

**SUPPLY OF 03Nos. 11KV OUTDOOR VCB
AT
1X800MW DEEN BANDHU CHHOTU RAM TPP, YAMUNANAGAR, HARYANA**

**VOLUME – I
CONSISTING OF:**

- **Volume-IA: Technical Conditions of Contract,**



**Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
Power Sector – Northren Region,
Plot No. 25 , Sector - 16A ,
Distt. Gautam Budh Nagar, NOIDA – 201 301 (INDIA)**



TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED



TECHNICAL CONDITIONS OF CONTRACT (TCC)

SCOPE OF WORK

1.0 2.0 SCOPE OF WORK

- a. This specification covers design, engineering, manufacturing, testing, inspection before dispatch, packing, forwarding, transportation, insurance during transit, delivery to site/ stores for 02Nos. 11kV Outdoor VCB.
- b. The scope also includes the circuit breakers, current and potential transformers, supporting structures, operating mechanism, relays, 230 AC to DC Power Pack for protection / relay supply, foundation bolts, all the accessories and auxiliary equipment mandatory spares and special tools for satisfactory installation and operation for VCBs.
- c. The scope also includes the circuit breakers, Isolators, current and potential transformers, supporting structures, operating mechanism, relays, 230 AC to DC Power Pack for protection / relay supply, foundation bolts, all the accessories and auxiliary equipment mandatory spares and special tools for satisfactory installation and operation for VCBs.

2.01 OPERATION AND CONTROLS

The breaker shall normally be operated by remote operation. Provisions shall be made for local electrical operation and mechanical operation also. The following facilities shall be provided in the circuit breaker:

- a. LOCAL/ REMOTE selector switch. The selection of "local" operation shall inhibit the operation of the breaker from any remote source.
- b. ON/ NEUTRAL/ OFF controls switches or ON/ OFF push buttons. The push buttons shall be momentary contact type with rear terminal connections.
- c. MECHANICAL EMERGENCY TRIP DEVICE: Suitable for manual operation in the event of failure of electrical supplies. The device shall be accessible without opening any access doors and distinctly labeled. It shall be shrouded and protected against inadvertent operation.
- d. Means shall be provided for manual operation of these circuit breakers during failure of auxiliary power in addition to electrical operation.
- d. Means shall be provided to prevent the mechanism from responding to a close signal when the trip coil is energized or to reclosing from a sustained close signal either opening due to a trip signal or failure to hold in the closed position.

2.02 ENCLOSURE

- a. The enclosure of the VCBs shall be provided in a sheet steel enclosure conforming to IS: 3427.
- b. The panel shall be free standing, dust, moisture, rodents and vermin proof suitable for outdoor installation. The panel shall have a high degree of protection (IP55) for outdoor installation with relevant standard.
- c. All door panels and removable covers shall be gasketed all round with neoprene bonded gasket. Ventilating louvers shall be provided to limit the temperature rise as provided in IS: 12729 and 3427.
- d. The entire equipment shall be enclosed inside this enclosure with only mechanical emergency trip device outside this enclosure.
- e. The housing shall be surface treated and painted in accordance with relevant standards.

2.03 PANEL WIRING AND ACCESSORIES

- a. Each panel shall be supplied with complete internal wiring.

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- b. Panel wiring shall be suitably bunched and clamped for neat appearance. The conductors used for wiring purpose shall be PVC insulated 1100 volt grade semi-flexible heat resistant, flame retardant and vermin proof electrolytic copper cable conforming to IS:1554. Each wire shall be continuous from end to end without any joint in between. All panel wiring shall be capable of withstanding a voltage of 2kV AC 50Hz for one minute.
- c. The size of the conductors for panel wiring shall be not less than 2.5mm².
- d. The wiring used as AC supply for illumination lamp and heater shall be differently colored from control wiring so as to distinguish them from each other. The colour of all earth wire shall be black.

2.04 TERMINAL BLOCKS

Terminal blocks covered by moulded insulating materials with adequate electrical clearances shall be provided for terminating the panel wiring and outgoing connections. The termination shall be made by crimping lugs or bare conductor with insulating sleeves at ends. The arrangement can be horizontal or vertical as per standard practice adopted by the manufacturer. All terminals must be numbered and wire termination provided with numbered ferrules for identification. All numbering and marking including those in wiring diagram shall follow the guidelines provided in IS: 11353. All circuit breaker auxiliary contacts including spare contacts shall be wired to the terminal blocks. Twenty (20%) percent spare terminals shall be provided.

2.05 CIRCUIT DIAGRAM

A durable copy of the circuit wiring diagram shall be affixed to the inner side of the door of the switchgear compartment. Labels shall be provided inside the compartment to describe the functions of the various items of equipment.

2.06 MOTOR

The motor for spring charging shall be single phase 230 Volt AC motor. Continuous motor rating shall be at least ten percent above the maximum load demand of the driven equipment. It shall remain within its rated capacity at all operating points that will arise in service. It shall be protected by HRC cartridge fuses or MCB. The motor shall comply with IS: 996.

2.07 INTERLOCKS

All doors or shutters which give access to live parts shall be interlocked in such a way that these cannot be opened unless the circuit breaker is in the open position. Other interlocks shall be provided as deemed necessary for safety.

2.08 TEMPERATURE RISE

The temperature rises and the maximum temperature of any part of the circuit breaker under continuous load condition and exposed in the direct rays of the sun shall not exceed the permissible limits as provided in Table V of IEC publication 694 or table 4 of IS: 12729. These limits shall not be exceeded when corrected for the difference between the ambient temperature at site and the ambient temperature specified in the standard.

2.09 AUXILIARY POWER

Two separate auxiliary power shall be provided by BHEL for each equipment:

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- **230V AC UPS Power:** To be utilized for auxiliary power of the equipment. Further conversion and storage is in the scope of the vendor.
- **230V AC Power:** To be utilized for Space heater.

2.10 CABLE ENTRY

A removable gland plate shall be provided at the bottom of the cabinet for entry of Purchaser's control, auxiliary power & Power cables in the cabinet.

2.11 DRAWINGS TO BE SUBMITTED FOR APPROVAL

- a. Foundation Drawings.
- b. SLD
- c. GA, GTP & Datasheet.
- d. Termination Block Details.
- e. Control Circuit Wiring Details.
- f. Auxiliary Power Circuit Details along with battery, charger, converter (if any).
- g. Manufacturing Quality Plan.

2.12 TESTS:

- a. Selection of test sample shall be done as per relevant IS.
- b. The conductors shall be subjected to routine and acceptance test in accordance with the relevant IS with latest amendments if any.

2.13 REJECTION AND RE-TESTING:

- a. As per relevant IS with latest amendment if any.
- b. BHEL also reserves the right to check length of the conductor at Store/ Site.
- c. The entire cost of testing for acceptance & routine tests and checking of length etc. shall be borne by the supplier.

2.14 INSPECTION:

- a. The purchaser's representative shall be entitled to have access to the works and all places of manufacturer. The said representative shall have full facilities for un-restricted inspection of supplier's works, raw materials, manufacture of conductor and conducting necessary tests. The supplier shall keep the purchaser informed well in advance of the time of starting and process of manufacture of conductor in its various stages. The acceptance of any quantity of materials shall in no way relieve the supplier of his responsibility for meeting all requirements of the specification and shall not prevent subsequent rejection, if such materials are later found to be defective. The supplier shall give an 07 (seven) days' notice to BHEL for the readiness of material for inspection through BHEL online inspection system. The details shall be shared with the successful bidder.
- b. No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested, unless the inspection is waived off, by the purchaser in writing.

2.15 SUPERVISION SERVICES

The Supplier will arrange for supervision during commissioning of VCBs. The supervision date will be intimated 1 week in advance by BHEL for commissioning of VCBs. Total supervision man-day for commissioning will be 01 day per equipment i.e. total 03 days.

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2.16 PACKAGING AND FORWARDING

The VCBs along with CTs, PTs, etc. as described in this scope should be packed as per relevant IS.

2.17 TRANSPORTATION

The transportation and freight insurance from works of the bidder to the site mentioned is also in the scope of the supplier.

2.18 GUARANTEE/ WARRANTY

The material shall be warranted for satisfactory operation for a period of 12 months from the date of commissioning or 18 months from the date of receipt at site whichever is earlier.

2.19 SPARES TO BE SUPPLIED ALONG WITH THE MAIN EQUIPMENT

SPARES FOR VCB		
S. No.	Description	Quantity
1	Closing Coil	01 Nos.
2	Tripping Coil	01 Nos.
3	Power Pack	01 Nos.

TECHNICAL CONDITIONS OF CONTRACT (TCC) STANDARDS APPLICABLE

3.0 LIST OF STANDARDS APPLICABLE

S. No.	List of IS applicable	Description
1	IS: 3427	AC Metal enclosed switchgear and controlgear for rated voltages above 1kV and up to and including 52kV.
2	IS: 12729	Common High-Voltage Switchgear and Controlgear Standards
3	IS: 1554	Specification for PVC insulated (Heavy Duty) Electrical Cables.
4	IS: 11353	Guide for uniform system of marking and identification of conductors and apparatus terminals.
5	IS: 996	Single phase AC Induction Motor for general purpose.
6	IEC: 694	Polyvinyl chloride insulated unsheathed and sheathed cables/ cords with rigid and flexible conductor for rated voltages up to and including 450/750V.
7	IS: 9920	High Voltage Switches.

NOTE: This list of standards applicable is indicative in nature and cannot be taken as a comprehensive list. All the other standards which are applicable as per the statutory rules and regulations are applicable to this scope.

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DETAILED TECHNICAL SPECIFICATIONS

4.0 TECHNICAL SPECIFICATION

6.1 TECHNICAL SPECIFICATION OF VACUUM CIRCUIT BREAKER

TECHNICAL SPECIFICATION OF VACUUM CIRCUIT BREAKER		
S. No.	Technical Parameters	Values
1	Standard	IS 3427
2	Rated Voltage	12kV
3	11kV Vacuum Circuit Breaker	01 Nos.
4	Mode of Operation	Motorized spring charging with means for manual operation during failure of power in addition to electrical operation.
5	No of Phases	3
6	Rated Frequency	50Hz
7	Power frequency withstand Voltage	28kV
8	Rated Short Circuit Current	21kA for 1sec
9	Degree of Protection	IP55 (Outdoor)
10	Rated Bus-bar Current	Minimum 800A
11	Bus-bar Material & Rating	Copper/ Aluminium (E91E) suitable for minimum 800A with PVC sleeve.
12	Maximum ambient temperature	50°C
13	Energy Meters	Multi-Function Meter
14	Indicating Instruments (Ammeter) with selector switch for individual phases	Analog Ammeter of suitable rating.
15	Indicating Instruments (Voltmeter) with selector switch for individual phases	Analog Voltmeter with feed from Three Phase Line PT.
16	Current Transformers	Dual Core CT: Metering Core: a. Ratio: 350/5A b. Class: 0.2 c. Burden: 2.5VA Protection Core: a. Ratio: 350/5A b. Class: 5P20 c. Burden: 2.5VA
17	Potential Transformers	Shall be provided for Line Voltage (suitable for 11kV). The same shall be fed to Indicating Instruments and Energy Meter. The burden shall be calculated accordingly. Three phase, resin cast, dry type fixed type potential transformer.

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DETAILED TECHNICAL SPECIFICATIONS

18	Protection Required with breaker	4 Element (3 Phase + EF) Non Directional Over current IDMT via numerical relay.
19	Indicating Lamps	Yes
19a	Breaker: OFF/ON/Auto trip/Trip circuit healthy/spring charge indication lamps	As per Manufacturer standard in compliance with IS.
19b	R,Y,B Phase Indication lamps	As per Manufacturer standard in compliance with IS.
20	Pad Lock Arrangement	The doors of the VCB shall be provided with padlock arrangement.
21	Door interlock with breaker	Shall be provided.
22	Terminal Block	20% spare TBs.
23	Emergency Push Button	Emergency push button for tripping the breaker outside the enclosure (on the body) shall be provided.
24	Annunciators & Hooters	Yes
25	Surge Arrestors	To be provided as per IE standards.
26	Space Heater & Thermostats	Yes
27	Power Pack	230V Single Phase UPS feeder is available from BHEL's end. Further conversion and storage for auxiliary supply of the RMU is in the scope of the vendor. The power pack should be capable for minimum 2 trippings even if input to power pack has failed. Separate 230V AC feeder available from BHEL is to be utilized for space heater.
28	Illumination Lamps	One. (The Compartment illumination lamp with door-operated switch shall be provided.)
29	Incoming Cable	1Rx3Cx185sqmm Armoured Al Cable.
30	Outgoing Cables	1Rx3Cx185sqmm Armoured Al Cable.
31	Painting Process	7 tank powder coating, Min Thickness 60 Micron
32	Enclosure Material	Minimum 2mm thick. Base sheet minimum 3mm thick.
33	Earthing Terminals	Earthing Terminals shall be brought out of the enclosure of the VCB for connection with the earth pits. (Earth Pits not in the scope of the vendor.)