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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

TECHNICAL SPECIFICATION

CONTROL AND DISTRIBUTION PANEL FOR COLOUR LIGHT SIGNALLING SUPPLY IN 25 kv AC. TRACTION SYSTEM.

SPECIFICATION No. TI/SPC/PSI/CLS/0021

Issue Date:……..

ISSUED BY

RESEARCH DESIGNS AND STANDARDS ORGANISATION
LUCKNOW - 226011.

SPECIFICATION FOR Control & distribution panel for colour light signalling supply in single Phase 25 kV AC 50 Hz Traction System

SPECIFICATION No. TI/SPC/PSI/CLS/0021

Amendment Number	Amendment /Revision	Total pages including drawings	Date of Issue
0	Draft Spec. TI/SPC/PSI/CLS/0021	16	----

	PREPARED BY	**CHECKED BY**	**APPROVED BY**
SIGNATURES			
DATE			
DESIGNATION	SSE/PR	DTI/ III	PEDTI

INDEX

ANNEXURES

1.0 SCOPE

1.1 This specification covers design, manufacture, testing and supply of 240 V a.c. 50 Hz power supply control and distribution panel for supply to colour light signalling installations. This specification supersedes specification No. ETI/PSI/43 (10/90). The panel to be installed either in the station master's room or signalling cabin at Railway stations, will have provision for automatic changeover from main source of supply, in case it fails, to either of the two standby sources of supply and back again to the main source when it is restored.

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

1.3 The "Make in India" Policy of Government of India shall be applicable.

2.0 SERVICE CONDITIONS

2.0 The distribution panels are intended for use in moist tropical climate with the following atmospheric conditions.

1.	Max. temperature of air	50^0 C
2.	Min. temperature of air	~~0^0 C~~ -20^0 C
3.	Max. temperature attainable by an object exposed to Sun	65^0 C
4.	Max. relative humidity	100%
5.	Max. wind pressure	200 kgf/sq.m.
6.	Altitude	2000 m
7.	Average annual rainfall.	1750 to 6250 mm.
8.	Number of thunderstorm days per annum.	85 days.
9.	No. of rainy days per annum	120 days (Max.)
10.	Average No. of dust storm days	35 days per annum.
11.	Vibrations	Max: 350 microns Average: 30 – 150 microns time duration: rapidly varying time duration 15 - 70 ms.

3.0 GOVERNING SPECIFICATIONS

3.1 The panel and its main components shall comply with the following specifications which shall be applied in the manner altered, amended or supplemented by this specification and the Indian Electricity Rules where-ever applicable: -

(i) Busbar-IS: 2673- 1979.
(ii) Contactors- ~~IS: 2959- 1985~~. IEC 60947
(iii) H.D. Switches (Rotary)- ~~IS: 4064 (Part I & II) 1978~~. IEC 60947 : PART 3 : 2012
(iv) The general requirement for LT switchgear ~~IS: 4237-1982~~. IEC 60947 : PART 1 : 2007
(v) Miniature air break circuit breaker ~~IS: 8828-1978~~ IEC 60898-1 : 2015
~~(vi) Electrical buzzer IS: 2268-1984.~~
(vii) Panel wiring – IS 5578 & 11353.
(viii) Control switches / Push button – ~~IS 6875~~. IS 13947 : Part 5 : Sec 2 : 2004
(ix) Cables : IS 1554 Part – I (latest version)

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 with justification

thereof are furnished.

4.0 GENERAL REQUIRMENT

4.1 The arrangement caters for three sources of 240 V a.c. 50 Hz power supply at each station, with a provision for automatic changeover, forming a reliable source of supply for colour light signalling installations and other emergency loads. The main source of supply shall be the local supply from the Electricity Board if available, the two standby supplies being from the 5KVA or 10 KVA or 25KVA or 50KVA, 25 kV/240Vauxiliary Transformer (AT) one each installed at UP & Down track connected to the 25 kV a.c. 50 Hz single phase traction overhead equipment of UP & Down tracks at the station/IBH/level crossing gate. However, in exceptional cases where local supply is un-reliable, one of the ATs may be used as the main source of supply the other AT being the standby supply. The power supply to the panel shall be brought by means of 1100V grade two core armoured XLPE insulated PVC sheathed aluminium conductor. XLPE cable conforming to IS: 7098 (Part-I) of size 25 sq. mm conductor for 5KVA AT, 70 sq. mm conductor for 10 KVA AT, 150 sq. mm conductor for 25 KVA AT and 300 sq. mm conductor for 50 KVA AT from each of the sources shall be used.

4.2 The circuits shall normally be fed from the main source of supply. When the main source of supply fails, the changeover to either of the two standby sources shall be affected automatically through suitable contactors in the panel. On restoration of the main source of supply, the circuits shall be connected back to the main source of supply automatically. Whenever an automatic change over occurs in the event of main supply going off (or whenever the main supply is again restored) an alarm buzzer will sound which can be silenced by pressing alarm reset microswitch. The typical / tentative schematic general arrangement of the panel is indicated in Drawing. No. ETI/PSI/035 -2 enclosed (Annexure – II).

4.3 Provision shall be made, in the event of defects/maintenance of the contactors, to connect the main or either of the standby supplies to the outgoing bus directly, so as to permit the contactor assembly being taken out without affecting continuity of supply to the load, supply from only one of the sources shall be connected to the outgoing bus at a time. Four outgoing circuits are connected to the 240 V busbar through individual miniature circuit breakers.

4.4 Provision shall be made that in case main supply voltage goes below 165V, main supply will be cut off and standby one supply shall be put on automatically, similarly this shall be applicable to stand by supply one and two also. However, if main supply voltage become normal, standby supply one or two will automatically be cut off and main supply will feed the load.

4.5 Provision shall be made that in case main supply voltage goes above 270 V +5%-0%, the main supply shall be cut off and standby one supply shall be put on automatically similarly this shall be applicable to standby supply one and two also. However, if main supply voltage become normal, standby one or two will automatically be cut off and main supply will feed the load.

4.6 The changeover time from one supply to other supply shall be less than 100 m sec.

5.0 RATING & DESIGN FEATURES

5.1 The capacity of control & distribution panel for supply to CLS installations shall be 30A, 60A, 150A, and 300A when used with 5KVA, 10KVA, 25KVA and 50KVA Auxiliary Transformers (Ats) respectively. The panel shall comprise the following.

(i) Rotary selector switch

S. No.	AT rating	Rating of rotary selector switch	Quantity
1	5KVA	4 Pole, 6-way, 240 V a.c. 50 Hz, 30 A	1
2	10KVA	4 Pole, 6-way, 240 V a.c. 50 Hz, 60 A	1
3	25KVA	4 Pole, 6-way, 240 V a.c. 50 Hz, 150 A	1
4	50KVA	4 Pole, 6-way, 240 V a.c. 50 Hz, 300A	1

(ii) Air Break Contactors

S. No.	AT rating	Rating of air break contactors	quantity
1	5KVA	240 V a.c., 50 Hz, 2 or 3 Pole as commercially available, 30 A with 2 NO and 2 NC auxiliary contacts	3
2	10KVA	240 V a.c., 50 Hz, 2 or 3 Pole as commercially available, 60 A with 2 NO and 2 NC auxiliary contacts	3
3	25 KVA	240 V a.c., 50 Hz, 2 or 3 Pole as commercially available, 150 A with 2 NO and 2 NC auxiliary contacts	3
4	50 KVA	240 V a.c., 50 Hz, 2 or 3 Pole as commercially available, 300 A with 2 NO and 2 NC auxiliary contacts.	3

(iii) **Miniature circuit breakers on input side-** Miniature circuit breakers as per IS: 8828/ Moulded case circuit breaker as per IS:13947 – 1&2 or IEC: 60947-2, for higher current ratings for which MCB's are not available, on input side".

S. No.	AT rating	Rating of miniature circuit breaker	quantity
1	5KVA	240 V a.c. 2 Pole, 50 Hz, 32 A	3
2	10KVA	240 V a.c. 2 Pole, 50 Hz, 63 A	3
3	25KVA	240 V a.c. 2 Pole, 50 Hz, 150 A	3
4	50KVA	240a.c. 2 Pole, 50 Hz, 315 A	3

Note: 3 pole commercially available MCCB may be used if 2 Pole MCCB not available.

(iv) **Miniature circuit breakers on out put side-** Miniature circuit breakers as per IS: 8828/ Moulded case circuit breaker as per IS:13947 –1&2 or IEC: 60947-2, for higher current ratings for which MCB's are not available, on output side".

S. No.	AT rating	Rating of miniature circuit breaker	quantity

1	5KVA	240 V a.c. 2 Pole, 50 Hz, 32 A	2
2	10KVA	240 V a.c. 2 Pole, 50 Hz, 63 A	2
3	25KVA	240 V a.c. 2 Pole, 50 Hz, 150 A	2
4	50KVA	240a.c. 2 Pole, 50 Hz, 315 A	2

Note: 3 pole commercially available MCCB may be used if 2 Pole MCCB not available. The current capacity of Rotary Selector Switch, Air break contactor indicate above as 30A, 60A, 150A, and 300A have been arrived at the lowest voltage 165 Volts of the ATs of 5KVA, 10KVA, 25KVA and 50KVA. However, in case of the normal voltage of 240Volt, the current ratings works out to be 21 A, 42A, 104A, 208A. based on this, it should be ensured that the max. load connected to these panels for CLS installations including other loads should not exceed 21 A, 42A, 104A & 208A at the rated voltage of 240 V.

(v) Miniature circuit breakers 240 V, a.c 2 pole 50 Hz, 1A and 6 A . 1 each

(vi) Lighting Emitting diodes (LED) for indication for incoming, outgoing and auto mode 10

(vii) ~~Alarm buzzer 240 V, a.c. 50 Hz~~ Inbuilt DC alarm buzzer 1

(viii) ~~Alarm reset micro switch~~ Alarm reset push button 1

5.2 DESIGN FEATURES

5.2.1 PANEL

The panel shall be made of sheet steel not less than 1.6 mm thick suitable for wall mounting. It shall be of the totally enclosed type so as to be completely dust, weather and vermin proof. It shall be provided with a hinged cover and suitable locking arrangements. Access to components inside the panel shall be possible only after opening the cover. Provision shall be made for entry of 3 incoming 1100V grade, two core armoured XLPE insulated PVC sheathed, Aluminium (conductor) cables each of 25 sq. mm for 5KVA AT or 70 sq. mm for 10 KVA AT or 150 sq. mm for 25 KVA AT or 300 sq. mm for 50 KVA AT, and 4 outgoing cables of suitable rating as field requirement each through suitable glands. The terminals shall be of tinned copper. The operating knobs/handles of the rotary switches and the miniature circuit breakers shall project outside the cover of the panel, for easy operation.

The interior of CLS panel shall be adequately lighted by, 5W 240 V AC LED tube/bulb with a door operated switch. The wiring shall be capable to ON/OFF the lamp through door operated switch if any one power supply is available on the panel.

The priority / sequence of power supply selection, mentioned in the specification may be changed by purchaser according to power supply source reliability and the same shall be furnished at the time of tender finalization and inspecting authority clearing the panel for dispatch shall check the same as per priority approved by tenderer.

5.2.2 ROTARY SELECTOR SWITCH: -

The Rotary selector switch shall be of flush type. The contacts shall be of robust design and have ample cross-section for carrying continuously 30 A for

5KVA AT, 60A for 10 KVA AT, 150A for 25KVA AT, 300A for 50KVA AT and be of positive make type to avoid any sparking. The rotary switch shall be enclosed with a transparent cover to prevent accidental/ inadvertent/ interference to circuit.

The selector switch shall have the following six positions: -

i. Off
ii. Main supply
iii. Standby one supply
iv. Standby two supply
v. Off
vi. Auto

5.2.3 CONTACTOR

The contactors shall be of electromagnetic air break type of robust design having a continuous rating of 240 V a.c. 50 Hz, 30 A for 5 KVA AT, 60 A for 10 KVA AT, 150 A for 25 KVA AT, 300 A for 50 KVA AT with 2 number normally open and 2 number normally closed auxiliary contacts. The contacts shall be silver plated, bounce proof and have ample cross section for carrying the rated current continuously without exceeding the permissible temperature rise.

5.2.4 MINIATURE CIRCUIT BREAKER

Miniature circuit breakers shall be suitable for operation on 240 V ac. 50 Hz and shall have a breaking capacity of 100 kVA. Miniature circuit breakers shall be enclosed in clear acrylic cover to prevent un-authorised operation / interference.

5.2.5 BUS BAR

Bus bar shall be made of high conductivity electro-lytic tinned copper supported on LT porcelain insulator. The section of the bus bar shall be of adequate capacity for carrying 30 A for 5KVA AT, 60A for 10 KVA AT, 155A for 25KVA AT, 300A for 50KVA AT continuously.

5.2.6 LIGHT EMITTING DIODES (LEDs)

The LEDs shall be provided on the cover of the panel to indicate the availability of supplies. They shall be housed in screwed translucent unbreakable covers moulded from heat resisting material and provided with chromium plated bazels. 3 Nos of LED shall be provided on the panel to indicate as on which supply (that is on main or standby 1 or standby 2 supply) load is connected.

5.2.7 CABLE GLAND

The entry of all wires / cables in to the panel shall be only through suitable glands which shall not allow ingress of vermin, insects etc. in to the panel. For outgoing wires / cables also, the suitable such cable glands shall be provided by the tenderer.

5.2.8 Panel wiring

All panel wiring shall be done with 1100 V grade PVC insulated single core,

tinned annealed stranded copper conductors for service in extremely tropical climate. The PVC wires shall conform to latest version/revision of IS: 694 and duly tested for flammability test as per IS: 10810 (Part 53)-1984. The wiring shall also not be prone to attack by vermin, i.e. mice, white ants, cockroaches etc.

The size of cable for Power circuits shall be of 10 sq. mm for 5 KVA, 16 sq. mm for 10 KVA, 50 sq. mm for 25 KVA and 120 sq. mm for 50 KVA rating.

The wire size for control circuits shall not be less than 2.5 sq.mm.

The terminal ends of all wires shall be provided with numbered interlock type ferrules, which are of PVC or other durable material with marking either engraved or punched so as to be indelible. The ferrules shall be of white or yellow color with black lettering thereon. The ends of all wires and cables shall be provided with suitable lugs/spades, which shall be crimped/soldered into the wires. All wiring shall be neatly bunched with PVC tape or laced by thread or PVC/Nylon wiring tags. No joints shall be permitted in the wiring.

5.2.9 Termination / Connection of incoming and outgoing power cables in the panel

All the incoming and outgoing power cables shall be connected to the respective MCBs through suitable terminal connectors which should be provided inside the panel. It shall be of suitable size to terminate/connect the corresponding incoming and outgoing cables. The size and numbers of incoming cable and size of cables for Panel wiring for power and control circuits are mentioned in clause No. 4.1 and 5.2.8 (ii) respectively. The terminal connectors shall be fixed in a manner to facilitate adequate gap of at least 20 mm between them and corresponding 2- pole MCB of each supply source to avoid short circuit and to facilitate ease of maintenance/replacement of cables. Adequate vacant space below the terminal connectors inside the panel should also be available to accommodate each incoming and outgoing cables.

5.2.10 Lay out of equipments

Layout of the various equipment inside the panel shall be made in such a manner to facilitate adequate working clearance within the various equipment during maintenance/ replacement. The details of working clearance among various equipment inside the panel must be indicated in design drawings, which shall be finalized by CORE/Prototype approving authority at the time of drawings approval prior to prototype testing. Drawing. No. ETI/PSI/035 – 4 is for reference, the size of panel and detailed drawings shall be finalized by CORE/Prototype approving authority at the time of design & drawings approval of the manufacturer.

6.0 EARTHING

Earthing of the panel and equipment there shall be as per IS: 3043 (latest edition).

7.0 PAINTING

The supporting frame and panel shall be properly treated to avoid rusting. The manufacturer shall use the following pretreatment through seven tank process:

- Degreasing
- Rinsing (water wash)
- Pickling (Acid pickling)
- Rinsing (water wash)

- Zinc Phosphating
- Rinsing (water wash)
- Drying
- Powder coating & Curing

The exterior & interior surface and the supporting frame of the panel shall be epoxy powder coated of Siemens Grey shade/color.

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

8.0 NAME PLATES

8.1 Suitable marking for identification of position of selector switch shall be indicated on the switch or panel. The schematic circuit diagram, generally as per the drawing attached to this specification and terminals block details of incoming and outgoing cable connection and inter panel wiring made of good quality acrylic sheet (or any other superior long lasting/durable material) with suitable lamination or coating for long life, shall be provided on inner side of panel door.

8.2 Black plastic plate 15 mm wide bearing suitable captions with 3 mm high engraved letters in white colour shall be mounted on top of the panel.

9.0 TESTS

9.1 GENERAL

9.1.1 Only after all the design and drawings have been approved and clearance given by Research Design and Standards Organization (RDSO)/Chief Electrical Engineer (CEE) to this effect, the manufacturer shall take up manufacture of the prototype unit for RDSO inspection. It is to be clearly understood that any changes required to be done in the prototype unit shall be done expeditiously.

9.1.2 Before giving the call to RDSO/CEE for inspection and testing of the prototype of the equipment, the manufacturer shall submit a detailed test schedule consisting of schematic circuit diagrams for each of the tests and nature of the test, venue of the test and the duration of the test and the total number of the days required to complete the tests at one stretch.

9.1.3 Once schedule is approved, the tests shall be done accordingly. However, during the process of type testing or even later, RDSO representative reserves the right to conduct any additional test(s) besides those specified therein, on any equipment/sub-system or system so as to test the equipment to his satisfaction or for gaining additional information and knowledge. In case of dispute or any disagreement arises between the manufacturer and RDSO/CEE during the process of testing as regards the type test results, it shall be brought to the notice of the Director General (Traction Installation), RDSO/ CEE as the case may be, whose decision shall be final and binding.

9.1.4 In the event of the tests not being carried through to completion at one stretch for any reason attributable to the successful tenderer/ manufacturer and it is required for the representative of the purchaser/ Director General (Traction Installation), Research Designs and Standards Organization, Lucknow, to go again or more number of times to the works of the successful tenderer/ manufacturer or other place(s) for continuing and/or completing the test on the prototype(s) of the equipment, the successful tenderer/ manufacturer shall reimburse to the purchaser/ Director General (Traction Installation), Research Designs & Standards Organization, Lucknow. The cost of the representative having to visit the works

or other place(s) for the test more than once. The cost as claimed by the purchaser/ Director General (Traction Installations), Research Designs & Standards Organisation, Lucknow shall be paid through demand draft to the concerned accounts officer of the Purchaser/Director General (Traction Installation), Research Designs and Standards Organization, Lucknow, shall be advised to the successful tenderer manufacturer.

9.2 Type routine and acceptance tests on various equipments shall be carried out as per the following schedule.

9.2.1 ROTARY SWITCH

The following tests shall be carried out as per IS:4064 (Part I&II) 1978: In case these tests have already been carried out at a Govt. recognised labs, the test certificates shall be submitted to RDSO/Zonal Rlys for scrutiny & approval.

TYPE TESTS

(i) General.
(ii) Verification of temperature-rise limit.
(iii) Verification of Dielectric properties.
(iv) Verification of rated making and breaking capacities.
(v) Verification of ability to carry the rate short time withstand current.
(vi) Verification of rated fused short circuit current.
(vii) Verification of rated short circuit making capacity.
(viii) Verification of Mechanical endurance.

ROUTINE TESTS

As per provision of Clause 8.3 of IS: 4064, Part I, 1978.

9.2.2 CONTACTOR

The following tests shall be carried out as per IS: 2959-1985: In case these tests have already been carried out at a Govt. recognized labs, the test certificates shall be submitted to RDSO/Zonal Rlys for scrutiny & approval.

TYPE TESTS

(i) Verification of temperature-rise limit.
(ii) Verification of Dielectric properties.
(iii) Verification of rated making and breaking capacities.
(iv) Verification of short circuit making and breaking capacities.
(v) Verification of Mechanical endurance.
(vi) Verification of operating limits.
(vii) Verification of ability to withstand over load currents.

ROUTINE TESTS

(i) Operating tests
(ii) Dielectric tests

9.1.3 MINIATURE CIRCUIT BREAKERS: -

The following tests shall be carried out as per IS: 8828-1978: In case these tests have already been carried at a Govt. recognized labs, the test certificates shall be

submitted to RDSO/Zonal Rlys for scrutiny & approval.

TYPE TESTS

(a) TEST DUTY –I

(i) High voltage test.
(ii) Over current device calibration test.
(iii) Temperature rise test.
(iv) Over load performance test.
(v) Endurance test.

(b) TEST DUTY-II

(i) Short Circuit capacity test.

(c) TEST DUTY-III

(i) Time/current characteristic test.
(ii) Flexible Cord test.
(iii) Shock test.

ROUTINE TESTS

(i) High Voltage test.
(ii) Over current device calibration test.

9.2 TESTS ON THE COMPLETE PANEL

The following checks and tests shall be carried out on the complete panel:-

(i) Visual & dimensional check.
(ii) Checking the wiring for correctness and continuity.
(iii) Voltage test on the panel and the wiring for withstand voltage of 2000V rms to earth for 1 minute.
(iv) Insulation resistance of the complete wiring with 1000V meggar.
(v) Endurance / Operation / functional tests on the rated load current: during this test, a rated load shall be connected to the output terminals for 10 Hours and the function/operation for changeover facility in manual as well as in auto mode of the panel shall be checked for 100 times. This test shall be carried out only one panel at the time of Proto type testing.
(vi) Measurement of changeover time from one supply to another supply.

10.0 DRAWINGS AND TECHNICAL DETAILS

10.1 The tenderer shall furnish schedule of guaranteed performance particulars, for the panel offered in the Performa attached as Annexure-I.

10.2 The following drawings shall be furnished as per Indian Rlys standard in sizes of 210x297 mm are any integral multiple thereof for the approval of the purchaser:

(a) Layout dimensional detail drawings of various equipment inside and outside of the panel, overall size the panel, mounting arrangement

drawings of the panel, control and power circuit in details etc.

(b) A sectional view of the rotary switch, together with plan showing mounting details and knob handle position.

(c) A sectional view of the contactor, together with the plan showing mounting details.

(d) A sectional view of the miniature circuit breaker together with the plan showing mounting details.

The tenderer shall furnish technical details, name of the manufacturer, country of origin and make of the equipment offered along with the drawings.

One soft copy of approved drawings shall be submitted to DG/TI/RDSO/Lucknow/CEE, core, Allahabad.

After the drawings are approved a prototype panel shall be got approved after the test out lined above before taking up the bulk manufacture.

11. OPERATION, MAINTENANCE INSTRUCTIONS & TRAINING

11.1 The panel shall be a maintenance free relay generally not needing any maintenance; however, the tenderer shall mention a maintenance schedule which shall be detailed enough to guarantee failure free service of the relay to the tenderer. The supplier shall supply free of cost 2 copies to the consignee of the Instruction Manuals for operation and maintenance of the equipment. The manuals shall contain full particulars of various components, full dimensioned drawings and circuit diagrams.

11.2 The Successful tenderer shall develop a maintenance schedule and a trouble shooting chart for effective, reliable and trouble-free operation of the panel. The basic maintenance schedule along with the troubleshooting, diagnostic chart shall be submitted to RDSO and approved by RDSO prior to commissioning of the panel for the first time at the site.

12.0 WARRANTY

12.1 The panel supplied against a purchase order/contract in which this specification is quoted, irrespective of origin individual equipment (imported / indigenous) shall be guaranteed for trouble - free and satisfactory performance for a period of 18 months from the date of supply or 12 months from the date of commissioning, whichever period is earlier, details of warranty clause, the extent of responsibility and other relevant aspects shall be included in the purchase order or the contract. The tenderer shall furnish detailed terms and conditions in this regard in his offer.

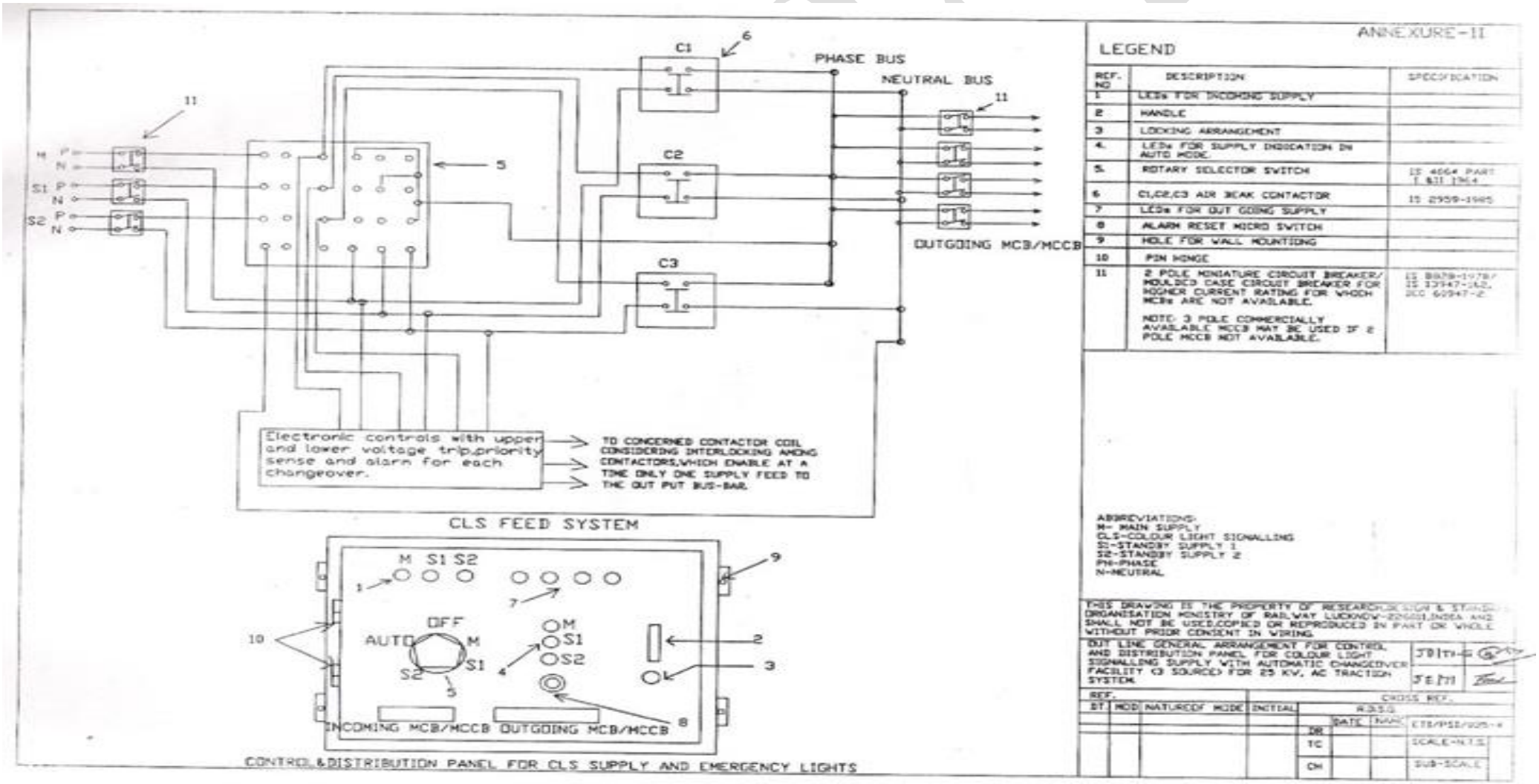
ANNEXURE-I

SCHEDULED OF GURANTEEDANDTECHNICAL PARTICULARS

S . N O	**Description**	**Manufacturer details**	**Unit of measurement**
1.0	**Particulars of control and distribution panel.**		
1.1	Name of the manufacturer		
1.2	Governing RDSO specification		
1.3	Rated control voltage with variation		Volt
1.4	Power consumption.		Watts
1.5	Lower and upper limits of 240 V on which the changeover from one supply to another supply occurs.		Volts
1.6	Power frequency withstand voltage for 1 minute		KV rms
1.7	Dimensions: Length Width breath		mm mm mm
1.8	IR value of complete wiring		
1.9	Switching time for switching one supply to another supply.		Sec.
2.0	**MINIATURE CIRCUIT BREAKER**		
2.1	Name of manufacturer		
2.2	Rated voltage		Volts
2.3	Rated current		Amp.
2.4	Rated making and breaking capacity of the contact		Amp.
2.5	Short time current carrying capacity of the contacts for 1 sec.		Amp.
2.6	Operating duty.		
3.0	**ROTARY SWITCH**		
3.1	Name of manufacturer		
3.2	Rated voltage		Volts
3.3	Rated current		Amp.
3.4	Rated making and breaking capacity of the contact		Amp.
3.5	Short time current carrying capacity of the contacts for 1 sec.		Amp.
4.0	**Air break contactors**		

4.1	Name of manufacturer		
4.2	Rated voltage		Volts
4.3	Rated current		Amp.
4.4	Rated making and breaking capacity of the contact		Amp.
4.5	Short time current carrying capacity of the contacts for 1 sec.		Amp.
4.6	Operating duty.		
4.7	Nos of NO & NC contacts provided with main contact.		Nos
5.0	**BUZZER**		
5.1	Name of manufacturer		
5.2	Operating voltage		Volts
5.3	Power consumption at rated voltage		Watts
5.4	Whether continuously rated for operating voltage		
6.0	**CABLE GLAND**		
6.1	Name of manufacturer		
6.2	Outside & inside diameter of cable gland.		mm
6.3	Whether protection against ingress of vermin, insects etc. ensured		

Annexure II



REF. NO	DESCRIPTION	SPECIFICATION
1	LEDs FOR INCOMING SUPPLY	
2	HANDLE	
3	LOCKING ARRANGEMENT	
4	LEDs FOR SUPPLY INDICATION IN AUTO MODE	
5	ROTARY SELECTOR SWITCH	IS 4064 PART I &II 1964
6	C1,C2,C3 AIR BREAK CONTACTOR	IS 2959-1965
7	LEDs FOR OUT GOING SUPPLY	
8	ALARM RESET MICRO SWITCH	
9	HOLE FOR WALL MOUNTING	
10	PIN HINGE	
11	2 POLE MINIATURE CIRCUIT BREAKER/ MOULDED CASE CIRCUIT BREAKER FOR HIGHER CURRENT RATING FOR WHICH MCBs ARE NOT AVAILABLE. NOTE: 3 POLE COMMERCIALLY AVAILABLE MCCB MAY BE USED IF 2 POLE MCCB NOT AVAILABLE.	IS 8828-1978/ IS 13947-(2), IEC 60947-2

OUT LINE GENERAL ARRANGEMENT FOR CONTROL AND DISTRIBUTION PANEL FOR COLOUR LIGHT SIGNALLING SUPPLY WITH AUTOMATIC CHANGEOVER FACILITY (3 SOURCES) FOR 25 KV, AC TRACTION SYSTEM.

JB/TH-G

JE/TI

REF. ST.	MOD	NATURE OF MODE	INITIAL	R.D.S.O. DATE	NAME	CROSS REF. ETI/PSI/025-A
				DR		SCALE-N.T.S.
				TC		
				CH		SUB-SCALE