

स्विचगियर अभियांत्रिकी प्रभाग/ SWITCHGEAR ENGINEERING DIVISION

बीएचईएल, भोपाल/BHEL, BHOPAL

PURCHASE SPECIFICATION FOR PROCURMENT OF SEMI-FURNISHED, WIRED
CONTROL & RELAY PANEL FOR OUTDOOR CIRCUIT BREAKER OF AP ORDERS

Annexure-A

Rev-03

SI No	Requirements	Compliance (Yes/No)
Item-001	Designed, manufactured, assembled & wired outdoor CRP cubicle for 11kV/33kV outdoor VCB. The detail specification is as detailed below:	
1.0	General Conditions	
1.1	Outdoor, sheet steel CRP Cubicle for 11/33kV VCB shall be designed, manufactured, assembled & wired with all fitments mounted (Except for items mentioned in clause-1.2 below) as per bill of material Table-I, OGA drawing No. 35610051565 Rev-00 & Scheme drawing No. 356200611775. The cubicle shall comply with the specification and drawings in totality	
1.2	Supply of Protection Relay, Master trip Relay, Auxiliary relays, Multifunction meter, Annunciator and Energy Meter as applicable is not in the scope of vendor. These equipment shall be provided by BHEL as free issue item to vendor inside BHEL factory premises. However, wiring of these equipment shall be done by vendor in line with BHEL scheme/wiring diagram at their works and Termination of wires for these equipment to be done inside BHEL factory premises by vendor's representative. Necessary drawing i.e Rear view of these relays/meter will be provided to vendor representative to terminate the lugged wires of exact length.	
1.3	Make of all BOM items shall be as per OGA drawing only, therefore vendor to prepare list of all items (along with type, make and model no.) mounted on each panel and furnish to BHEL for approval before Bulk manufacturing.	
1.4	Equipment conforming to other internationally accepted standards, which ensure equal or higher quality than the standards mentioned would also be acceptable subject to BHEL approval for same.	
1.5	Panel and all items mounted on the panel shall be guaranteed for satisfactory operation for 60 months from the date of receipt of last consignment at site against each PO. If during the guarantee period, the materials are found defective or sub-standard, the same will have to be repaired or replaced free of cost by the vendor within 30 days of intimation.	
1.6	Drawing mentioned in clause 1.1 are typical & only for preparation of offer. In the event of order it is the vendor's responsibility to take latest drawings from BHEL during detailed engineering stage, before bulk manufacturing.	
1.7	Discrepancy if any, found at any stage among drawings and tender specification shall be brought out to the notice of BHEL notice for resolution.	
1.8	Deviations, if any shall be clearly brought out. Compliance to each clause of the specification shall be submitted along with the offer, else it will be deemed as complied by the vendor.	
1.9	The offer shall be submitted in 2 separate bids (Technical and price). If found necessary the bidder shall depute his technical representative for discussions and on the spot finalization/ confirmations of technical points at the time of technical bid opening.	
1.10	Vendor to submit detailed quality plan for approval by BHEL before start executing order.	
1.11	Vendor to provide Type-test report for IP55 with in 1 month of Placement of order. Only Type Tested panels shall be accepted by BHEL.	
1.12	Vendor shall manufacture a proto-type model of the ordered CRP as per specification and offer the same for inspection and routine test by BHEL/Customer's representative at vendor's works or BHEL Bhopal works. Also, stage-wise progress of the panels shall be informed to BHEL for arranging BHEL/ customer's representatives for stage inspection at vendor's works.	
1.13	In case the end customer inspection at vendor works is waived-off, then vendor shall depute his representative to BHEL Bhopal works to demonstrate testing/functioning of scheme during inspection.	

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1.14	All the instruments (Meters, TLK etc.) to be provided on the panel shall be flush mounted.	
1.15	All the indicating meters shall be of 96 sq mm size.	
1.16	All relays shall conform to IS 3231/1966 along with all latest amendments.	
1.17	All the LEDs shall have LVGP protection and surge suppressor circuit. LED lamp assembly shall be of fire retardant glass epoxy PCB, industrial heat resistant, fire resistant, non-hygroscopic DMC material, chrome-plated corrosion resistant solid brass bezel, polycarbonate lens in desired colour shades, the intensity of light should be minimum 100mcd at 20mA. Indication lamp used shall be suitable to operate either on DC voltage or AC Voltage as per application. Universal type i.e LED lamp suitable for both AC/DC voltage range are not acceptable.	
1.18	Other standard accessories, which are not specifically mentioned but are necessary for scheme completion shall be provided.	
1.19	AC Auxiliary Power Supply: 250V with + 10 or – 20% variation, 50Hz with +/- 5% variation, effectively earthed system.	
1.20	DC Auxiliary Power Supply: **VDC with + 20 or – 20% variation.	
1.21	The Vendor will be held responsible for any damages and/or losses of all and any kind that may occur by not following the specification.	
2.0	Construction	
2.1	Dimensions of sheet steel cubicle shall be 1750mm(height) X 650mm(depth) X 800mm(width) resting on 200 mm high legs as per OGA drawing No. 35610051565 Rev-00.	
2.2	Suitable stiffeners shall be provided at the back of front panel to avoid buckling & waviness after cut outs are made and fitments are mounted. PVC troughs shall be provided for neat wiring.	
2.3	Lift off type doors shall be provided to panels. Vendor to ensure that device Door shall be fitted on external channel and not on internal channel as per OGA drawing.	
2.4	Proper polyurethane or neoprene rubber gasket & door pocket shall be provided. Door of cubicle shall be connected to earth bar using 2 runs of 2.5sqmm Green PVC flexible wire.	
2.5	Concealed handle with built-in lock & shooting bolts with 3 point latching at top, middle & bottom shall be provided.	
2.6	Front swing type internal mounting plate of the cubicle shall be manufactured from 3 mm Thk. C.R.S. sheet, Cable gland plate by 4 mm and 2 mm for rest.	
2.7	Lifting lugs shall be provided at the 4 top corners of cubicle for lifting of panels.	
2.8	Powder coated, Plain Finish as per Corporate Standard AA0674124 & AA56159 enclosed. Thickness of coating shall be 80-90 microns. Exterior shade Shall be informed during detailed Engineering Stage while Interior shall be White	
2.9	All ferrous components like internal mounting plates, C channels, fuse panels, brackets etc. shall be painted, same as interior finish, to prevent any kind of rusting or corrosion.	
2.10	Surface treatment shall follow seven tank process. Painting shall be done through process of powder coating with pure polyester base grade A structure finish with UV resistant. Suitable rust resisting primer shall be applied on the interior and exterior surface of steel, which shall be followed by application of an undercoat suitable to serve as base and binder forth finishing coat. The paint shall be guaranteed for 5 years from the date of receipt of material in BHEL.	
2.11	Cubicle should be suitable for IP:55 degree of protection to IS:13947.	
2.12	Cable entry shall be from bottom. Undrilled cable gland plate with proper gasket shall be provided.	
2.13	All non-ferrous items shall be tin plated.	
2.14	Each and every mounted equipment shall have anodised label (front and back) as detailed in in drg.	

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	35610051565.	
2.15	All the Device labels, MCL/BCL, Fuse labels etc. shall be in vendor scope and shall be mounted by vendor before dispatch to BHEL. Details of all the labels are available in drg. 35610051508. Any change in the same shall be communicated during detailed Engineering stage.	
2.16	Panel interior shall be illuminated by CFL lamps/LED BULB OF 9WATT connected to 240V single phase AC supply.	
2.17	Earth Bar : 3 mm X 25mm cross section tin plated copper bar shall be provided at the bottom of the panel across the depth of the cubicle.	
2.18	Earthing of metallic parts or body of equipment on panel shall be done with using 2 runs of 2.5sqmm Green PVC flexible wire..	
2.19	Schematic diagram of CT, PT, CB circuitry along with protection circuitry giving terminal nos. and bus wire shall be printed page-wise in laminated durable stickers and pasted inside the panel door of respective panel and remaining circuit diagrams such as AC, DC Ckt, illumination and annunciation Ckt. Stc., shall be kept in pocket	
2.20	Cable tray type rack shall be provided for mounting of modem near to energy meter of size 20cmX20cmX5cm	
2.21	Device Mounting swing plate of cubicle shall be connected to earth bar using 2 runs of 2.5sqmm Green PVC flexible wire.	
2.22		
3.0	Wiring	
3.1	Terminal blocks shall be of 1100V grade, clip-on to channel, screw driver operated stud type, disconnecting type for CT & PT circuits, non-disconnecting type for rest of the circuits. Disconnecting terminal blocks suitable for taking two lugged wires with conductor cross section of upto 6 sqmm size. Non-disconnecting terminal block shall be suitable for taking two lugged wires with conductor cross section of upto 4 sqmm size. All current carrying part of TBs shall be of tinned brass. The screws shall be of brass & the washers, nuts etc. used for terminal connectors shall also be of tin plated brass.	
3.2	All TBs shall be shrouded by easily removable shrouds made of transparent dielectric material. At least 20% extra terminal block of each type shall be provided in each panel. All terminals shall be provided with ferrules indelibly marked or numbered as per relevant wiring drg. Terminal blocks shall be rated for not less than 15A.	
3.3	Panel wiring for all circuits shall be done with 2.5 sqmm, PVC insulated, 1100V grade heat resistant, vermin proof & stranded copper conductor wire (ISI mark) conforming to IEC:227, 502 & IS:1554 using solder less crimping tinned copper lugs. Insulated sleeves shall be provided to all the wire termination. Termination shall be such that no strand of a conductor shall left loose or overhanging. CT/PT wiring shall be terminated through ring type lugs	
3.4	All the internal wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and TBs. Wiring gutters & troughs shall be used for this purpose. Wiring connected to Space Heaters in the cubicles shall be suitably insulated over safe length from the heater terminals in order to avoid burning of insulation of wire.	
3.5	Colour of wires: 1 phase AC circuit (Phase & Neutral): Black DC circuits (Positive & Negative): Grey Earth: Green Spare contacts: Grey 3 phase CT & PT circuits:	

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	A phase: Red, B phase: Yellow, C phase: Blue and Neutral: Black	
3.6	For identification of wires numbered ferrules with black letter/ digit over white surface at both ends of wire are to be provided. Tubular ferrules is also acceptable.	
3.7	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. All internal wiring to be connected to external equipment shall terminate on vertically mounted terminal blocks on each side of the cubicle.	
3.8	Vendor to specifically note that sequence of wiring termination shall be strictly in line with BHEL wiring tables.	
4.0	Testing and Inspection	
4.1	Serial nos. & Routine test reports of all the items mounted shall be provided to BHEL before Inspection.	
4.2	Panels shall be subjected to the following tests during inspection:	
4.3	Functional and sequence tests shall be carried out for all equipment to verify schematic drawing.	
4.4	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.	
4.5	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.	
4.6	Verification of wiring as per approved drawings.	
4.7	Electrical control, Interlock and sequential operation tests as per approved schematic drawings.	
4.8	Vendor Representative shall be present during testing at BHEL to rectify the defective components of vendor scope and to rectify wiring mistakes, if any.	
4.9	Routine test certificates (as per relevant standard) of all fitments mounted on panel shall be furnished during inspection of these panels.	
4.10	Panels will be inspected and test witnessed by BHEL/Customer's representative at vendor's works or BHEL Bhopal works. In case the end customer denies to inspect the panels at vendor works, the vendor shall depute his representative to BHEL Bhopal works to demonstrate testing/functioning of scheme during inspection. Inspection will be carried out in lots separately.	
5.0	Packing and Despatch	
5.1	The vendor is responsible for the correct and adequate packing of each unit so that these panels will arrive at destination undamaged.	
5.2	The quality of packing of panels shall provide maximum protection against damage, breakage and pilferage during transport, storage and multiple handling, including handling by e.g. hoisting, lifting devices and forklift trucks	
5.3	Wiring table, GA drawing and schematic drawings (prepared by BHEL) are to be supplied in duplicate copies along with each unit and are to be housed in a proper weather proof enclosure (pocket) on the rear of the control panel door.	

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Table-I to Annexure-A: Bill of Material (to be mounted in panel by vendor)

Item	Bill of material	Device Ref	Qty of Fitments for Item-001	Compliance (Yes/No)
1.	Panel wiring of CRP cubicle with ferrules as per BHEL prepared wiring tables and with suitable copper lugs and end sleeves.	-	1 set	
2.	3 & 1/ 2 digit LED display Digital A.C. Ammeter. CT secondary operated. Accuracy Class 0.5. CT ratio shall be programmable in the meter in case of change in CT taps. CT ratio shall be informed during detailed Engineer stage for programing the same before dispatch of panel to BHEL. Auxiliary Supply-110V AC. Size 96 mm square, conforming to IS1248.	A	1	
3.	3 & 1/ 2 digit LED display Digital A.C. Voltmeter. PT secondary operated. Accuracy Class 0.5. PT ratio: 11KV OR 33KV /110V. Range 0–15KV or 0-40KV(11KV OR 33KV corresponds to 110V AC input from PT secondary). PT ratio and range shall be programmable in case of change in PTR. Auxiliary Supply-110V AC. Size 96mm square, conforming to IS1248.	V	1	
4.	Five position Ammeter Selector Switch with R / Y / B / NEUTRAL / OFF" positions	AS	1	
5.	Seven Position Voltmeter Selector Switch with seven positions RY / YB / BR / RN / YN / BN / OFF" positions.	VS	1	
6.	Heavy duty Switch for CB control, having Trip / Neutral / Close positions, spring return to neutral type. Pistol grip handle.	CS	1	
7.	LED type (One Red and one Green) indicating lamp for breaker Close and Trip positions respectively, rated for **VDC supply.	IL	2	
8.	LED type blue colour indicating lamp rated for 240V AC supply for control supply healthy.	IL	1	
9.	LED type white colour indicating lamp rated for **VDC supply for CB spring charged indication.	IL	1	
10.	LED type Amber colour indicating lamp rated for **VDC supply for Auto-trip indication.	IL	1	
11.	LED Type RED,YELLOW & GREEN 63.5V AC for RYB phase Indication of PT Circuit	IL	3	
12.	Screw & back connected type 30Amps Test terminal block, 3 phase, 4 wire, for use with the energy meter.	TBTVM	1	
13.	Auxiliary Contactor for DC Supply monitoring, **VDC.	80D	1	
14.	Auxiliary Contactor for Aux. Contact multiplication, **VDC DC	86X	1	
15.	**VDC DC, 16A MCB as per IS-8828 for incoming DC supply to the CRP. AC & DC MCBs are of Different Colour for Easy identification	MCBDC	1	
16.	240V AC, 16A MCB as per IS-8828 for incoming AC supply to the CRP. AC & DC MCBs are of Different Colour for Easy identification	MCBAC	1	
17.	Socket and plug top (5-15A, 250 VAC) with 15A switch.	SKTS	1	
18.	CFL Illumination lamp with door operated switch (10W, 230 VAC/LED BULB 9WATT)	CFL	1	
19.	Panel space heater (75W, 240VAC) with heater switch and thermostat.	H	1 set	
20.	On demand CB Trip circuit supervision scheme, each set comprising one LED type Yellow colour indicating lamp rated for **VDC supply , one push	-	2 Sets	

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Item	Bill of material	Device Ref	Qty of Fitments for Item-001	Compliance (Yes/No)
	button switch with 2 No contacts for trip circuit healthy check-up & two variable resistors (0-300 ohm).			
21.	Alarm cancellation scheme comprising two auxiliary contactors rated for **VDC, one LED type amber indicating lamp rated for **VDC, two push button switches with black actuator for alarm Accept & Reset and one static buzzer rated for **VDC.	-	2 sets	
22.	Necessary rear connected LT Fuses for Protection and Control Circuits as per drawings.	-	1 set	
23.	Necessary earth link assembly as per drawings.	-	1 set	
24.	1 Set - Brass Cable glands a) CT cable - 5 Core, 2.5 sqmm - 3 Nos. b) PT cable - 4 Core, 2.5 sqmm - 1 No. c) Control cable - 10 Core, 2.5 sqmm - 2 No d) Control cable - 4 Core, 2.5 sqmm - 10 No. e) Two nos. spare glands with suitable dummies for i) 5 Core, 2.5 sqmm, ii) 4 Core, 2.5 sqmm, iii) 10 Core, 2.5 sqmm	-	1 set	
25.	Stud type (Bolt and nut) terminal blocks for disconnecting type for CT and PT circuits. Non-disconnecting type for other circuits. 20% spare terminals shall be provided for both type.	-	1 set	
26.	Suitable copper earth strip of 25 x 3 mm size with adequate number of holes with suitable nuts and bolts.	-	1 set	

**** Auxiliary DC supply voltage shall be confirmed by BHEL after Placement of Purchase order.**