भारत सरकार, रेल मंत्रालय

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

कर्षण संस्थापन निदेशालय
TRACTION INSTALLATION DIRECTORATE

TECHNICAL SPECIFICATION FOR LOW TENSION DISTRIBUTION PANELS FOR TRACTION SUBSTATION, SUB-SECTIONING & PARALLELING POST, SECTIONING & PARALLELING POST

SPECIFICTION NO: TI/SPC/PSI/LTDPNL/0300

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Technical Specification for Low Tension Distribution Panels for Traction Substations (TSS) of 25KV and 2X25KV and Sub-Sectioning & paralleling Post (SSP) and Sectioning & Paralleling Post (SP) of 2x25KV

SPECIFICATION NUMBER: TI/SPC/PSI/LTDPNL/0300

Amendment Number	Revision	Total pages including drawings
0	NA	17

PREPARED BY	**CHECKED BY**	**REVIEWED BY**	**APPROVED BY**
SSE/Protection	DTI-3	EDTI	PEDTI

1.0 SCOPE:

1.1 This specification covers the 240V AC distribution panels and the 110 V DC distribution panels to be installed in the control room of an unattended 25KV and 2x25KV traction substation (TSS), Sub-sectioning and paralleling post (SSP) & sectioning and paralleling post (SP) of 2x25KV for control and distribution of 240V single phase AC and 110 V DC supplies respectively.

1.2 The equipment offered shall be complete in all respects and shall include all accessories or materials which are useful or necessary for efficient operation of the distribution panel. Each accessories and materials shall be deemed to be within the scope of this specification whether specifically mentioned or not.

1.3 This specification supersedes specification No. ETI/PSI/29 (12/79).

2.0 SERVICE CONDITIONS

2.1 The distribution panels are intended for use in moist tropical climate in India with the following atmospheric conditions:

i)	Maximum ambient air temperature	55^0 C
ii)	Minimum ambient air temperature	-10^0 C
iii)	Max. temperature attainable by an object exposed to sun	70^0 C
iv)	Relative humidity: 24 h average	5% to 95%
v)	Annual rainfall ranging from	1750 mm to 6250 mm
vi)	Maximum number of thunder storm days per annum.	85 days
vii)	Maximum number of dust storm days per annum.	35 days
viii)	Number of rainy days per annum	120 days
ix)	Basic wind pressure	200 kgf/m^2
x)	Altitude above MSL	2000 meters.
xi)	Vibrations	Max:350micron Average:30-150 micron Time duration: rapidly varying time duration 15-70 ms.

2.2 The ratings of LT supply transformer are generally installed at traction substation (TSS), Sub-sectioning and paralleling post (SSP) and sectioning and paralleling post (SP) to give 240V single phase, AC supply for control and relay panel, battery chargers, control room and yard lighting, space heaters for circuit breakers / interrupters, fans, pumps etc. are given below :

Sl. No.	Type of TSS/SSP/SP	Capacity of LT supply transformer	Size of cable between LT supply transformer and AC distribution panel
1.	25kV TSS	1x25KVA & 1x10KVA, 25 kV/240V single phase transformer	For 10 KVA Transformer: Two core 16 sq.mm, PVC insulated, 1100 V grade

			aluminium cable conforming to IS: 1554 (Part-1) or latest. For 25 KVA Transformer: Two core 70 sq.mm, PVC insulated, 1100 V grade aluminium cable conforming to IS: 1554 (Part-1) or latest.
2.	2x25 KV TSS	2X50KVA, 25 kV/240V single phase transformer	Two core 185 sq.mm, PVC insulated, 1100 V grade aluminium cable conforming to IS: 1554 (Part-1) or latest.
3.	2X25kV SSP/SP	2x10KVA, 25 kV/240V single phase transformer	Two core 70 sq.mm, PVC insulated, 1100 V grade aluminium cable conforming to IS: 1554 (Part-1) or latest.

ACDB panel should have proper size inlet and sufficient space to ease termination of above sizes of cables as applicable.

2.3 Two battery chargers suitable for trickle and boost charging of the 110 V, 200Ah lead acid battery at 25kV TSS, 250Ah at 2x25kV TSS and 150 Ah at 2x25 KV SSP/SP installed as applicable at TSS, SSP & SP. PVC insulated 1100 V grade heavy duty, 2 x 2.5 sq.mm copper cable (two cables in parallel), complying with IS:1554, Pt. I (latest version) shall be brought from each of the two chargers and the battery and terminated on the 110 V DC panel.

3.0 GOVERNING SPECIFICATION

3.1 The panels and their main components shall comply with the latest edition of various latest versions of the following specifications which shall be applied in the manner altered, amended by this specification and the Indian Electricity Rules, where applicable.

i)	Heavy duty switches.	IEC 60947
ii)	Distribution fuses boards	IS:2675
iii)	Miniature circuit breakers for AC and DC operation.	IS/IEC 60898-2
iv)	Miniature circuit breakers for AC operation.	IS/IEC 60898-1
v)	Bus bars	BS: 159
vi)	Electrical indicating instruments.	IS:1248
vii)	General requirements for LT switchgear	IEC 60947 : PART 1 : 2007

3.2 Any deviation from this specification calculated to improve the performance, utility and efficiency of the equipment proposed by the tenderer will be given due consideration provided full particulars thereof and justification therefore, are furnished.

4.0 GENERAL DESCRIPTION

4.1 240V AC DISTRIBUTION PANEL

4.1.1 The two incoming 240V AC supplies from the two LT supply transformers shall be brought through independent switch-fuse units and connected to the 240V ac bus bar

through a double pole two position change over switch. There shall be no other position for the change over switch. Only one supply is to be fed into the bus bar at a time. Outgoing circuits shall be connected to the 240V AC bus bar through separate switch-fuse units each with a sub distribution circuit. The schematic of circuit arrangement of AC distribution panel for different location is given in the annexures:

(i) Two numbers 10KVA LT supply transformer as (Annexure-II) for 2x25KV SSP/SP/AT Post.

(ii) One number each 10KVA and 25KVA LT supply transformer as (Annexure-III) for 25KV TSS.

(iii) Two numbers 50KVA LT supply transformer as (Annexure-IV) for 2X25KV TSS.

4.1.2 The 240 V ac distribution panels shall comprise the following for different application :

4.1.2.1 For 2x25kV SSP/SP/AT post (2X10KVA LT supply transformer)

i)	Double pole switch-fuse unit, 63 A, 240V rating for controlling the incoming supplies to the panel.	2 Nos
ii)	Double pole changeover switch, 63A, 240V capacity	1No.
iii)	Electrolytic copper bus bars, tinned, of 100A capacity, natural air cooled and supported on porcelain insulators for phase and neutral	1 set
iv)	Double pole switch-fuse unit 40 A with two nos. of 32A and two nos. 16 A sub-distribution DP MCBs 240V AC, 50 Hz.	1 set
v)	Double pole switch-fuse unit, 32 A with two nos. 10 A and 4 nos. 5 A sub distribution DP MCBs 240V AC, 50 Hz.	1 set
vi)	Double pole switch-fuse unit 32 A, with 6 nos. 5 A sub-distribution DP MCBs 240V AC, 50 Hz.	1 set
vii)	240V red LED indication lamps for indication of supply in the two incoming and three main outgoing circuits	5 nos.
viii)	Moving iron or Digital voltmeter 144 sq. mm, 90 deg. Scale, 0-300 V range, Grade 'A' accuracy to IS: 1248	1

4.1.2.2 For 25kV TSS (1x10KVA & 1X25KVA LT supply transformer)

i)	Double pole switch-fuse unit, 63 A and 150A, 240V rating for controlling the incoming supplies to the panel.	1No. each
ii)	Double pole changeover switch, 150A, 240V capacity	1No.
iii)	Electrolytic copper bus bars, tinned, of 200A capacity, natural air cooled and supported on porcelain insulators for phase and neutral	1 set
iv)	Double pole switch-fuse unit 32 A with two nos. of 10 A and two nos. 32 A sub-distribution DP MCBs 240V AC, 50 Hz.	1 set
v)	Double pole switch-fuse unit, 32 A, with three nos. 16 A sub-distribution DP MCBs 240V AC, 50 Hz.	1 set
vi)	Double pole switch-fuse unit, 32 A with two nos. 10 A and 4 nos. 5 A sub distribution DP MCBs 240V AC, 50 Hz.	1 set
vii)	Double pole switch-fuse unit 50A, with 2 nos. 32 A and 6 nos. 5 A sub-distribution DP MCBs 240V AC, 50 Hz.	1 set
viii)	240V red LED indication lamps for indication of supply in the two incoming and four main outgoing circuits	6 nos.
ix)	Moving iron or Digital voltmeter 144 sq. mm, 90 deg. Scale, 0-300 V range, Grade 'A' accuracy to IS: 1248	1

4.1.2.3 For 2x25kV TSS (2X50KVA LT supply transformer)

i)	Double pole switch-fuse unit, 250 A, 240V rating for controlling the incoming supplies to the panel.	2 Nos
ii)	Double pole changeover switch, 250A, 240V capacity	1No.
iii)	Electrolytic copper bus bars, tinned, of 300A capacity, natural air cooled and supported on porcelain insulators for phase and neutral	1 set
iv)	Double pole switch-fuse unit 32 A with two nos. of 10 A and two nos. 32 A sub-distribution DP MCBs 240V AC, 50 Hz.	1 set
v)	Double pole switch-fuse unit, 32 A, with three nos. 16 A sub-distribution DP MCBs 240V AC, 50 Hz.	1 set
vi)	Double pole switch-fuse unit, 32 A with two nos. 10 A and 4 nos. 5 A sub distribution DP MCBs 240V AC, 50 Hz.	1 set
vii)	Double pole switch-fuse unit 150A, with 3 nos. 50A and 7 nos. 5 A sub-distribution DP MCBs 240V AC, 50 Hz.	1 set
viii)	240V red LED indication lamps for indication of supply in the two incoming and four main outgoing circuits	6 nos.
ix)	Moving iron or Digital voltmeter 144 sq. mm, 90 deg. Scale, 0-300 V range, Grade 'A' accuracy to IS: 1248	1

NOTE: The double pole switch-fuse units envisaged above shall have fuse of appropriate rating in phase carrying pole and solid copper link in the neutral carrying pole.

4.1.3 The switch- fuse units, bus bar chamber and sub-distribution boards etc. shall be of totally enclosed type housed in heavy sheet steel housings of completely dust, weather and vermin proof. The bus bar chamber shall be provided with detachable covers at both ends and the switch –fuse units, sub-distribution boards etc. with hinged covers to facilitate inspection and maintenance. The switch-fuse unit enclosure shall have suitable inter-lock to ensure that the door cannot be opened unless the switch is in the OFF position and that the unit cannot be switched ON unless the door is properly closed. The internal arrangement in the switch fuse units, change-over switch and sub-distribution boards etc. shall be such that all live metal and terminals etc. are suitably shrouded so as to protect against contact with live parts when the door is open. The various units on the panel shall be provided with top and bottom or side entries fitted with suitable glands for incoming and out-going cables as required.

4.1.4 The various units constituting the panel shall be neatly and securely mounted on the channel iron frame work designed for wall mounting or floor mounting. The change over switch and the two incoming switches shall be mounted below the bus bar chamber and the outgoing feeder switches shall be mounted above the bus bar chamber. The sub-distribution MCBs boards may be mounted on top of the respective feeder switches or beside them as convenient. The voltmeter shall be mounted in a central position at bottom of the panel and shall be connected to the bus bar.

4.2 110 V dc Distribution panel:

4.2.1 Two incoming circuits from the dc output terminals of the battery chargers shall be connected through a double pole change over switch to a bus bar housed inside the panel. The Lead-Acid battery of 110 V, 200AH (25KV TSS) and 250AH (2x25KV TSS) and

150AH (2x25KV SSP/SP) will be directly connected to these bus bars. There shall be 8 numbers of outgoing circuits from the bus bars for 2x25KV SSP/SP and 14 numbers of outgoing circuits from the bus-bar for 25KV and 2X25 TSS, each controlled by a double pole miniature circuit breaker. LED lamps shall be provided for each of the outgoing circuits to indicate the availability of supply and also for bus bar supply indication. A schematic arrangement is shown in Annexure-V for 25KV and 2x25KV TSS and Annexure-VI for 2x25KV SSP/SP for guidance. All the switches and MCBs shall be rated for operation on 110V DC.

4.2.2 The dc distribution panel shall comprise the following:-

4.2.2.1 For 25KV and 2x25KV TSS

Sl. No.	**Descriptions of MCBs, changeover switches & LEDs indication on panel**	**Numbers**
i)	Double pole change over switch, 63A DC rating.	1
ii)	Double pole miniature circuit breaker of 32A, 110 V, DC rating for each of the outgoing circuits.	14
iii)	Electrolytic copper bus bar, tinned, 100A, DC capacity for positive as well as negative natural air cooled and supported on porcelain epoxy insulators duly covered by heat shrinkable sleeve.	1 set
iv)	110V DC red LEDs indicators, flush mounted, removable from front of the panel for each outgoing circuit and bus bar supply indication.	15
v)	Moving coil or Digital volt-meter 144 sq.mm, 90^0 scale, 0-200V, DC range. Grade "A" accuracy to **IS:1248**	1

4.2.2.2 For 2x25KV SSP / SP

Sl. No.	**Descriptions of MCBs, changeover switches & LEDs indication on panel**	**Numbers**
i)	Double pole change over switch, 63A DC rating.	1
ii)	Double pole miniature circuit breaker of 32A, 110 V, DC rating for each of the outgoing circuits.	8
iii)	Electrolytic copper bus bar, tinned, 100A, DC capacity for positive as well as negative natural air cooled and supported on porcelain epoxy insulators duly covered by heat shrinkable sleeve.	1 set
iv)	110V DC red LEDs indicators, flush mounted, removable from front of the panel for each outgoing circuit and bus bar supply indication.	9
v)	Moving coil or Digital volt-meter 144 sq.mm, 90^0 scale, 0-200V, DC range. Grade "A" accuracy to **IS:1248**	1

4.2.3 The panel shall be of totally enclosed type made of heavy sheet steel housing being completely dust, weather and vermin proof. The bus bars inside the panel shall be centrally located. The MCBs shall be mounted below the bus bars and so provided inside the panel that their operating levers/ knobs shall not be accessible from outside unless the panel cover is opened. The flush mounted change over switch and the voltmeter shall be

mounted above the bus bars. The busbar chamber of the panel shall have detachable covers at both ends, whereas the other portion of the panel housing MCBs and change over switch etc. can have hinged covers. The arrangements inside the panel shall be such that all live metals and terminals etc. are suitably shrouded so as to protect against contact with liver parts, when the door is open. The frame of the panel shall be provided with the necessary number of openings duly fitted with suitable glands for cables entry. The distribution panel shall be suitable for wall mounting.

5.0 GENERAL REQUIREMENTS

The AC and DC panels shall be dust, weather and vermin proof. They shall be light, compact and at the same time robust in construction. They should be adequately dimensioned so that the various equipments installed inside the panels do not get overheated, beyond permissible temperature rise for bare copper conductors of 35 deg.C over an ambient of 45 deg. C.

5.1 Wiring:

5.1.1 All panel wiring shall be done with switch- board typically, 1100 V grade, PVC insulated single core, tinned, annealed copper conductors for service in extremely humid tropical climate. The wiring shall be flame retarding and shall not be prone to attack by vermin i.e. mice. White ants, cockroaches etc.

5.1.2 The size of wiring of AC distribution panel for connection of in-coming switches to busbars shall be of adequate rating according to LT supply transformer capacity. The size of wiring of DC distribution panel for connecting of in-coming switches to bus-bar shall not be less than 25sq. mm stranded copper conductors. The circuits connecting out-going switches with busbars and sub distribution fuse boards shall not be less than 10 sq. mm stranded copper conductors. These stranded wires shall generally comprise of seven strands. The wiring for meters/indication lamps etc. shall be of 1.5sq. mm copper stranded conductors. The terminations on the bus bar shall be provided with tinned copper crimped lugs and brass bolts, nuts and spring washers. All wiring shall be neatly done and supported properly where necessary.

5.1.3 The colour scheme for the wiring shall be as under:

Red- For positive of dc circuits and phase conductors of ac circuits.

Black- For negative of dc circuits and neutral conductors of ac circuits.

5.2 Painting

The sheet steel as well as other steel works shall be properly treated and then an under coat suitable to serve as base and binder for the finishing coat shall be applied. The panel shall be epoxy powder coated to Siemens gray shade on the exterior and interior surfaces of the panels shall be epoxy powder coated of white color.

If any painted surface gets damaged during transit, the surface finish shall be restored at site after erection by tenderer.

5.3 Earthing

All current free metallic bodies of the equipments on the distribution panels shall be connected to the frame-work and the framework to the main earth ring inside the control room. The connections shall be by means and bare copper wire/ strip of size

not less than 12 SWG suitable earth terminals for this purpose shall be provided on individual equipments as well as the panel. Duplicate earthing shall be provided for the framework.

5.4 Name Plates:

5.4.1 All switch- fuse units, MCBs and instruments etc. shall have name plates with rating date, serial number and manufacturer's name etc.

5.4.2 A schematic circuit diagram, printed in plastic sheet/adhesive waterproof paper, shall be provided inside the panel at a prominent place.

5.4.3 Suitable identification labels indicating functions shall be provided on each of the switch-fuse unit, sub-distribution boards, MCBs, LEDs etc. In case of change over switch, the operating handle positions shall be distinctly marked indicating the corresponding incoming source of supply.

5.4.4 All the MCBs in the panels shall be provided with marking indicating the rating on the top of MCBs. Further, suitable identification labels shall be provided at the incoming and outgoing terminals for proper connections.

5.4.5 The bus bar chamber shall be identified by a suitable label provided on the cover thereof. The phase/ positive and neutral / negative bus bars shall be identified by red and black indelible markings on the respective bus bars.

5.4.6 Black plastic plates about 50 mm wide bearing suitable captions to be approved by the purchaser, with 30 mm wide engraved letters shall be mounted on the top of each panel.

6.0 **TESTS:-**

6.1 Prototype and routine tests shall be conducted on the main components as per standard specifications mentioned in para 3.1 or manufacturer shall be submitted type test report as per relevant IS/IEC of the main components outsourced for use in distribution board.

6.2 The following checks and tests shall be carried out on the complete panels:

i) Visual inspection for identification label on the panel, LED indication, rating of different equipment on the panel.

ii) Checking the wiring for correctness and continuity.

iii) Dielectric test on the panels and the wiring for withstand voltage of 2000 V (rms) to earth for 1 minute.

iv) Insulation resistance of the complete wiring by 1000 V Megger.

7.0 TECHNICAL DATA AND DRAWINGS

7.1 The tenderer shall furnish guaranteed performance data and other technical particulars for the equipments offered in the Performa attached as Annexure-I. He shall also submit, along with the tender, the manufacturer's descriptive literature/ catalogue of the panels switches fuse units, sub distribution boards, MCB etc. offered, together with the proposed layout of panels showing disposition of various equipments thereon.

7.2 The tenderer shall indicate their compliance or otherwise against each clause and sub-clause of the technical specification. The tenderer shall for this purpose enclose a

separate statement, if necessary, indicating the clause reference and compliance or otherwise wherever the tenderer deviates from the provisions of the clause, he shall furnish his detailed remarks.

7.3 Successful tenderer shall be required to submit detailed dimensioned drawings including reproducible copies for the equipments offered, as per Railways standards in sizes of 210 mm x 297 mm or any integral multiple thereof, for approval of the purchaser.

Annexure-I

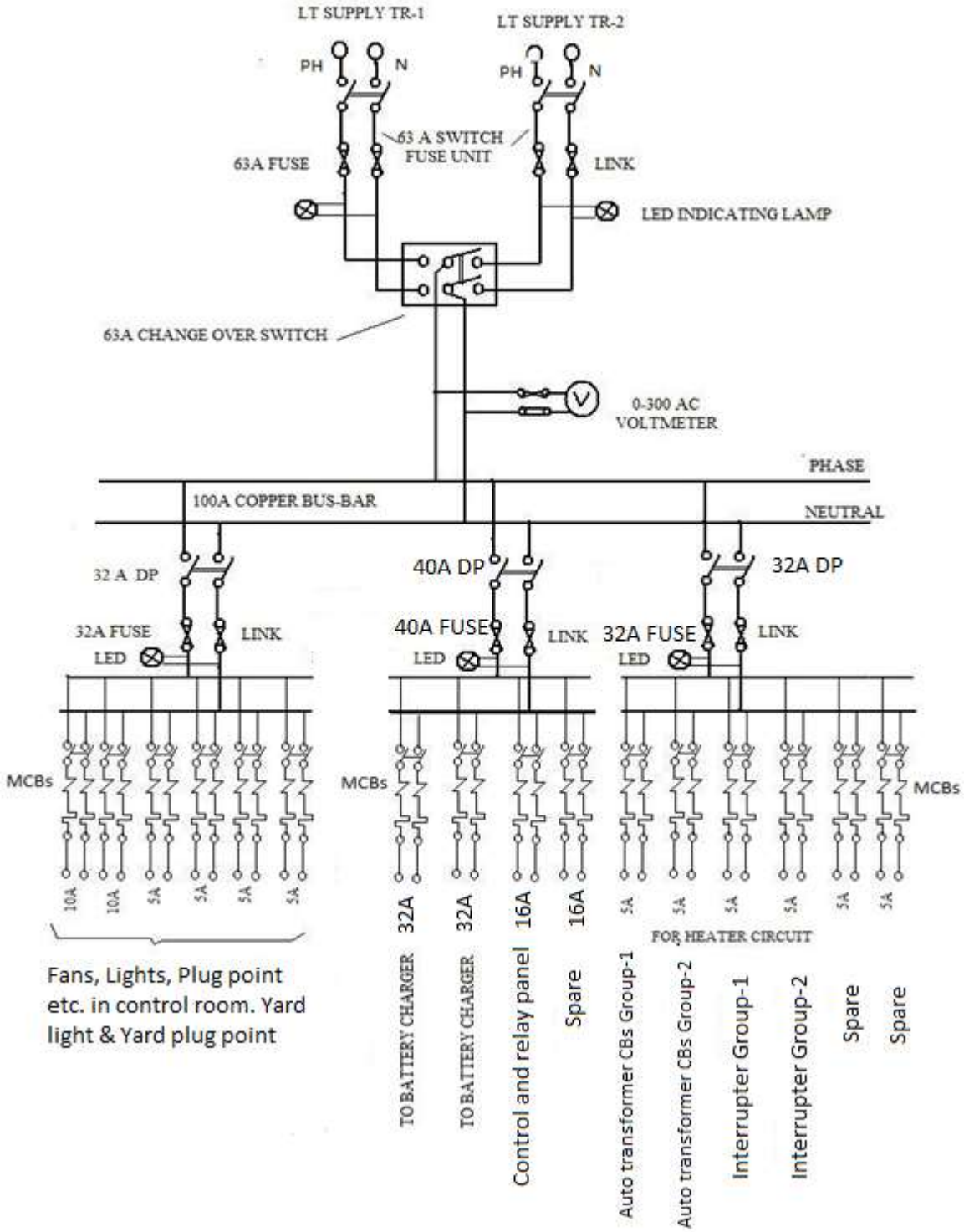
SCHEDULE OF GUARANTEED PERFORMANCE, TECHNICAL AND OTHER PARTICULARS.

S. No.	Description	Units of measurement	Remarks
I	240V AC distribution panel		
1.	Name of the manufacturer		
2.	Country of origin		
3.	Governing specification		
4.	Make, type, specification and ratings of switch-fuse units.		
5.	Make, type, ratings and specification of MCBs		
6.	Change over switch: i) Make ii) Type iii) Specification iv) Rating		
7.	(a) size and material for bus bar	Sq.mm	
	(b)Normal current carrying capacity	Amp	
	(c) Whether the busbars are tinned.		
8.	Voltmeter: i) Make ii) Type iii) Range. iv) Specification v) Class of accuracy		
9.	Type of indication lamp, make, type, consumption & life	Watts	
10.	Overall width, height and breadth of panel	mm	
11.	Weight of panel.	kg	
12.	Type of mounting.		
II	~~Do~~ **DC distribution Panel**		
1.	Name of manufacturer.		
2.	Country of origin.		
3.	Specification.		
4.	Make, type specification and ratings of MCBs		
5.	Chageover Switches i) Make ii) Type iii) Specification iv) Rating		
6(a)	Size and material for busbar.	mm	
b)	Normal current carrying capacity.	Amp	
c)	Whether the busbars are tinned.		
7.	Voltmeter i) Make		

	ii) Type iii) Range iv) Specification v) Class of accuracy		
8.	Type of indication lamp, make, type, consumption & life	watts	
9.	Overall height, width and breadth of panel.	mm	
10.	Weight of panel	kg	
11.	Type of mounting		

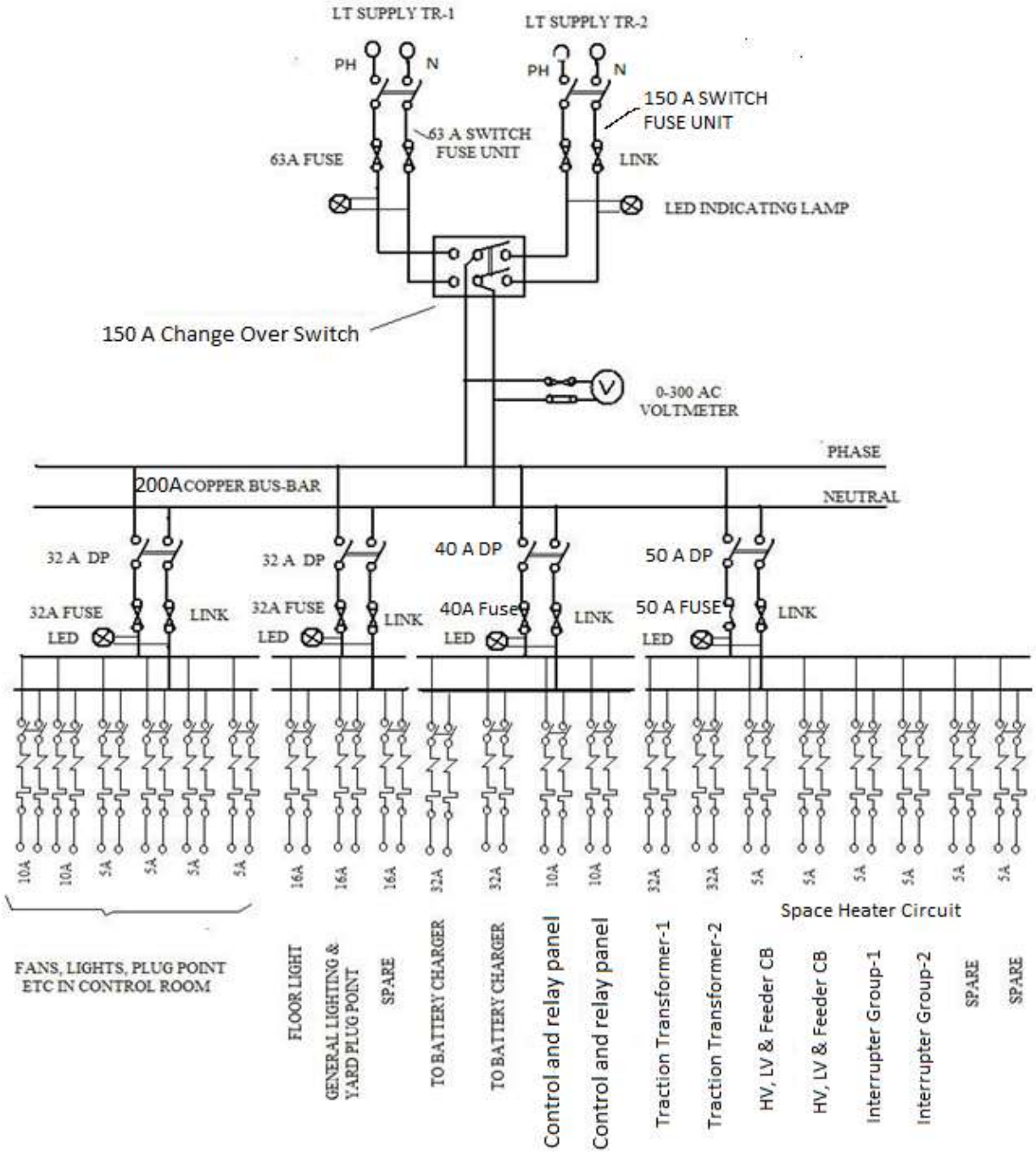
Annexure-II

SCHEMATIC DIAGRAM of 240V AC DISTRIBUTION PANEL FOR 2X25KV SSP/SP



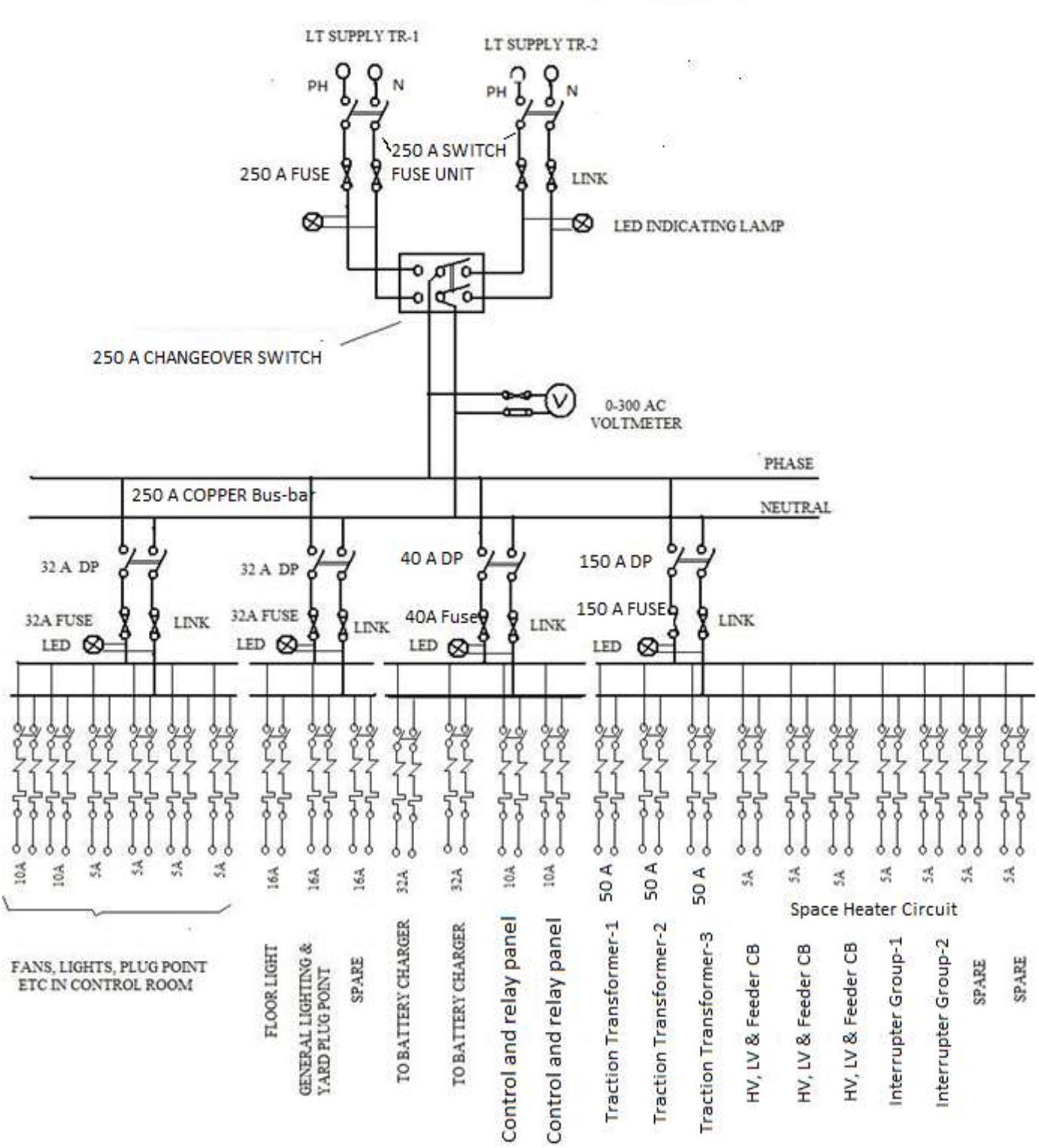
Annexure-III

SCHEMATIC DIAGRAM of 240V AC DISTRIBUTION PANEL FOR 25KV TSS



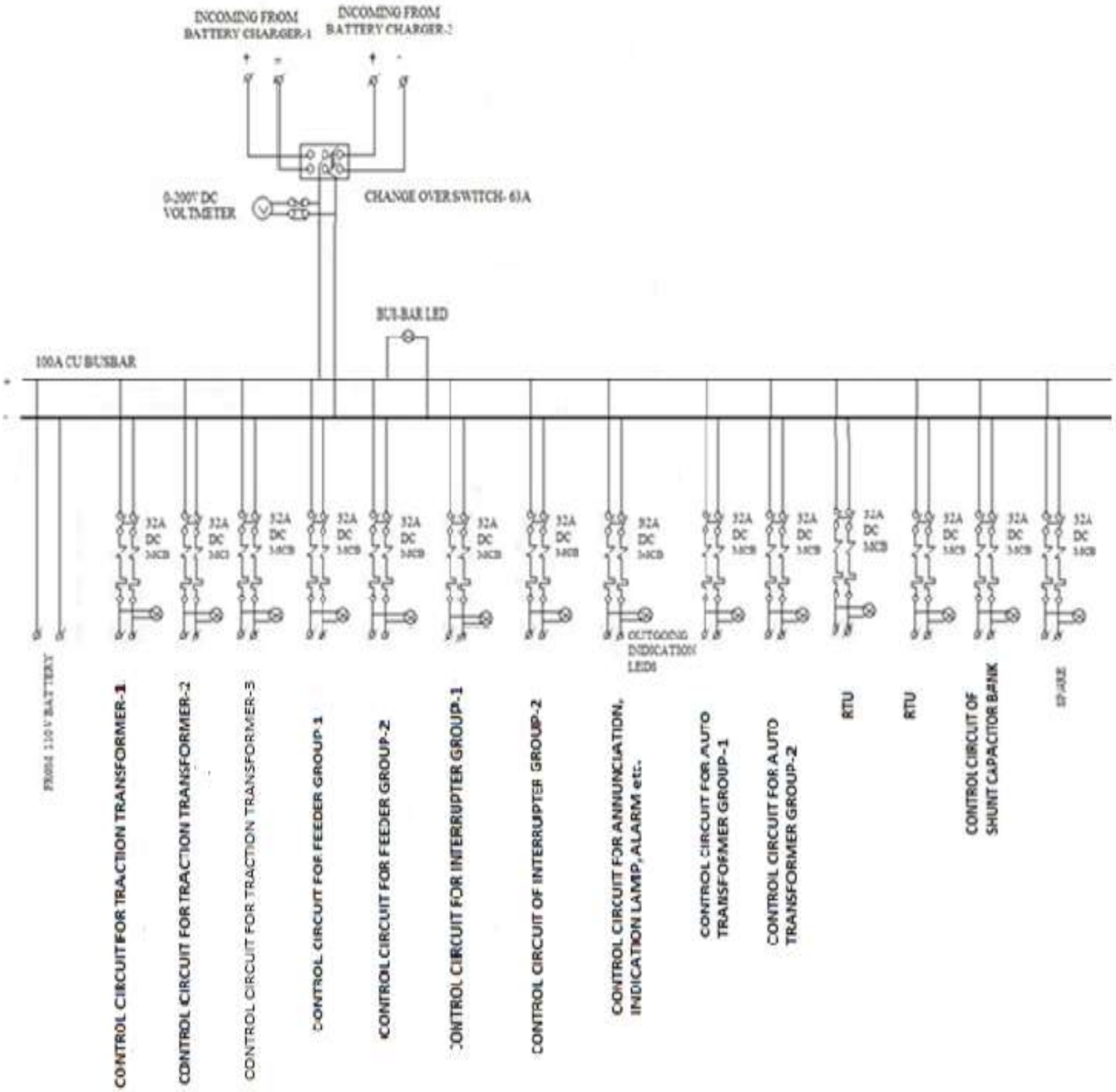
Annexure-IV

SCHEMATIC DIAGRAM of 240V AC DISTRIBUTION PANEL FOR 2X25KV TSS



Annexure-V

SCHEMATIC DIAGRAM of 110V DC DISTRIBUTION PANEL FOR 25KV and 2X25KV TSS



Annexure-VI

SCHEMATIC DIAGRAM of 110V DC DISTRIBUTION PANEL FOR 2X25KV SSP/SP