanac Time switch with battery back up of min. TEN years, 4 Digit LED display, 24 hours range, manual override facility, 10 Amp 3 relay output, with NO/NC Contacts suitable for operation on 240V single phase AC supply. (x) Each lighting panel LP-E(24) shall be fed from a 415V/42V, 3 phase-4 wire, 3 KVA transformer. The transformer shall be located inside the lighting panel itself. Transformers shall be dry type, natural air cooled with class F insulation or better. Impedance of transformer shall be 5%. Transformers shall be tested as per IS:11171. Off-circuit tap changer with +/- 5% in steps of +/- 1.25% tapping shall be provided. One minute power frequency withstands voltage for lighting transformer shall be 2.5 KV. Incomer side : 40A TPN MCB Outgoing feeder: 16A MCB



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DOP: IP55.

(y) Lighting panels, etc. shall be earthed by two separate and distinct connections with earthing system.

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

Indoor: Without timer

Outdoor: With timer.

4.0 Inspection & Testing

Standard Quality Plan is enclosed. Inspection shall be carried out as per Quality Plan without any implication on cost and delivery. There shall be no commercial implication to BHEL on account of any changes in QP during contract stage.

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 **08.09.18**. 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.

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.

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.

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

GALVANISING TESTS:

The quality of galvanizing shall be smooth, continuous, free from flux stains and shall be inspected visually.

In addition following tests shall be conducted as acceptance tests.

(a) Uniformity of coating - The coating of any article shall withstand for one (1) minute dips in standard copper sulphate solution without the formation of an adherent red spot of metallic copper upon the basic metal.

(b) The quality of cadmium/zinc plating on items with screw threads shall be free from visible defects such as unplated areas, blisters and modules and shall be inspected visually.



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(c) In addition, the plating thickness shall be determined microscopically/ chemically or electronically.

5.0 DOCUMENTATION

5.1 Documents required after award of contract shall be as per Attachment-I (to be submitted by successful bidder).



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ATTACHMENT – I

DOCUMENTS REQUIRED AFTER AWARD OF LOI

SL. No.	DOCUMENT TITLE	DOCUMENT NO.	CATEGORY
1	TECHNICAL DATA SHEET FOR LDB/ LP/ TRANSFORMER	PE-V0-434-558-E001	PRIMARY
2	SUB-VENDOR LIST FOR LDB /LP /TRANSFORMER	PE-V0-434-558-E088	PRIMARY
3	GA DRAWING & SLD OF LDB-H(12)	PE-V0-434-558-E003	PRIMARY
4	GA DRAWING & SLD OF LDB-H(18)	PE-V0-434-558-E002	PRIMARY
5	GA DRAWING OF 100 KVA TRANSFORMER	PE-V0-434-558-E004	PRIMARY
6	GA DRAWING & SLD OF WDB-H(18)	PE-V0-434-558-E005	PRIMARY
7	GA DRAWING & SLD OF LDB-F(8)- Two incomer	PE-V0-434-558-E006	PRIMARY
8	GA DRAWING & SLD OF DC LDB-D(12)	PE-V0-434-558-E007	PRIMARY
9	GA DRAWING & SLD OF LDB-H(12)- Two incomer	PE-V0-434-558-E008	PRIMARY
10	GA DRAWING & SLD OF LP OUTDOOR TYPE (LP-E24) with 3kVA Trf	PE-V0-434-558-E009	PRIMARY
11	GA DRAWING & SLD OF LP-A(18) - DECORATIVE	PE-V0-434-558-E010	PRIMARY
12	GA DRAWING & SLD OF LP-A(12) - INDOOR	PE-V0-434-558-E011	PRIMARY
13	GA DRAWING & SLD OF LP-A(12) - OUTDOOR	PE-V0-434-558-E012	PRIMARY
14	GA DRAWING & SLD OF LP-A(12) - DECORATIVE	PE-V0-434-558-E013	PRIMARY
15	GA DRAWING & SLD OF LP-A(18) - INDOOR	PE-V0-434-558-E014	PRIMARY
16	GA DRAWING & SLD OF LP-A(18) - OUTDOOR	PE-V0-434-558-E015	PRIMARY
17	GA DRAWING & SLD OF LP-D(6) - INDOOR	PE-V0-434-558-E016	PRIMARY
18	GA DRAWING & SLD OF LP-D(6) - OUTDOOR	PE-V0-434-558-E017	PRIMARY
19	GA DRAWING & SLD OF LP-S(6)	PE-V0-434-558-E018	PRIMARY
20	GA DRAWING OF 50 KVA TRANSFORMER	PE-V0-434-558-E019	PRIMARY
21	MANUFACTURING QUALITY PLAN FOR LDBs & LPs	PE-V0-434-558-E901	PRIMARY
22	MANUFACTURING QUALITY PLAN FOR LIGHTING TRANSFORMERS	PE-V0-434-558-E902	PRIMARY
23	TYPE TEST REPORT OF LDBs	PE-V0-434-558-E408	SECONDARY
24	TYPE TEST REPORT OF LP	PE-V0-434-558-E409	SECONDARY
25	TYPE TEST REPORT OF TRANSFORMERS	PE-V0-434-558-E410	SECONDARY



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Note:

1. The above list of drawings and documents is indicative.
2. Document submission and resubmission shall be done through document management system (DMS).
3. R-0 submission within 14 days from PO & subsequent revisions within 10 days of comments received from BHEL.



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DATA SHEET -A

S. No.	Description	Unit	Value
1.0	SYSTEM DESIGN DATA		
1.1	Design ambient	⁰ C	50
1.2	AC Supply		
a)	Rated voltage	V	415
b)	Rated frequency	Hz	50
c)	Voltage variation (permissible)	%	+10% to -10%
d)	Frequency variation (permissible)	%	+3% to -5%
e)	Combined voltage & frequency variation (sum of absolutes permissible)	%	10%
f)	System fault level & duration	kA, sec.	50kA for 1 sec.
1.3	DC Supply		
a)	Rated voltage	V	220
b)	Voltage variation (permissible)	%	+10% to -15%
c)	System fault level & duration	kA, sec.	20kA for 1 sec.
2.0	APPLICABLE STANDARDS IS 60947 Low voltage switchgear and control gear IS 11171 Dry type transformers IS 13703 Low voltage fuses for voltages not exceeding 1000V AC or 1500 V IS 10118 Code of practice for selection, installation and maintenance of switchgear and control gear IS 60898 Electrical Accessories - circuit breakers for over protection for household and similar installations IS 1901 Visual indicator lamps IS 60079 Explosive atmospheres IS 5572 Classification of hazardous areas (other than mines) having flammable gases and vapours for electrical installation IS:2551 Danger notice plates		



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3.0	LIGHTING/ WELDING DISTRIBUTION BOARDS- FORM IV B CONSTRUCTION AS PER IEC 61439.		
3.1	Operational Front		Single Front
3.2	Type of execution of modules (functional unit)		☒ Fixed ☐ Draw out
3.3	Type of sheet		CRCA
3.4	Sheet thickness (minimum)		
a)	Non-load bearing covers	mm	1.6 mm
b)	Non-load bearing partitions	mm	1.6 mm
c)	Load bearing members	mm	2.0 mm
d)	Frames	mm	2.0 mm
e)	Door	mm	1.6 mm
f)	Withdrawable unit (if applicable)	mm	2.0 mm
3.5	Cable alley width (minimum)	mm	400
3.6	Bus bar material		Electrolytic grade E 91 E min. size 50X12 mm
3.7	Earth bus bar material		☒ GI Strip ☐ Aluminium ☐ Copper
3.8	Degree of Protection		
a)	Main Panel		IP-52 for indoor
b)	Transformer cubicle		IP-42 IP-52 for transformer terminal box.
3.9	Gland plate thickness	mm	3.0
3.10	AC LDB/ WDB		
a)	No. of Incomers		☒ One ☒ Two
b)	Bus coupler required		☒ Yes (Applicable for LDB with two incomers). ☐ No
c)	Incomer and Bus coupler rating	A	As per transformer rating
d)	Type of Incomer and Bus coupler		☒ TPN SFU FOR 50kVA ☒ TPN MCCB FOR 100kVA
e)	Type of Outgoing Feeders		☒ TPN SFU ☐ MCCB



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f)	Outgoing feeders rating	A	63
g)	Cable entry		☒ Bottom ☐ Top
3.11	Lighting Transformer		
a)	Rating	kVA	100 / 50
b)	Type of cooling		Air natural
c)	Voltage ratio	V	415/415
d)	Rated frequency	Hz	50
e)	No. of phases		3
f)	Vector group		Dyn1
g)	Off circuit taps		
	Tap range, steps	%	+5% to -5% in steps of 2.5%
	Voltage of each tap	V	As per manufacturer's data
h)	Impedance at rated current, frequency at 75 °C	%	As per IS
i)	Rated current		
	Primary	A	As per manufacturer's data
	Secondary	A	As per manufacturer's data
j)	Transformer type		☒ Cast resin / ☐ Encapsulated / ☒ Non-Encapsulated
k)	Transformer winding insulation		Class B or better
l)	Transformer winding insulation temperature rise limit		80 degree C above 50 degree C ambient
n)	Type of ventilation arrangement provided for transformer enclosure		As per manufacturer's data
o)	Winding conductor material		Copper
p)	Iron loss at 50 Hz and 100% rated voltage	kW	As per manufacturer's data
q)	Copper loss at rated load at 75 °C	kW	As per manufacturer's data
r)	Regulation at full load at 75 °C and 0.8 p.f. lagging		As per manufacturer's data



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s)	Weight	kg	As per manufacturer's data
3.12	DC LDB		
a)	No. of Incomers		☒ One ☐ Two
b)	DC incomer Type		DP Switch fuse unit with contactor
c)	DC incomer rating	A	125
d)	AC incomer type		NA
e)	AC incomer rating	A	NA
f)	Bus coupler required		☐ Yes ☒ No
g)	Incomer and Bus coupler rating	A	125
h)	Type of Bus coupler		☐ SFU ☐ DP MCCB
i)	Type of Outgoing Feeders		☒ DP SFU ☐ MCCB ☐ DP MCB
j)	Outgoing Feeders rating	A	32
k)	Changeover required in DC LDB		☐ Yes (Converter for Conversion of AC to DC) ☒ No
l)	Provision of Manual override		☐ Yes ☐ No
m)	Cable Entry		☒ Bottom ☐ Top
4.0	LIGHTING PANELS		
4.1	Application		☐ Indoor ☐ Outdoor ☒ Both
4.2	Type of sheet		CRCA
4.3	Sheet thickness (minimum)		2.0mm
4.4	Degree of Protection		
a)	Indoor panel		IP-55
b)	Outdoor panel		IP-55, Weather proof with canopy
c)	Canopy in outdoor panel		☒ Yes ☐ No
4.5	Bus bar material		☒ Aluminium ☐ Copper
4.6	Earth bus bar required		☒ Yes ☐ No
4.7	Earth bus bar material		☒ GI Strip ☐ Aluminium ☐ Copper
4.8	Gland Plate	mm	3.0
4.9	Earthing studs required		☒ Yes ☐ No



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4.10	Hinged door with locking facility		☒ Yes ☐ No
4.11	AC Lighting Panel		
a)	Incomer rating	A	63A for LP and SLP
b)	Type of Incomer		☐ SFU ☒ TP MCB
c)	Earth Leakage Circuit Breaker (ELCB) in incomer required		☐ Yes ☒ No
d)	Type of Outgoing Feeders (non-flameproof panel)		☒ SP MCB ☐ TPN MCB
e)	Type of Outgoing Feeders (Flameproof panel)		☐ DP MCB ☐ TPN MCB
f)	Type of Outgoing Feeders (Street Light panel)		☐ SPN MCB ☒ TP MCB
g)	Energy Saving System required for indoor panel		☐ Yes ☒ No
h)	Energy Saving System required for outdoor panel		☐ Yes ☒ No
i)	Timer required Street Light panel/ High mast feeder pillar		☒ Yes ☐ No
j)	Photocell required for Street Light panel/ High mast feeder pillar		☒ Yes ☐ No
k)	Outgoing feeders rating	A	20
4.12	DC Lighting Panel		
a)	Incomer rating	A	32
b)	Type of Incomer		☒ DP SFU ☐ DP MCCB
c)	Type of Outgoing Feeders (non-flameproof panel)		☒ DP SFU
d)	Type of Outgoing Feeders (Flameproof panel)		☐ DP MCB
e)	Outgoing feeders rating	A	20
5.0	COMPONENTS OF LIGHTING SYSTEM EQUIPMENT		
5.1	Moulded Case Circuit Breaker (MCCB)		
a)	Rated voltage	V	415



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b)	Number of poles		Three
c)	Rated short circuit duty	kA	50
d)	Rated breaking capacity (rms)	kA	50KA
e)	Rated making current (peak)	kA	105KA
f)	Release with short circuit		YES
g)	Release with overload		YES
h)	Release with under voltage		NO
i)	Auxiliary contacts		
	Numbers	NO+NC	2NO+2NC
	Rating	A	As per manufacturer data
5.2	Switch-Fuse Unit		
a)	Utilisation category for main contacts		DC22
5.3	Miniature Circuit Breaker		
a)	SPN MCB rating (min)	A	Refer Sl. No. 3 & 4
b)	DP MCB rating (min)	A	Refer Sl. No. 3 & 4
c)	TPN MCB rating (min)	A	Refer Sl. No. 3 & 4
d)	Short time rating	kA	9
e)	Magnetic short circuit protection required		☒ Yes ☐ No
f)	Thermal overload protection required		☒ Yes ☐ No
5.4	Current Transformer		
a)	Type		Cast resin
b)	Secondary current rating	A	☒ 1 ☐ 5
c)	Burden	VA	10
d)	Accuracy class		1.0
e)	Instrument Safety Factor		<5
5.5	Voltage Transformer		



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a)	Type		Cast resin
b)	Secondary terminal voltage (phase-phase)	V	110 V
c)	Burden	VA	10
d)	Accuracy class		1.0
e)	Winding configuration		Star/ Star
f)	System grounding		☒ Effective ☐ Non-effective
5.6	Indicating Meters		
5.6.1	Ammeter		
a)	Type		Analog
b)	Shape		Square
c)	Size		96mm x 96mm
d)	Accuracy		2.0
e)	Current coil rating	A	1
f)	Angle of deflection	deg	90
5.6.2	Voltmeter		
a)	Type		Analog
b)	Shape		Square
c)	Size		96mm x 96mm
d)	Accuracy		2.0
e)	AC voltage coil rating	V	0-500
f)	DC voltage coil rating	V	0-250
g)	Angle of deflection	deg	90
5.6.3	Energy meter		
a)	Type		☒ Analog ☐ Digital
b)	Accuracy		1.0
c)	Current coil rating	A	1
d)	Voltage coil rating	V	0-500
5.7	Power Contactors		



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a)	Coil voltage (nominal)		
	AC contactors	V	240
	DC contactors	V	220
b)	Current rating of contacts		
	Power	A	As per manufacturer data
	Control	A	As per manufacturer data
5.8	Under voltage relay		
a)	Type		☒ Electromagnetic ☐ Static
b)	Coil voltage rating	V	110
c)	Means for in-built testing provided		As per manufacturer data
5.9	Timer		
5.9.1	Time switch		
a)	Type		Digital synchronous
b)	Range	hr	0-24
c)	Coil voltage rating	V	240
5.9.2	Timer for AC-DC changeover		NA
a)	No. of contacts		
	ON time delay	NO+NC	As per scheme requirement
	OFF time delay	NO+NC	As per scheme requirement
	Instantaneous	NO+NC	As per scheme requirement
b)	Coil voltage rating		
	AC timer	V	240
	DC timer	V	220
c)	Time delay range		
	AC timer	sec	0-5
	DC timer	Sec	0-180
5.10	Selector switch		
a)	Type of selector switch		☒ Stay put ☐ Wing knob



**TECHNICAL SPECIFICATION FOR
DISTRIBUTION BOARDS & LIGHTING
PANELS**

3 x 800 MW PATRATU STP

SPECIFICATION NO. PE-TS-434-558-E002

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b)	Lockable		☐ Yes ☒ No
5.11	Push Button		
a)	Voltage grade	V	500
b)	Potential free contacts		2NO+2NC
5.12	Indicating Lamps		
a)	Lens Colour		
	ON condition		Red
	OFF condition		Green
b)	Circuit voltage	V	240V
5.13	Cable Glands		By vendor for all incoming and outgoing cables
a)	Type		☒ Double compression ☐ Single compression
b)	Material		Brass
c)	Nickel Plating provided		☒ Yes ☐ No
d)	Flameproof glands with flameproof equipment		☒ Yes ☐ No
5.14	Cable Lugs		By vendor for all incoming and outgoing cables
a)	Type		Crimping type/ ring type
b)	Material		Tinned copper
6.0	PAINTING		
6.1	Finished Colour shade		
a)	LDBs		During detail engineering without any price implication to BHEL
b)	LPs		Powder coated with colour shade RAL9002
6.2	Paint Finish		
a)	Interior		☐ Matt ☒ Semi-glossy
b)	Exterior		☒ Semi-glossy ☐ Full-glossy
6.3	Paint Thickness (minimum)	Microns	80 micron



**TECHNICAL SPECIFICATION FOR
DISTRIBUTION BOARDS & LIGHTING
PANELS**

3 x 800 MW PATRATU STP

SPECIFICATION NO. PE-TS-434-558-E005

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ANNEXURE-1

SUB-VENDOR LIST

बी एच ई एल 		PROJECT : 3 X 800 MW PATRATU TPS					SUB VENDOR LIST			DATE 10.09.19		
TECHNICAL SPECIFICATION FOR DISTRIIBUTION BOARDS AND LIGHTING PANEL												
Sl. No.	ITEM	QP / INS CAT.	QP No:- 4410- 001- QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB- SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	SC DETAIL SUB SCH	REMARKS	

1	LT Contactor	III				C&S Electric	Noida	A			
						GE	Bangalore	A			
						L&T	Mumbai	A			
						Siemens	Mumbai / Aurangabad	A			
						Any make's model with VDE or CE or UL or CSA marking or <i>BIS approved with CML no.</i>					Refer Note 3
2	Switch Fuse Unit/MCCB	III				Siemens	Mumbai / Aurangabad	A			
						L&T	Mumbai	A			
						C&S Electric	Noida	A			
						GE	Bangalore	A			
						Any make's model with VDE or CE or UL or CSA marking or <i>BIS approved with CML no.</i>					Refer Note-3
3	Auxiliary Relays	III				Any make's model with VDE or CE or UL or CSA marking or <i>BIS approved with CML no.</i>					Refer Note-3
4	Lighting	III				Automatic	Lonavla	A			

बी एच ई एल 		PROJECT : 3 X 800 MW PATRATU TPS					SUB VENDOR LIST			DATE 10.09.19		
TECHNICAL SPECIFICATION FOR DISTRIBUION BOARDS AND LIGHTING PANEL												
Sl. No.	ITEM	QP / INS CAT.	QP No:- 4410- 001- QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB- SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	SC DETAIL SUB SCH	REMARKS	

	Transformer					Electric Ltd.,					
						Indcoil,	Kurla West Mumbai	A			
						Power Pack Enterprises	Mumbai	A			
						Vijay Electricals Ltd	Hyderabad	A			
						Gilbert & Maxwell,	Nasik	A			
						Kappa Electricals,	Chennai	A			
						Ames Impex Electricals Pvt. Ltd	Ahmedabad	A			
5	LT CT/PT/CBCT/ Control Transformer	III				Kappa	Bangalore	A			
						Southern Electric	Chennai	A			
						Precise	Mumbai	A			
						G&M	Baroda	A			CBCT Only
						Silkaans	Mumbai	A			
						Ind Coil	Mumbai	A			
						Pragati	Thane	A			
						Prayog	Pune	A			
						AE	Mumbai	A			
						Logicstat	Delhi	A			For control transformer only

		PROJECT : 3 X 800 MW PATRATU TPS					SUB VENDOR LIST			DATE 10.09.19		
		TECHNICAL SPECIFICATION FOR DISTRIBUION BOARDS AND LIGHTING PANEL										
Sl. No.	ITEM	QP / INS CAT.	QP No:- 4410-001-QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	SC DETAIL SUB SCH	REMARKS	

						C&S Electric	Noida	A				For CT only
6	A) LT AC / DC Control & Selector Switch B) Indicating Meters C) Transducer D) Indicating Lamp E) LT fuse F) Push Button G) Terminal Block H) MCB I) LT PVC Copper Wires J) Timers	III				Any make with VDE or CE or UL or CSA marking or <i>BIS approved with CML no.</i>						Refer Note-3
7	GI Wires & Flats	III				M/s APT Engineering Works M/s Gram Engineering M/s Arun Engg Works Indiana Cable	New Delhi Howrah Mumbai Mumbai	A A A A				

बी एच ई एल 		PROJECT : 3 X 800 MW PATRATU TPS					SUB VENDOR LIST			DATE 10.09.19		
TECHNICAL SPECIFICATION FOR DISTRIIBUTION BOARDS AND LIGHTING PANEL												
Sl. No.	ITEM	QP / INS CAT.	QP No:- 4410- 001- QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB- SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	SC DETAIL SUB SCH	REMARKS	

						Trays Corporation						
						Jamna Metal Company	Delhi	A				
						M.J. Works	New Delhi	A				
						Mettalite Industries	Delhi	A				
						National Galvanising Co	Calcutta	A				
						Press Metal Corporation	Mumbai	A				
						System Encl. Enterprises	Calcutta	A				
8	Junction boxes (Hot dip galvanized)	III	Q-24			JASPER ENGNIREEES PVT. LTD.	Noida	NOTED			Galvanising shall be carried at sources given in note no 2.	
						Electro Controls & Devices	Greater Noida					
						M/s Shrenik & Co.	Ahmedabad					
						M/s PHOENIX MECANO LTD.,	Pune					
						Adroit Control	Faridabad					

		PROJECT : 3 X 800 MW PATRATU TPS TECHNICAL SPECIFICATION FOR DISTRIBUION BOARDS AND LIGHTING PANEL					SUB VENDOR LIST		DATE 10.09.19		
Sl. No.	ITEM	QP / INS CAT.	QP No:- 4410- 001- QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB- SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	SC DETAIL SUB SCH	REMARKS

						Engineers Pvt.Ltd.					
						M/s PHOENIX MECANO LTD., MIKA ENGINEERS (Type-S only)	Pune Mumbai				
						M/s PHOENIX MECANO LTD.,	Pune				
						BAJAJ ELECTRICALS	New Delhi				
						AJMERA INDUSTRIES & ENGG. WORKS	Mumbai				
						S.B. ELECTRICAL ENGINEERING CORPORATION	Mumbai				
						RITTAL INDIA PVT. LTD.	New Delhi				
	Cable gland	III				ALLIED TRADERS & EXPORTERS	Noida	NOTED			

		PROJECT : 3 X 800 MW PATRATU TPS TECHNICAL SPECIFICATION FOR DISTRIBUION BOARDS AND LIGHTING PANEL					SUB VENDOR LIST		DATE 10.09.19		
Sl. No.	ITEM	QP / INS CAT.	QP No:- 4410- 001- QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB- SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	SC DETAIL SUB SCH	REMARKS

9											
						ARUP ENGG & FOUNDRY WORKS	Kolkata				
						BALIGA LIGHTING EQPT.PVT.LTD.	Chennai				
						COMMET BRASS PRODUCTS	Goregaon- Mumbai				
						DOWELLS	Goregaon- Mumbai				
						ELECTROMAC INDUSTRIES	Andhjeri- Mumbai				
						INCAB	Kolkata				
	Cable Lugs / Ferrules	III				Dowell	Mumbai	A			
						Chetna	Nasik	A			
						M/s Billets Elektro Werke Ltd. (3D)	Umbergaon	A			

बी एच ई एल 		PROJECT : 3 X 800 MW PATRATU TPS					SUB VENDOR LIST			DATE 10.09.19		
TECHNICAL SPECIFICATION FOR DISTRIIBUTION BOARDS AND LIGHTING PANEL												
Sl. No.	ITEM	QP / INS CAT.	QP No:- 4410- 001- QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB- SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	SC DETAIL SUB SCH	REMARKS	

10						Any make with VDE or CE or UL or CSA marking or <i>BIS approved with CML no.</i>					Refer note - 3
								Noted			
11	Switchboxes	III				Anchor	Mumbai	NOTED			a)Galvanisation shall be at sources as per note no 3. b) Subject to submission of required documents for fabrication facility and experience details by main contractor.
						Elexpro Electricals	Navsari				
						Bajaj Electricals	New Delhi				
						Ajmera industries & Engg. works	Navi Mumbai				
						S.B electrical Engineering corporation	Mumbai				
12	Hume Pipe	III				BIS licensee					Refer note- 3

NB

Under sub supplier approval status as per NTPC column:

A : Mean that vendor to this item is acceptable to NTPC.

		PROJECT : 3 X 800 MW PATRATU TPS TECHNICAL SPECIFICATION FOR DISTRIBUION BOARDS AND LIGHTING PANEL					SUB VENDOR LIST		DATE 10.09.19		
Sl. No.	ITEM	QP / INS CAT.	QP No:- 4410-001-QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	SC DETAIL SUB SCH	REMARKS

QP/INSPN CATEGORY:

CAT-I : For these items the Quality Plans are approved by NTPC/BHEL and the final acceptance will be on physical inspection witness by NTPC/BHEL.

CAT-II : For these items the Quality Plans approved by NTPC/BHEL. BHEL reserves the right to inspect. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.

CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC/BHEL shall be on the basis certificate of conformance by the main supplier.

@ : Vendor acceptance is subject to Sub QR clearance.

Note 1 : Approval conditions attached to above identified vendors, as applicable shall be adhered to.

Note 2 : List of acceptable galvanisers:

- M/s MJ Engg, Delhi
- M/s Jamna Metal, Delhi
- M/s A.V. Engg, Kolkata
- M/s Inar Profiles, Vishakhapatnam
- M/s Anand Udyog, Mumbai
- M/s Techno Engg, Chandigarh
- M/s Steelite Engg, Mumbai
- M/s National Galvaniser, Kolkata
- M/s Unistar Galvaniser, Kolkata
- M/s B.P. Projects, Kolkata
- M/s Bajaj, Pune
- M/s Electrocure Industries, Mumbai

		PROJECT : 3 X 800 MW PATRATU TPS TECHNICAL SPECIFICATION FOR DISTRIBUION BOARDS AND LIGHTING PANEL					SUB VENDOR LIST		DATE 10.09.19		
Sl. No.	ITEM	QP / INS CAT.	QP No:- 4410- 001- QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB- SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	SC DETAIL SUB SCH	REMARKS

- m) M/s B.G. Shirke, Pune
- n) M/s Gurpreet Galvanisers, Hyderabad
- o) M/s Sigma, Mumbai
- p) M/s Radhakrishnan Shetty, Chennai
- q) Karamtara , Mumbai
- r) Poona Galvanisers, Pune
- s) Neha Galvaniser, Kolkata
- t) Unitech Galvanisers, Hoogly
- u) Gurpreet Galvanisers, Hyderabad
- v) **DMP Projects, Kolkata**

Additional galvanisers, if any, proposed by manufacturer through main contractor during detailed engineering shall be reviewed and assessed by NTPC as per merits of the case.

Note-3- VDE / CE / UL / CSA MARKING FOR PRODUCT QUALITY: CERTIFICATION PREFERABLY FROM THIRD PARTY AGENCY OR BIS APPROVAL LETTER WITH CML NO. FOR PRODUCT QUALITY SHALL BE SUBMITTED FOR NTPC's VERIFICATION/ INFORMATION, PRIOR TO FIRST SUBMISSION/ During submission of QP.



**TECHNICAL SPECIFICATION FOR
LIGHTING/WELDING DISTRIBUTION
BOARDS & LIGHTING PANELS**

3 x 800 MW PATRATU STP

SPECIFICATION NO. PE-TS-434-558-E005

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DATA SHEET -C

S. No.	Description	Unit	Value
1.0	SYSTEM DESIGN DATA		
1.1	Design ambient	⁰ C	
1.2	AC Supply		
a)	Rated voltage	V	
b)	Rated frequency	Hz	
c)	Voltage variation (permissible)	%	
d)	Frequency variation (permissible)	%	
e)	Combined voltage & frequency variation (sum of absolutes permissible)	%	
f)	System fault level & duration	kA, sec.	
1.3	DC Supply		
a)	Rated voltage	V	
b)	Voltage variation (permissible)	%	
c)	System fault level & duration	kA, sec.	
2.0	APPLICABLE STANDARDS IS 60947 Low voltage switchgear and controlgear IS 11171 Dry type transformers IS 13703 Low voltage fuses for voltages not exceeding 1000V AC or 1500 V IS 10118 Code of practice for selection, installation and maintenance of switchgear and controlgear IS 60898 Electrical Accessories - circuit breakers for over protection for household and similar installations IS 1901 Visual indicator lamps IS 60079 Explosive atmospheres IS 5572 Classification of hazardous areas (other than mines) having flammable gases and vapours for electrical installation IS:2551 Danger notice plates		



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3.0	LIGHTING/ WELDING DISTRIBUTION BOARDS		
3.1	Operational Front		
3.2	Type of execution of modules (functional unit)		
3.3	Type of sheet steel		
3.4	Sheet metal thickness (minimum)		
a)	Non-load bearing covers	mm	
b)	Non-load bearing partitions	mm	
c)	Load bearing members	mm	
d)	Frames	mm	
e)	Door	mm	
f)	Withdrawable unit (if applicable)	mm	
3.5	Cable alley width (minimum)	mm	
3.6	Bus bar material		
3.7	Earth bus bar material		
3.8	Degree of Protection		
a)	Main Panel		
b)	Transformer cubicle		
3.9	Gland plate thickness	mm	
3.10	AC LDB/ WDB		
a)	No. of Incomers		
b)	Bus coupler required		
c)	Incomer and Bus coupler rating	A	
d)	Type of Incomer and Bus coupler		
e)	Type of Outgoing Feeders		
f)	Outgoing feeders rating	A	
g)	Cable entry		



**TECHNICAL SPECIFICATION FOR
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3.11	Lighting Transformer		
a)	Rating	kVA	
b)	Type of cooling		
c)	Voltage ratio	V	
d)	Rated frequency	Hz	
e)	No. of phases		
f)	Vector group		
g)	Off circuit taps		
	Tap range, steps	%	
	Voltage of each tap	V	
h)	Impedance at rated current, frequency at 75 °C	%	
i)	Rated current		
	Primary	A	
	Secondary	A	
j)	Transformer type		
k)	Transformer winding insulation		
l)	Transformer winding insulation temperature rise limit		
n)	Type of ventilation arrangement provided for transformer enclosure		
o)	Winding conductor material		
p)	Iron loss at 50 Hz and 100% rated voltage	kW	
q)	Copper loss at rated load at 75 °C	kW	
r)	Regulation at full load at 75 °C and 0.8 p.f. lagging		
s)	Weight	kg	



**TECHNICAL SPECIFICATION FOR
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3.12	DC LDB		
a)	No. of Incomers		
b)	DC incomer Type		
c)	DC incomer rating	A	
d)	AC incomer type		
e)	AC incomer rating	A	
f)	Bus coupler required		
g)	Incomer and Bus coupler rating	A	
h)	Type of Incomer and Bus coupler		
i)	Type of Outgoing Feeders		
j)	Outgoing Feeders rating	A	
k)	Changeover required in DC LDB		
l)	Provision of Manual override		
m)	Cable Entry		
4.0			
4.1	Application		
4.2	Type of sheet steel		
4.3	Sheet metal thickness (minimum)		
3.4	Degree of Protection		
a)	Indoor panel		
b)	Outdoor panel		
c)	Canopy in outdoor panel		
4.5	Bus bar material		
4.6	Earth bus bar required		
4.7	Earth bus bar material (if applicable)		
4.8	Gland Plate	mm	
4.9	Earthing studs required		
4.10	Hinged door with locking facility		



**TECHNICAL SPECIFICATION FOR
LIGHTING/WELDING DISTRIBUTION
BOARDS & LIGHTING PANELS**

3 x 800 MW PATRATU STP

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4.11	AC Lighting Panel		
a)	Incomer rating	A	
b)	Type of Incomer		
c)	Earth Leakage Circuit Breaker (ELCB) in incomer required		
d)	Type of Outgoing Feeders (non-flameproof panel)		
e)	Type of Outgoing Feeders (Flameproof panel)		
f)	Type of Outgoing Feeders (Street Light panel)		
g)	ESS required for indoor panel		
h)	ESS required for outdoor panel		
i)	Timer required Street Light panel/ High mast feeder pillar		
j)	Photocell required for Street Light panel/ High mast feeder pillar		
k)	Outgoing feeders rating	A	
4.12	DC Lighting Panel		
a)	Incomer rating	A	
b)	Type of Incomer		
c)	Type of Outgoing Feeders (non-flameproof panel)		
d)	Type of Outgoing Feeders (Flameproof panel)		
e)	Outgoing feeders rating	A	
5.0	COMPONENTS OF LIGHTING SYSTEM EQUIPMENT		
5.1	Moulded Case Circuit Breaker (MCCB)		
a)	Rated voltage	V	
b)	Number of poles		
c)	Rated short circuit duty	kA	



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d)	Rated breaking capacity (rms)	kA	
e)	Rated making current (peak)	kA	
f)	Release with short circuit		
g)	Release with overload		
h)	Release with under voltage		
i)	Auxiliary contacts		
	Numbers	NO+NC	
	Rating	A	
5.2	Switch-Fuse Unit		
a)	Utilisation category for main contacts		
5.3	Miniature Circuit Breaker		
a)	SPN MCB rating (min)	A	
b)	DP MCB rating (min)	A	
c)	TPN MCB rating (min)	A	
d)	Short time rating	kA	
e)	Magnetic short circuit protection required		
f)	Thermal overload protection required		
5.4	Current Transformer		
a)	Type		
b)	Secondary current rating	A	
c)	Burden	VA	
d)	Accuracy class		
e)	Instrument Safety Factor		
5.5	Voltage Transformer		
a)	Type		
b)	Secondary terminal voltage (phase-phase)	V	
c)	Burden	VA	



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d)	Accuracy class		
e)	Winding configuration		
f)	System grounding		
5.6	Indicating Meters		
5.6.1	Ammeter		
a)	Type		
b)	Shape		
c)	Size		
d)	Accuracy		
e)	Current coil rating	A	
f)	Angle of deflection	deg	
5.6.2	Voltmeter		
a)	Type		
b)	Shape		
c)	Size		
d)	Accuracy		
e)	AC voltage coil rating	V	
f)	DC voltage coil rating	V	
g)	Angle of deflection	deg	
5.6.3	Energy meter (if applicable)		
a)	Type		
b)	Accuracy		
c)	Current coil rating	A	
d)	Voltage coil rating	V	
5.7	Power Contactors		
a)	Coil voltage (nominal)		
	AC contactors	V	
	DC contactors	V	



**TECHNICAL SPECIFICATION FOR
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b)	Current rating of contacts		
	Power	A	
	Control	A	
5.8	Under voltage relay		
a)	Type		
b)	Coil voltage rating	V	
c)	Means for in-built testing provided		
5.9	Timer		
5.9.1	Time switch		
a)	Type		
b)	Range	hr	
c)	Coil voltage rating	V	
5.9.2	Timer for AC-DC changeover		
a)	No. of contacts		
	ON time delay	NO+NC	
	OFF time delay	NO+NC	
	Instantaneous	NO+NC	
b)	Coil voltage rating		
	AC timer	V	
	DC timer	V	
c)	Time delay range		
	AC timer	sec	
	DC timer	Sec	
5.10	Selector switch		
a)	Type of selector switch		
b)	Lockable		



**TECHNICAL SPECIFICATION FOR
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5.11	Push Button		
a)	Voltage grade	V	
b)	Potential free contacts		
5.12	Indicating Lamps		
a)	Lens Colour		
	ON condition		
	OFF condition		
b)	Circuit voltage	V	
5.13	Cable Glands		
a)	Type		
b)	Material		
c)	Nickel Plating provided		
d)	Flameproof glands with flameproof equipment		
5.14	Cable Lugs		
a)	Type		
b)	Material		
6.0	PAINTING		
6.1	Paint shade		
a)	LDBs		
b)	LPs		
6.2	Paint Finish		
a)	Interior		
b)	Exterior		
6.3	Paint Thickness	Microns	



**TECHNICAL SPECIFICATION FOR
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PANELS**

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SECTION – II

STANDARD TECHNICAL REQUIREMENTS



TECHNICAL SPECIFICATION FOR DISTRIBUTION BOARDS & LIGHTING PANELS

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1.0 INTENT OF SPECIFICATION

- 1.1 The requirements given in specification shall be fully complied with.
- 1.2 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.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship, and shall be capable of performing required function in a manner acceptable to Purchaser, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgement is not in full accordance herewith.
- 1.4 Make of all equipment and components shall be to the approval of Purchaser.

2.0 CODES & STANDARDS

- 2.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.
- 2.2 The material, construction, manufacture, inspection and testing shall conform to the latest revisions of standards as specified in Data Sheet A.
- 2.3 In case of conflict between the applicable reference standard and this specification, stringent requirement shall govern.

3.0 DESIGN REQUIREMENTS

3.1 LIGHTING DISTRIBUTION BOARD (LDB) / WELDING DISTRIBUTION BOARD (WDB)

3.1.1 General Requirements of LDBs/ WDBs

- a) LDB/WDB shall be totally enclosed, modular in construction, indoor type and suitable for electrical system data as specified in Data Sheet-A. The LDB/ WDB shall be free standing type suitable for installation on cable trenches / floor.
- b) LDB/ WDB shall consist of dust and vermin proof cubicles without the use of louvers (except the transformer compartment, where applicable).
- c) Good quality synthetic rubber / neoprene gaskets shall be put around the door, cover edges and cut-out edges for push button, lamps etc. for protection against dust. The door when closed, shall compress the gasket uniformly.



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- d) Cut-out 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/ WDB reasonably dust free such that the normal operations are not affected.
- e) The LDB/ WDB shall be designed to prevent contact with live parts both within the modules and in the cable alley.
- f) The bidder shall be responsible to check and coordinate the MCB characteristic with back up fuses etc. provided.
- g) All equipment shall be constructed of non-hygroscopic and non-inflammable materials.
- h) All components mounted in the LDB/ WDB 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 other than the affected unit itself. Maintenance and inspection shall be possible in any individual unit without affecting other units.
- i) Incoming unit shall comprise of either switch-fuse/ composite switch-fuse unit or MCCB as per Data Sheet A. Outgoing units shall be either switch-fuse/ composite switch-fuse unit or MCCB as per data Sheet A.
- j) 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.
- k) 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.
- l) Each LDB/ WDB shall be fitted with base frame made of angle or channel.
- m) All fixing nuts and bolts together with grounding bolts shall be provided.
- n) Lifting lugs shall be provided for each shipping section of LDB/ WDB. Removal of such lugs or hooks shall leave no opening in the LDB/ WDB.

3.1.2 LDB/ WDB with transformers (Additional Features)

- a) The LDB/ WDB shall be arranged in two adjacent but separate compartments, one compartment for the lighting transformer and the other for the incoming & outgoing feeders etc.
- b) 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/ WDB.



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- c) 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.
- d) 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.
- e) Connections between transformer secondary terminals and the busbars shall be made by using PVC insulated flexible copper cables or busbars.
- f) Warning plate shall be provided on transformer enclosure. The inscription of warning plate shall be as given below:
 - DO NOT OPEN DOORS WHEN ENERGISED
 - KEEP TAPS AT SAME POSITION FOR ALL PHASES
- g) Transformer enclosure shall be provided with a danger plate.

3.1.3 Lighting Transformer/ Welding Transformer

- a) Transformer, where specified, shall form an integral part of LDB/ WDB.
- b) Lighting transformer shall be dry type, natural air cooled and suitable for mounting inside the lighting distribution board. Transformer particulars shall be as specified in Data Sheet A.
- c) Rating of transformer shall be as per BOQ.
- d) Winding shall be of copper material and maximum winding temperature at full load and under site conditions shall not exceed 120 °C.
- e) Transformer shall be suitable for cable connections on the primary side and flexible cable or busbar connection on the secondary side.
- f) The secondary neutral of the transformer shall be brought out for getting a grounded 4 wire supply system.
- g) The transformer neutral shall be brought outside the LDB/ WDB for earthing. The neutral bus bar shall be insulated from the LDB/ WDB enclosure.
- h) Transformers shall be provided with the rollers, pulling holes, lifting lugs, jacking positions etc.

3.1.4 Busbars, Connections and Joints

- a) Busbars shall be supported on non-hygroscopic and non-inflammable insulators of material such as glass reinforced moulded plastic material, epoxy cast resin



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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.

- b) Busbars shall be contained in a separate vermin-proof compartment within the LDB/ WDB and shall have bolted sheet steel covers for providing suitable access.
- c) Busbar clearances in the air shall be as per applicable standard for 415V, 3 phase system.
- d) Temperature for busbars, droppers and connections shall not exceed 90 deg.C for an ambient of 50 deg.C while carrying maximum continuous current.
- e) 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.
- f) 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.
- g) The neutral bus shall be rated same as phase bus.
- h) 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.
- i) Busbars and connections shall be provided with colour coded PVC sleeves. All live parts shall be properly shrouded with insulating material.
- j) Earth busbar shall be provided separately.
- k) Busbar Joints
 - Busbar and tap off joints shall be bolted type.
 - Busbars shall be thoroughly cleaned before jointing. Suitable contact grease shall be applied to remove oxide film just before jointing.
 - For copper busbars, the connecting portion shall be tinned or silver plated.

3.1.5 Wiring and Terminals

- a) 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.
- b) Wiring shall be made by 1100 volt grade three / seven strand PVC insulated copper wire having a cross-sectional area of not less than 1.5 sq.mm. All



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connections from CT leads upto instruments, terminals shall be made by copper wires of minimum 2.5 sq.mm size.

c) All wiring shall be made with the Colour Codes specified below :

i) 3 phase AC Connections

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

ii) 1 phase AC Connections

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

iii) DC Connections

Positive	White
Negative	Grey

iv) Earth Connection Green

d) 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.

e) 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.

f) System of marking of wiring shall be as per applicable standard.

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

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

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

j) 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.

3.1.6 Cable Terminations



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- a) All cables, either incoming or outgoing to the LDB/ WDB, 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.
- b) 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 as per Data Sheet-A. The gland plate shall be of adequate size for connecting requisite number of cable glands for power and control cables.
- c) Heavy duty bolt-on termination tinned copper lugs of compression type shall be used for power cable termination. The tinned copper cable lugs for all incoming and outgoing power cables shall be supplied by the vendor.
- d) For supporting and clamping of cable cores at regular interval in cable alleys, suitable slotted angle upto the respective terminal blocks shall be provided.

3.1.7 Earthing

- a) An earth busbar of adequate size of shall be provided at the bottom for the entire length of the LDB/ WDB. Material of earth busbar shall be GI unless mentioned otherwise in Data Sheet A.
- b) 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.
- c) Doors shall have a flexible copper wire for earth connection to fixed unit.
- d) Each LDB/ WDB shall be fitted with two earthing studs located in accessible position on sides for connection of internal earth busbar to the external earthing connection.
- e) Earth busbar shall be brought outside LDB/ WDB for making external connections.

3.1.8 Types of LDB/ WDB

- a) The LDB/ WDB shall be of following type:
 - LDB/ WDB-H (n) - AC LDB/ WDB with 100 kVA transformer
 - LDB/ WDB-F (n) - AC LDB/ WDB with 50 kVA transformer
 - LDB/ WDB-N (n) - AC LDB/ WDB with no transformer
 - LDB-D (n) - DC LDB

NOTE: (n) indicates number of outgoing feeders.

- b) AC LDB/ WDB (LDB/ WDB-H, LDB/ WDB-F, LDB/ WDB-N)



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Each LDB/ WDB shall comprise of the following and comply with Data Sheet A :

- i. One lighting/welding transformer (LDB/WDB-H & LDB/WDB-F).
- ii. Incomer(s) 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/WDB type LDB/WDB-H & LDB/WDB-F.
- iii. Set of busbars with 3 phase and neutral.
- iv. TPN switchfuse units or MCBs for each outgoing circuit.
- v. Three indicating lamps with fuses for indicating bus supply ON.
- vi. CT operated ammeter with selector switch.
- vii. VT operated voltmeter with selector switch.
- viii. Power & control terminals, earth-stud, earth busbar, designation labels, internal wiring, power cable lugs, glands etc. shall be provided to complete the LDB/ WDB in all respects.

c) DC LDB (LDB-D)

Each LDB shall comprise of following and comply with enclosed Data Sheet A :

- i. Incomer & Outgoing feeders shall be as per Datasheet-A.
- ii. Two pole DC contactor on the incoming circuit for changeover to DC in case of AC normal supply failure.
- iii. One under voltage relay of suitable range, if required.
- iv. One ON delay timer.
- v. One test push button.
- vi. Set of busbars for positive and negative.
- vii. Two indicating lamps with fuses for indicating bus supply ON.
- viii. 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.

3.2 LIGHTING PANELS (LPs)



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3.2.1 General Requirements of Lighting Panels

- a) 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.
- b) Panels shall be suitable for indoor / outdoor application as per Data Sheet A.
- c) 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.
- d) LPs shall consist of dust and vermin proof cubicles without the use of louvers.
- e) Good quality synthetic rubber / neoprene gaskets shall be put around the door. The door when closed, shall compress the gasket uniformly.
- f) The LPs shall be designed to prevent contact with live parts when the front door is open.
- g) All busbars (phase, neutral, positive, negative as applicable) within a panel shall be of the same size.
- h) 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.
- i) The rated continuous current of the equipment and components shall be as given in Datasheet-A. These ratings shall be obtained with the components mounted in their housing as in service without exceeding the permissible temperature rise.
- j) Each LP shall be fitted with M.S. mounting brackets.
- k) 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 as per Data Sheet-A. The gland plate shall be of adequate size having knock-outs for requisite number cable connections. Gland plate shall be provided with gasket.
- l) The lighting panel shall be complete with copper busbars, and shall incorporate incomer and outgoing circuits as per Data Sheet-A. Number of outgoing circuits shall be as per BOQ.
- m) Each lighting panel shall be fitted with two GI earth studs located in accessible position on the outside of the panel on opposite sides.
- n) All metal parts of the panel except current carrying parts shall be bonded together electrically to the earthing stud.



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- o) 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.
- p) The supply of cable lugs for power and control cable connections forms part of the supply of equipment.
- q) Each panel shall be provided with a circuit directory plate with inscriptions neatly typed and laminated, fitted on the inside of door.

3.2.2 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.

3.2.3 AC Lighting Panel (LP-A)

- a) LPs shall be provided with incomer and requisite number of outgoing circuits as per Data Sheet-A. Number of outgoing circuits shall be as per BOQ.
- b) Separate neutral shall be available at terminal block for each outgoing circuit.
- c) Construction of AC Normal and AC Emergency panels shall be same.

3.2.4 DC Lighting Panels (LP-D)

- a) LPs shall be provided with incomer and requisite number of outgoing circuits as per Data Sheet-A. Number of outgoing circuits shall be as per BOQ.

3.2.5 Decorative Type Lighting Panels (LP-A)

- a) Decorative lighting panels shall be designed for use in areas like administrative building, service building, canteen, residential premises etc.
- b) Thickness of sheet steel shall be as per manufacturer's practice.
- c) LPs shall be of tone colour with elegant finish.
- d) LPs shall be provided with incomer and requisite number of outgoing circuits as per Data Sheet-A. Number of outgoing circuits shall be as per BOQ.
- e) LPs shall be suitable for either surface or flush mounting. Flush mounted panels shall have the collared door suitable for matching with the wall.



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- f) Lighting Panels may be provided with transparent acrylic cover for operation of MCBs.
- g) LPs shall be provided with knockouts on the top, bottom and sides.

3.2.6 Street Lighting Panel (LP-S)

- a) Street Lighting Panels shall be provided for feeding power supply to luminaires of street light poles, flood lighting poles, lighting masts, watch towers etc.
- b) Each Street Lighting Panel shall comprise of the following :
 - i. One TPN door interlocked switch-fuse unit incomer. Interlock defeat feature shall also be provided.
 - ii. Three pole AC Contactor
 - iii. 0 - 24 hrs timer and/or photo-electric switch for automatic switching of contactor
 - iv. Three phase & neutral busbars
 - v. Single pole or three pole MCBs for each outgoing circuit as per Data Sheet A
 - vi. Two lamps for bus supply ON & OFF indications
 - vii. Complete wiring arrangement as per control scheme.
 - viii. Auto-Manual selector switch
 - ix. ON push button
 - x. OFF push button
- c) Switching ON and switching OFF shall be through both 0 - 24 hrs timer and light sensor in automatic mode.
- d) One number light sensor in weather proof enclosure having IP:55 degree of protection shall be supplied loose along with each SLP.
- e) 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.
- f) Two nos. outgoing circuit in each panel shall be tapped before contactor for watch tower supply.



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4.0 COMPONENTS OF LDB/WDB AND LIGHTING PANEL

4.1 MOULDED CASE CIRCUIT BREAKERS

- a) Moulded case circuit breakers (MCCBs) shall be provided when called for in Data Sheet A for use in lieu of switch fuse. MCCB shall meet the requirements stipulated in Data Sheet A.
- b) MCCBs in AC circuits shall be of single throw, air break, heavy duty type 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 LDB/ WDB without transformers.
- c) Operating mechanism shall be quick make, quick break and trip free type.
- d) 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/ WDB.
- e) 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.
- f) MCCB terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.
- g) Under voltage releases and other releases shall be provided as specified in data Sheet-A.

4.2 SWITCH-FUSE UNITS

- a) 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.
- b) These units shall be provided for general purpose i.e. incoming or outgoing units.
- c) The units shall be of the air break air insulated type and designed to ensure safety to operating personnel.
- d) 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.
- e) 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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- f) The fixed contact shall be so shrouded that maintenance of the unit can be carried out in safety with the busbars live.
- g) 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.
- h) Composite switch-fuse or the combination of switch and fuse shall meet the requirements of its components as follows:

Isolating Switch

- i. Switches shall be air-break, quick make, and quick break heavy duty type conforming to applicable standard.
- ii. All switches shall have visible ON / OFF position indication and shall be padlockable in any (ON / OFF) position.
- iii. 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.
- iv. The switches shall be suitable for independent manual operation.
- v. The switch contacts shall be of silver alloy or silver plated copper and springs of non-corrosive material.
- vi. 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.

High Rupturing Capacity (HRC) Fuses

- i. 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.
- ii. 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.
- iii. Fuses shall preferably be fitted with a device to indicate operation (i.e. when the fuse has blown).
- iv. 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



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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.

- v. Fuse carriers and bases shall be of good quality moulded insulating material. Porcelain fuse bases and carriers will not be accepted.
- vi. The rating and characteristics of fuse links shall be chosen appropriately for short circuit protection of circuits downstream.

4.3 MINIATURE CIRCUIT BREAKERS

- a) 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.
- b) MCBs shall have suitable rating as specified in Data Sheet A.
- c) 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.
- d) The terminals of MCB and ON/OFF positions shall be clearly and indelibly marked.

4.4 CURRENT TRANSFORMERS

- a) 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.
- b) The short time current duration for CTs shall be one second.
- c) CT primary current shall not be less than the full load thermal rating of the associated circuit. CT secondary current shall be as specified 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.
- d) CTs shall be of bar primary / wound primary / ring type capable of carrying the rated primary current.

4.5 VOLTAGE TRANSFORMER

- a) 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.
- b) VT secondary windings shall be earthed in LDB/ WDB / LP through link, which can be removed for insulation testing.
- c) Three phase voltage transformers shall be as per Data Sheet A.



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Single phase VTs shall have voltage rating of (Nominal System Voltage / $\sqrt{3}$) V / (110 / $\sqrt{3}$) V so that secondary voltage shall be 110 volts phase to phase when the secondary winding is star connected.

- d) VTs shall have an output rating adequate to cater to the burden connected to them.

4.6 INDICATING METERS

- a) Meters shall be panel mounted, flush type and suitable for rear terminal connection.
- b) 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.
- c) 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.
- d) All the divisions and the quantity to be measured shall be clearly marked. Instruments shall conform to applicable standard 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.
- e) Instruments having metallic cases shall be fitted with earthing terminals.

4.7 CONTACTORS

- a) Contactors shall be of the air break type, electromagnetic type fitted with arc shields.
- b) 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'.
- c) Electrically independent auxiliary contacts not less than 2NO + 2NC for interlocking and indication shall be fitted to individual power contactor.
- d) All springs shall be made out of a corrosion proof material.

4.8 RELAYS

- a) 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.
- b) 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



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provided for a particular relay, separate suitable test block shall be provided on the board for this purpose.

- c) Relay performance shall not alter due to mechanical shock or vibration or external magnetic field which may be present at the place of mounting.
- d) Each relay shall not have less than two independent pairs of contacts.

4.9 TIMERS

4.9.1 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.
- 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.

4.9.2 On/Off 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 as mentioned in Data Sheet A.
- e) Timer shall be suitable for mounting inside the panel.

4.10 SELECTOR SWITCHES

- a) 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



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- b) Selector switches shall be stay put type, provided with properly designated escutcheon plates clearly marked to show operating position.
- c) Terminals carrying potential above 120 Volts shall be shrouded to prevent accidental contact with personnel.
- d) Ammeter selector switches shall have make before break contacts.
- e) 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.
- f) 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.

4.11 PUSH BUTTONS

- a) Push button shall be heavy duty, flush mounted suitable for the application.
- b) Push button shall be provided with integral escutcheon plates marked with its function identified as per schemes.
- c) Colour shall be appropriate to the function.
- d) Minimum number of contacts shall be 2 NO + 2 NC or as per the requirements of control scheme.

4.12 INDICATION LAMPS

- a) Indication lamps shall be complete with lens covers and holders.
- b) Each lamp shall be fitted with a durable resistance integrally wired in series with the lamp. Alternatively, lamps with built in transformers are acceptable.
- c) The lamp cover (lens) shall be translucent of appropriate colour.
- d) Bulbs and covers shall be interchangeable, easily replaceable from the front without the need for any special means.
- e) Terminals having potential above 120V shall be shrouded to prevent contact with personnel.
- f) Terminals shall be suitable for ring type copper cable lugs of size depending upon the circuit rating.

4.13 CABLE GLANDS

- a) Whether specifically mentioned or not, cable glands of suitable sizes shall be supplied along with each equipment for power and control cables.
- b) Rubber components used in the gland shall be of neoprene.



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

4.14 CABLE LUGS

- a) All equipment shall be supplied with the power and control cable lugs of suitable size, whether specifically mentioned or not.
- b) Name / trade name and size of lug shall be engraved/ indelibly printed on each cable lug.

4.15 TERMINALS

- a) Terminals shall be stud type of copper material.
- b) Terminals shall be provided with transparent cover(s).
- c) Separate terminals shall be available for each termination of loop-in and loop-out power connections.

5.0 LABELING

- 5.1 Labels to identify all the Main assemblies, Sub-assemblies and components of the LDB/ WDB and LPs shall be provided.
- 5.2 Name and rating plate / marking shall be provided as required by relevant standard applicable to each component / assembly to be identified.
- 5.3 Labels shall be of two colour, three layer plastic material with matt or semi matt finish or of the anodised aluminium sheet.
- 5.4 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.
- 5.5 All labels shall be securely fixed on to the equipment by means of self tapping screws or other approved means.
- 5.6 Stick-on type labels of good quality and permanent mounting shall be acceptable for internally mounted components only.
- 5.7 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/ WDB number for LDB/ WDB.

Designation and LP number for LPs.



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ii. **Location :**

Top centre in the front of the LDB/ WDB.

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

5.8 CIRCUIT DIAGRAM / DIRECTORY PLATE

- a) 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.
- b) The circuit list shall be typed or printed stating the location of the equipment served, rating of the protective unit and the circuit loadings.
- c) 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.

6.0 SURFACE TREATMENT

- 6.1 All metal parts and the surfaces (exterior & interior) of equipment, unless stated otherwise in case of reflectors, shall be degreased by dipping in hot alkaline solution and rubbed with wire brush to remove oil & scale from them & then rinsed in water. Alternatively, they may be shot / sand blasted.
- 6.2 Parts shall be pickled by dipping in hydrochloric acid tank to remove the rust from the surfaces formed during storage of sheets & then rinsed to remove traces of the acid. The cleaning and pretreatment of all metal parts shall be as per applicable standard.
- 6.3 The surfaces to be painted shall then be prepared by phosphatizing to protect them from further rusting & to create a good bond with the paint. The pretreatment shall conform to the applicable standard.



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- 6.4 All parts shall then be subjected to a coat of red oxide primer paint.
- 6.5 All inside and outside surfaces of panel shall be spray painted with synthetic enamel of the shade and minimum thickness as per Data Sheet A.
- 6.6 Electrostatic or powder painting shall be acceptable subject to purchaser's approval.
- 6.7 Wherever possible, finished parts shall be coated with peelable compound by spraying method to protect the finished product from scratches, grease, dirty and oily spots during handling and transportation.

7.0 PACKING

7.1 Packing procedure shall conform to the following :

- a) The equipment shall be properly packed before dispatch. The packing shall prevent damage to the contents while handling and lengthy period of outdoor storage.
- b) The equipment shall be wrapped in weather proof packing using polythene sheets/ air bubble sheets/ thermocol sheets and then secured in wooden packing cases. Wood for wooden packing cases/ crates shall be chemically treated to prevent deterioration due to fungi and attack by termites, borers, and any other kind of infection.
- c) The equipment shall be secured by fixing base plate/ frame with the help of bolt and nuts etc. to bottom frame of the wooden packing cases/ crates. Suitable cushioning material like rubberised coir (min. 50 mm thick & 100 mm wide) shall be provided on the bottom support. Gap between the panel and casing shall be filled with rubberised coir with distance between consecutive supports less than 500mm.

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

8.0 INSPECTION & TESTING

- 8.1 Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-558-E005) without any deviations. At contract stage, the successful bidder shall submit the same QP for BHEL/ ultimate customer's approval. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ ultimate customer's approval. There shall be no commercial implication to BHEL on account of any changes in QP during contract stage.
- 8.2 All the components and completely assembled equipment shall be tested as per the latest edition of standards. Charges for these tests shall be deemed to be included in equipment price.



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- 8.3 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.
- 8.4 Functional testing shall be carried out for Lighting/Welding Distribution Boards/ Lighting Panels.
- 8.5 All manufacturing processes viz. machining, sheet forming, electroplating, wire routing, cleating & crimping, assembly, surface preparation shall conform to good manufacturing practices.
- 8.6 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.
- 8.7 Safety interlocking verification shall be done.
- 8.8 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.
- 8.9 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.
- 9.0 TOOLS AND TACKLE**
- 9.1 Tools & tackle which are essential to facilitate assembly, adjustments, erection, maintenance & dismantling of equipment shall be provided as part of equipment supplied.
- 9.2 The above tools shall be supplied along with the initial consignment of equipment so as to be available prior to erection but may not be used for erection purposes.
- 9.3 Vendor shall also submit a list of recommended tools and tackle. Acceptance of these tools and tackle shall not be a binding on the purchaser.
- 9.4 Schedule of tools & tackle shall be filled up by bidder.



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10.0 SPARES

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

10.2 Erection & commissioning spares are included in the bidder's scope of supply. Bidder to furnish list of E&C spares in the relevant schedules of the Bid Form and Price Schedules.

SL. NO.		COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
						M	C/N				M	C	N	
1		2	3	4	5	6		7	8	9	D*	**	10	11
1	Lighting Panels & Lighting Distribution Boards Final Inspection and Testing	a) Overall Dimensions	MA	Meas.	100%	One Panel/Type/lot		NTPC/Main supplier Appd. Drg / data sheet	NTPC/Main supplier Appd. Drg / data sheet	Inspt. Report		P	W	W
		b) Thickness of sheet	MA	Meas.	100%	--DO--		--DO--	--DO--	--DO--		P	W	W
		c) Paint shade	MA	Visual	100%	--DO--		--DO--	--DO--	--DO--		P	W	W
		d) Thickness of paint	MA	Meas	100% of items	Min. 5 points/ Panel		--DO--	--DO--	--DO--		P	W	W
		e) Surface finish	MA	Visual	100%	--DO--		Smooth, without lump	Smooth, without lump	--DO--		P	W	W
		f) Adhesion Test	MA	Mech.	One sample/lot/size	One sample lot		Should not peel off	Should not peel off	--DO--		P	W	W
		g) Name Plate	MA	Visual	100%	10% of each type		NTPC/Main supplier Appd drg/ data sheet	NTPC/Main supplier Appd drg/ data sheet	--DO--		P	W	W
		h) Tightness of bus bar bolts	MA	Mech	100%	One Panel/Type/lot		Manufacturer Std.	Manufacturer Std.	--DO--		P	W	W
		i) Bus Bar Clearance	MA	Meas.	100%	--DO--		NTPC/Main supplier Appd drg /data sheet	NTPC/Main supplier Appd drg /data sheet	--DO--		P	W	W

LEGEND: RECORDS IDENTIFIED IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY THE CONTRACTOR IN QA DOCUMENTATION

** M: MANUFACTURER/SUB-SUPPLIER, C: CONTRACTOR/NOMINATED INSPECTION AGENCY (SUBJECT TO PRIOR APPROVAL OF NTPC). N: NTPC, INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE

"CHP" BY NTPC SHALL BE IDENTIFIED IN COLUMN "N" AS "W".

SL. NO.		COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REVIEWED BY	APPROVED BY
1		2	3	4	5	M C/N	6	7	8	9	10	11
		j) GA& Bill of material	CR	Phy.	100%	10% of each type	--DO--	--DO--	--DO--	P W W		
		k) Identification of Component lay out	MA	Visual	100%	One Panel/ type/lot	--DO--	--DO--	--DO--	P W W		
		l) Completeness of										
		i) Wiring	MA	Elect.	100%	--DO--	--DO--	--DO--	--DO--	P W W		
		ii) Ferruling	MA	Visual	100%	--DO--	--DO--	--DO--	--DO--	P W W		
		m) Size of wires	MA	Meas.	100%	--DO--	--DO--	--DO--	--DO--	P W W		
		n) Colour coding of bus bar	MA	Visual	100%	--DO--	--DO--	--DO--	--DO--	P W W		
		o) Spare terminals	MA	Meas.	100%	--DO--	--DO--	--DO--	--DO--	P W W		
		p) Shrouding of live parts	MA	Visual	100%	--DO--	--DO--	--DO--	--DO--	P W W		
		q) Door earthing	MA	Megger	100%	--DO--	--DO--	--DO--	--DO--	P W W		
		r) Functional Tests including HV, IR & continuity	CR	Elec.	100%	10%	--DO--	--DO--	--DO--	P W W		
		s) Degree of protection (Paper insertion method)	CR	Phy.	100%	One Panel/ type/lot	NTPC/Main supplier Appd drg./data sheet	NTPC/Main supplier Appd drg./data sheet	--DO--	P W W		

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"CHP" BY NTPC SHALL BE IDENTIFIED IN COLUMN "N" AS "W".



ITEM : (MATERIAL, CLASS, GRADE, RATING,
SIZE ETC.):
LIGHTING PANEL & LIGHTING
DISTRIBUTION BOARDS

STANDARD QUALITY PLAN

Q.P. No. : 0000-999-QOE-S-034

REV. : 01 DTD: 15/03/04

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VALID UPTO :14.03.07

REVIEWED BY

S.D. SINGH

O.P. NIRANJAN

I. J. SINGH

APPROVED BY

ANIL KUMAR

ANIL KUMAR

ANIL KUMAR

ANNEXURE 1 TO SQP NO. 0000 - 999 - QOE - S - 034 REV 01

Sl. No	Item	Make	NOTE : Makes of major BOIs will be subject to NTPC approval / acceptance
1	Indicating Meters		
2	Indicating lamp		
3	Current Transformer		
4	Potential Transformer		
5	Dry Type Transformer		
6	Timer		
7	MCB		
8	On-Off Switch		
9	Fuse		
10	Push Button		
11	Contactor		
12	Terminal Block		
13	Wires		

LEGEND: RECORDS IDENTIFIED IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY THE CONTRACTOR IN QA DOCUMENTATION

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"CHP" BY NTPC SHALL BE IDENTIFIED IN COLUMN "N" AS "W".