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SPECIFICATION FOR MOSAIC CONTROL PANELS

1.0 SCOPE :-

This specification covers the requirements of completely assembled and wired Mosaic Control Panels consisting of modular and miniature control & monitoring components. The Mosaic Control Panels shall include mosaic grid structure of metallic alloy, various control & monitoring components like pushbutton, LED indicating lamps, annunciation facia windows, semaphore (earth switch position) indicator, indicating meters, various types of selector switches, interposing relays, auxiliary relays, flasher relay etc. It shall also include various passive components like blank tiles, mimic diagrams screen-printed / UV printed on blank tiles, complete with texts engraved/printed as per the requirements.

2.0 GENERAL TECHNICAL REQUIREMENT OF MOSAIC PANEL :-

- i. The material of mosaic modules and blank tiles shall be flame-retardant polycarbonate plastic as per IS304 (UL904). It should have anti-static, non-reflecting, non-toxic properties, and shall be preferably halogen-free. It should also be possible to wipe clean the surface of mosaic tiles with ordinary detergent solution.
- ii. The mosaic grid material shall be metallic alloy/poly carbonate with metallic alloy stiffeners. Necessary anti-corrosion plating/treatment shall be provided as required.
- iii. The surface colour of all mosaic modules and blank tiles shall be RAL 7035 (Light Grey), and surface finish shall be semi-glossy.
- iv. Design of the mosaic grid assembly shall ensure sufficient rigidity, strength and ruggedness. All necessary hardware for ensuring support and strength to the mosaic grid shall be considered.
- v. Design of the grid structure shall also include a buff-finished, metallic (preferably aluminium) framework on all four sides of the assembled grid. Identification of rows and columns as per drawings shall be done on the frame by way of transparent, self-adhesive, printed stickers.
- vi. It should be possible to make alterations to, or filling up of, openings on a grid by simple methods and utilizing readily available tools at any time even after the assembly of the grid. Vendor shall submit explanatory literature/drawing about how this can be done along with the offer/order execution. Any special tool if required shall be considered for supply along with panels.
- vii. As a standard practice, row height and column width shall be taken to be either 24 mm or 25 mm. However other tile sizes are also acceptable based on past supply details and satisfactory performance and will be discussed during order execution.
- viii. Sizes, i.e., number of rows and columns of mosaic grid to be considered by the supplier should be sufficient enough to cater the mounting of fittings required and display of MIMIC in clear and segregated manner. However it should be atleast 60% of the total panel front area.
- ix. Mimic diagrams are to be screen printed / UV printed on blank tiles to form a complete single line diagram. Mimic size shall be of 7mm except busbar which shall be 10 mm. Mimic diagrams shall depict various symbols and shall be in different colours as per RAL standard OR Indian standard IS:5 as per approved drawings.

REV.		PRINTS TO :-	APPROVED –		
ALTD.		Issued Online	Dinesh Pawar		
APPD.			PREPARED	ISSUED	DATE
			Reena Bharti		16/06/2020



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- x. Inscriptions are required for all types of functional components and also on blank tiles/tagging tiles. Inscriptions shall be as per approved drawings to be finalized during order execution.
- xi. All push button/LED modules and annunciation facia modules shall have the electronic circuit installed in high quality printed circuit boards, incorporating SMD technology.
- xii. All push buttons shall have two sets of normally open contacts and shall be individually brought out on separate terminal points; a common terminal point for a set of two NO contacts is not acceptable. All push button shall comply with IS-4794 & IS/IEC-60947 and shall have preferably CE/VDE/UL/CSA/BIS marking.
- xiii. All LEDs shall be designed to operate at specified auxiliary voltage and shall have requisite resistors in series with each of them. All LEDs must conform to IS:13947-5 / IEC-60947-5-1 and shall have preferably CE/VDE/UL/CSA/BIS marking.
- xiv. Annunciator facia modules shall be rated for 220V DC. They shall have planar LEDs in SMD design so as to have uniform illumination over the surface of the front facia. Normally, bi-colour facia is required for trip and non-trip indications. Alarm Sequence shall be site selectable as per ISA sequence by means of DIP switches.
- xv. Semaphore indicators shall be preferably rotating disc type, LED type is also acceptable.
- xvi. All selector switches shall have silver/gold plated switch contacts. Switching current rating of individual contacts of the switches shall not be less than 10 A at 220V DC. Terminal numbers and position labels shall be suitably engraved or inscribed as per approved drawings. Switches shall have preferably CE/VDE/UL/CSA/BIS marking.

3.0 MAJOR FITMENT LIST FOR CONTROL PANELS

A list of major fitments are listed below for mounting on panels, however the list is not exhaustive and any component/fitments necessary to meet the functional requirement envisaged in the specification shall be considered and supplied :

3.1 Fitments for Line-Tie-ST Diameter (2 Sets)

- a. Discrepancy type Breaker Control Switch with LED lamp, 4 Pos (T-NAT-NAC-C) – 3 Nos.
- b. Discrepancy type Isolator Control Switch with LED lamp, 4 Pos (T-NAT-NAC-C) – 8 Nos.
- c. Panel-BCU selector switch (2 Pos.) No. of Poles shall be as per scheme requirement - 3 nos.
- d. Semaphore Indicator for Earth switches - 8 nos.
- e. Ammeter Selector switch - 02 nos. (Built-in meters also acceptable)
- f. Voltmeter Selector switch - 02 nos. (Built-in meters also acceptable)
- g. 4 Digit Digital Voltmeter, Size: 48x96mm, Input: 0-110V AC PT Sec. – 2 Nos.
- h. 4 Digit Digital Ammeter, Size: 48x96mm, Input: 0-1A AC CT Sec. – 2 Nos.
- i. Multi-Function Meter (KWH & KVARh), Input: From CT & PT Secondary – 2 Nos.
- j. Indicating Lamps of colors as per requirement - 6 Nos.
- k. Push Buttons for Alarm Accept, Reset, Test, Silence – 4 Nos.
- l. Synchronising Socket, 12 Pin, BCH make – 3 Nos.
- m. Buzzer/Hooter with LED for Alarm/Trip – 2 Nos.
- n. Alarm annunciator, 48 Window – 1 No.



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3.2 Fitments for Line-Tie-GT Diameter (1 Set)

- a. Discrepancy type Breaker Control Switch with LED lamp, 4 Pos (T-NAT-NAC-C) – 3 Nos.
- b. Discrepancy type Isolator Control Switch with LED lamp, 4 Pos (T-NAT-NAC-C) – 8 Nos.
- c. Panel-BCU selector switch (2 Pos.) No. of Poles shall be as per scheme requirement - 3 nos.
- d. Semaphore Indicator for Earth switches - 8 nos.
- e. Ammeter Selector switch - 02 nos. (Built-in meters also acceptable)
- f. Voltmeter Selector switch - 02 nos. (Built-in meters also acceptable)
- g. 4 Digit Digital Voltmeter, Size: 48x96mm, Input: 0-110V AC PT Sec. – 2 Nos.
- h. 4 Digit Digital Ammeter, Size: 48x96mm, Input: 0-1A AC CT Sec. – 2 Nos.
- i. Multi-Function Meter, Input: From CT & PT Secondary – 2 Nos.
- j. Indicating Lamps of colors as per requirement - 6 Nos.
- k. Push Buttons for Alarm Accept, Reset, Test, Silence – 4 Nos.
- l. Synchronising Socket, 12 Pin, BCH make – 3 Nos.
- m. Buzzer/Hooter with LED for Alarm/Trip – 2 Nos.
- n. Alarm annunciator, 48 Window – 1 No.

3.3 Fitments for Bus Reactor-Tie-Future Diameter (1 Set)

- a. Discrepancy type Breaker Control Switch with LED lamp, 4 Pos (T-NAT-NAC-C) – 2 Nos.
- b. Discrepancy type Isolator Control Switch with LED lamp, 4 Pos (T-NAT-NAC-C) – 6 Nos.
- c. Panel-BCU selector switch (2 Pos.) No. of Poles shall be as per scheme requirement - 2 nos.
- d. Semaphore Indicator for Earth switches - 6 nos.
- e. Ammeter Selector switch - 01 No. (Built-in meters also acceptable)
- f. Voltmeter Selector switch - 01 No. (Built-in meters also acceptable)
- g. 4 Digit Digital Voltmeter, Size: 48x96mm, Input: 0-110V AC PT Sec. – 1 No.
- h. 4 Digit Digital Ammeter, Size: 48x96mm, Input: 0-1A AC CT Sec. – 1 No.
- i. Multi-Function Meter, Input: From CT & PT Secondary – 1 No.
- j. Indicating Lamps of colors as per requirement - 4 Nos.
- k. Push Buttons for Alarm Accept, Reset, Test, Silence – 4 Nos.
- l. Synchronising Socket, 12 Pin, BCH make – 2 Nos.
- m. Buzzer/Hooter with LED for Alarm/Trip – 2 Nos.
- n. Alarm annunciator, 32 Window – 1 No.

3.4 Fitments for Bus-1 & Bus-2 VT (1 Set)

- a. Discrepancy type Isolator Control Switch with LED lamp, 4 Pos (T-NAT-NAC-C) – 2 Nos.
- b. Panel-BCU selector switch (2 Pos.) No. of Poles shall be as per scheme requirement - 1 no.
- c. Semaphore Indicator for Earth switches - 4 Nos
- d. 4 Digit Digital Voltmeter, Size: 48x96mm, Input: 0-110V AC PT Sec. – 2 Nos.
- e. 4 Digit Digital Freq. Meter, Size: 48x96mm, Input: 110V AC PT Sec. – 2 Nos.



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- f. Buzzer/Hooter with LED for Alarm/Trip – 2 Nos.
- g. Alarm annunciator, 24 Window – 1 No.
- h. Indicating Lamps of colors as per requirement - 2 Nos.
- i. Push Buttons for Alarm Accept, Reset, Test, Silence – 4 Nos.

3.5 Common Fitments for complete control panel board (1 Set)

- a. Interposing Contactor relay for contact multiplication – As required for scheme
- b. AC/DC MCB– 1 lot
- c. Socket and plug top (5-15A, 230 VAC) with 15A switch – 1 No for each panel
- d. Panel space heater (75W, 230VAC) with heater switch and thermostat - 1 No for each panel
- e. LED lamp with door switch (18W, 230 VAC) - 1 No for each panel
- f. Alarm Cancellation relay, 240V AC – 1 No.
- g. Incoming DC supply supervision relay – 2 Nos.
- h. Auxiliary relay for DC fail Alarm accept, 220V DC – 1 No.
- i. Flasher Relay for Discrepancy circuit – 1 No.
- j. Latched Contactor relay for Close & Open command - As required for scheme

4.0 SHEET STEEL ENCLOSURE DETAILS

- 1. Floor standing, folded/welded construction control board panels of dimension 2230mm (H) X 3000mm (W) X 1000mm (D) resting on 50 mm high plinth & 15mm thick anti-vibration pad.
- 2. Finish: (Powder coated, Plain Finish). Thickness of coating shall be 60 microns.
 - a) Exterior & Interior: Shade will be RAL7035, Semi Matt finish. However it is subject to end customer acceptance.
 - b) Plinth :- Black
- 3. Cubicle should be suitable for IP:52 degree of protection (IP:31 for Mosaic is acceptable) to IS:13947.
- 4. Base frame, door frames, front sheet of the cubicle shall be manufactured from 3 Thk. C.R.S. sheet and 2.5 mm for rest.
- 5. Panel wiring : PVC insulated, 1100V grade heat resistant, flame retardant, vermin proof & stranded copper conductor wire (ISI mark) conforming to IEC:227, 502 & IS:1554 with conductor cross section and color as finalized during drawing approval.
- 6. For identification of wires numbered ferrules with black letter/ digit over white surface at both ends of wire are to be provided.
- 7. At least 20% spare terminal blocks shall be provided on each terminal strip.
- 8. There shall be a minimum clearance of 250mm between the first terminal block and associated cable gland plate. Also the minimum clearance between edges of two adjacent columns of terminal blocks shall be 150mm.
- 9. Cable gland plate : Cable entry shall be from bottom. Cable gland plate with proper gasket shall be provided. Cable gland plate shall be earthed (connected to earth bar) using copper braided flexible cable. Thickness of gland plate shall be 3mm.
- 10. Lifting Arrangement : Lifting eye bolts as required shall be provided at the top of cubicle. Suitable plugs shall be provided for blanking eye bolts after erection.
- 11. Panel Lock: Concealed handle with built-in lock & shooting bolts with 3 OR 4 point latching at top, middle & bottom.
- 12. Suitable stiffeners & PVC troughs shall be provided at the back of front panel to avoid buckling & waviness after cutouts are made and fitments are mounted.
- 13. Door : Lift off type doors shall be provided to panels. Doors shall be provided with ventilating louvers having fine suitable washable filter for dust proofing. Proper polyurethane or neoprene rubber gasket & door pocket shall be provided. Each door of cubicle shall be connected to earth bar using flexible copper braided cable.

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14. All ferrous components like internal mounting plates, C channels, fuse/MCB panels, brackets etc. shall be painted, same as interior finish, to prevent any kind of rusting or corrosion.
15. Earth Bar : 3 mm* 25mm cross section tin plated copper bar shall be provided at the bottom of the panel across the width and one depth of the cubicle.
16. Stud type terminal blocks. Disconnecting type CATDM4/CDTTS of Elmex/Connectwell for CT and PT circuits. Non disconnecting type CATM3/CSTSB3 of Elmex/Connectwell for other circuits. 20% spare terminals shall be provided.
17. All non-ferrous items shall be zinc passivated/tin plated.

5.0 INSPECTION AND TESTING

1. All electronic components and other raw materials used in the offered mosaic control panel board must be of reputed makes from manufacturers with proven credentials or their authorized dealers. A list of makes/sources of various bought-out items used shall be submitted during order execution for approval.
2. Supplier shall submit, for review by BHEL, the Quality Assurance Plan/Procedure of the manufacturer during order execution for the entire process from incoming goods to finished products.
3. Routine test certificates (as per relevant standard) of all fitments mounted on panel shall be furnished during inspection of these panels.
4. Panels will be inspected and test witnessed by BHEL/Customer's representative at supplier's works or BHEL Bhopal works. In case the customer denies to inspect the panels at supplier works, the supplier shall depute his representative to BHEL Bhopal works to demonstrate testing/functioning of control scheme during inspection. The supplier shall give atleast 15 days advance notice for inspection of panels.
5. Panels shall be subjected to minimum of following tests during inspection:
 - i. Functional and sequence tests shall be carried out for all equipment to verify schematic drawing.
 - ii. Panel wiring shall be tested for High voltage power frequency withstand test by applying 2.0 kV, 50Hz, between all terminals shorted and earth, for one minute.
 - iii. IR value test shall be performed. Panel wiring shall be tested for insulation resistance between all terminals shorted and earth, using a 500V DC Megger for IR value greater than 1 Mega Ohm.
 - iv. Verification of wiring as per approved drawings.
 - v. Electrical control, Interlock and sequential operation tests as per approved schematic drawings.

6.0 GENERAL

1. The control panels offered shall meet the UPRVUNL/ DCPL Specification Clause 13.00.00, 13.04.00, 13.05.00 & 13.06.00 of Chapter-03, Vol-IV.
2. AC Auxiliary Power Supply: 230V with + 10 or – 20% variation, 50Hz with +/- 5% variation, effectively earthed system.
3. DC Auxiliary Power Supply: 220V DC with + 10 or – 15% variation, ungrounded system.

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4. All make of fitments shall be subject to acceptance from end customer/user i.e M/s UPRVUNL/NTPC.
5. Wiring table, GA drawing and schematic drawings are to be supplied in duplicate copies along with the panels in the event of order and are to be housed in a proper weather proof enclosure (pocket) on the rear of the control panel door.
6. Stage of completion of the panels shall be informed continuously, so that BHEL or customer's representatives could inspect the panels at various stages at supplier's works.
7. Deviations, if any, major or minor in nature shall be clearly brought out. Compliance to each clause of the specification and notes shall be specifically confirmed in the offer, else it will be deemed as complied by the vendor.
8. The offer shall be submitted in 2 separate bids (Technical and price). Price breakup of all the fitments shall be furnished along with the price bid.
9. It shall be vendor's responsibility to ensure complete interfacing of control panel with Protection panel. Necessary interface to be taken care in the schematic drawings with Drawing number and Sheet number reference.
10. Any fitment/equipment identified during drawing approval required for functioning of the control system to meet the specification requirement shall be supplied without any price implication to BHEL.
11. Synchronising trolley suitable for 12 pin socket of BCH make shall be in the BHEL scope of supply.
12. Protection panels are under supply by us, our drawings will be shared with successful vendor for control interface.
13. Panels shall be supplied in wooden packing to avoid any damage during transit.
14. All the fitments and Mosaic panel shall be guaranteed by the vendor for successful operation for a period of 36 months from the date of receipt at our works.
15. Following minimum documents are to be submitted with the offer :-
 - i) Catalogue of each component/fitment
 - ii) Catalogue of Mosaic Tile based panels along with original photographs
 - iii) Typical OGA drawing of Control Board along with BOM
 - iv) Manufacturing and testing facilities available for control board
 - v) Mosaic equipment manufacturer's authorization
 - vi) Organizational structure along with contact details
 - vii) Compliance to this specification with seal and signed across each page
16. Following minimum documents are to be submitted for approval within 6 weeks of receipt of order :-
 - i) OGA & detailed schematic drawing of Control Board
 - ii) Quality Plan
 - iii) Data Sheet of each component/fitment

7.0 ENCLOSURES

- a. Single Line Diagram for 400KV Switchyard - 9962-001-TB-572-PVE-P-052
- b. UPRVUNL/ DCPL Specification Chapter-03 (Sh-09 to 16 of 40) : Switchyard, Vol-IV.