

**POWER TRANSMISSION CORPORATION OF UTTARAKHAND LTD.**  
(A Govt. of Uttarakhand Enterprise)  
**CHIEF ENGINEER, OPERATION & MAINTENANCE**  
**GARHWAL ZONE, PTCUL**  
**26 - CIVIL LINES, ROORKEE - 247667**

E- Tender for “Procurement of 245KV & 36KV Circuit Breaker for 220KV Substation Chamba Tehri(G)”.

DOWNLOADED BY: -

M/s / Shri \_\_\_\_\_

| Sr. No. | DESCRIPTION   |  |
|---------|---|--|
| 1.      | Tender No.  | CE/GZR-03/2021-22  |
| 2.      | Name of Work  | “Procurement of 245KV & 36KV Circuit Breaker for 220KV Substation Chamba Tehri(G)”.  |
| 3.      | Completion Time   | <b>04 Months</b>   |
| 4.      | Route Length in Kms.  | --   |
| 5.      | Tender issuing office   | Office of Chief Engineer (O&M) Garhwal Zone, Power Transmission Corporation of Uttarakhand Ltd. " 26-Civil Lines, Roorkee-247667 |
| 6.      | Tender Fees   | <b>Rs. 1,000.00+180.00 (GST@18%) =Rs.1,180.00 (Non refundable)</b>   |
| 7.      | EMD/Bid Security  | <b>Rs. 73,000.00</b>   |
| 8.      | Starting date of issue of Bid documents. The tender document is to be downloaded through website- <a href="http://www.uktenders.gov.in">www.uktenders.gov.in</a> against payment of tender fees as above. The non refundable tender fees as specified above should be sent along with the bids as specified in the bid documents. | 18.04.2021   |
| 9.      | Last date of Request of Bid Documents.  | As per tender notice / corrigendum if any  |
| 10.     | Last date of issue of Bid Documents.  | As per tender notice / corrigendum if any  |
| 11.     | Closing Date of receipt of Bid through E-tendering  | As per tender notice / corrigendum if any  |
| 12.     | Address & Place of Submission of Bid supporting documents.  | Chief Engineer (O&M), Garhwal Zone, PTCUL, 26-Civil Lines Roorkee-247667.  |
| 13.     | Date and Time of Opening of Technical Bid   | As per tender notice / corrigendum if any  |
| 14.     | Address & place of Technical bid(Part-1) opening  | Chief Engineer (O&M), Garhwal Zone, PTCUL, 26-Civil Lines Roorkee-247667.  |
| 15.     | Type of Tender  | Open Tender  |
| 16.     | Validity of Bid   | 180 days after the date of opening of technical bid (Part-I)   |
| 17.     | Contact & Telephone No. of the Tender issuing office  | Phone No.:- 01332-272256<br>Fax No. : 01332-2722315  |
| 18.     | E-mail address of the tender issuing office   | ce_oandmg@ptcul.org<br>chiefengineergarhwal@gmail.com  |

**CHIEF ENGINEER (O&M) GARHWAL ZONE, ROORKEE**

पावर ट्रान्समिशन कारपोरेशन ऑफ उत्तराखण्ड लि0  
मुख्य अभियन्ता (परिचालन एवं अनुरक्षण) कार्यालय,  
गढवाल क्षेत्र, 26- सिविल लाईन्स, रूड़की  
ई-निविदा सूचना

एतदद्वारा, ई-निविदा सं0 सी0ई0/जी0जैड0आर0-03/2021-22 के द्वारा 220के0वी0 उपकेन्द्र चम्बा (टी0ग0) पर 245के0वी0 एवं 36के0वी0 एस0एफ0-6 सर्किट ब्रेकर की आपूर्ति हेतु ई-निविदाएं आमन्त्रित की जाती हैं। ई-निविदा ऑनलाईन/ऑफ लाईन जमा करने की अन्तिम तिथि 19.05.2021 को समय 15.00 बजे तक हैं, जो दिनांक 20.05.2021 को 15.00 बजे खोली जायेगी। ई-निविदा से सम्बन्धित अन्य विस्तृत विवरण ई-निविदा वेबसाईट [www.uktenders.gov.in](http://www.uktenders.gov.in) (Tender ID: 2021\_PTCUX\_32220\_1) से प्राप्त, एवं ई-निविदा सूचना पिटकुल की वेबसाईट [www.ptcul.org](http://www.ptcul.org) पर देखी की जा सकती हैं। ई-निविदा सम्बन्धी जानकारी हेतु मोबाईल नं0 +91-8899890000 से सम्पर्क करें।

मुख्य अभियन्ता (परि0एवं अनु0)

“राष्ट्र हित में बिजली बचायें”

**POWER TRANSMISSION CORPORATION OF UTTARAKHAND LTD.  
OFFICE OF THE CHIEF ENGINEER (OPERATION & MAINTENANCE)  
GARHWAL ZONE, 26-CIVIL LINES, ROORKEE  
E-TENDER NOTICE**

On line, e-tenders against specification No. CE/GZR-03/2021-22 for procurement of 245KV & 36KV SF-6 Circuit Breaker at 220KV Substation Chamba (T.G.) are hereby invited. The last date & time of submission of online/offline bid is upto 15.00 Hours on 19.05.2021 which shall be opened on 20.05.2021 at 15.00Hrs. Details of E-tender can be obtained from E-tender website [www.uktenders.gov.in](http://www.uktenders.gov.in) (Tender ID: [2021\\_PTCUX\\_32220\\_1](https://www.uktenders.gov.in/tender/2021_PTCUX_32220_1)) and information of E-tender can be seen from PTCUL website [www.ptcul.org](http://www.ptcul.org). For any assistance on e-tendering, please contact on Mobile No. +91-8899890000.

CHIEF ENGINEER (O&M)

“SAVE ELECTRICITY IN THE INTEREST OF NATION”

## **Pre Qualifying Criteria**

1. **Scope Of Work:** The scope of work covers the design, manufacturing, assembly, testing at the manufacturer's works and Supply of 245KV and 36KV SF6 Circuit Breaker at 220KV Substation Chamba Tehri(G) for protection system in three phase power network of PTCUL and proper stacking as per direction of site engineer or its representative. All tools & Tackles and other accessories to be used for proper stacking of CB's shall be arranged by the Supplier at its own cost.

## **(A) TECHNICAL-QUALIFYING REQUIREMENTS**

1. Experience of having successfully completed similar supply during last 7 years ending last day of month previous to the one in which applications are invited should be either of the following:
  - a) Three similar completed supply costing not less than the amount Rs. 9.69 Lac.  
Or
  - b) Two similar completed supply costing not less than the amount Rs. 12.11 Lac.  
Or
  - c) One similar completed supply costing not less than the amount Rs. 19.38 Lac.
2. The Bidder/Collaborator/JV Partner must have executed similar supply i.e. he must have "supplied 33KV, 132KV and above circuit breaker" in the last seven years as per above condition and these work should be working satisfactorily. Certificate of completion, Agreement no./PO, Amount of work done and schedule time completion versus actual time of completion work, not less the rank of Executive Engineer of similar work should be submitted.
3. The bidder must comply the technical specification & GTP of Circuit Breaker with vendor name for supply of items from the approved vendor in PTCUL and an undertaking must be submitted with the bid.
4. The Bidder/Collaborator/JV Partner should be manufacture/authorized dealer or should have executed successfully the similar supply.
5. Copies of Supply Orders (as per above criteria) from the Govt. Power Utilities/PSUs/Govt. Organizations/Other Govt. Department for similar supply is required to be submitted along with the bid.
6. MSME rules will be applicable as per Uttarakhand Government. The contractor should submit valid certificate.

## **(B) FINANCIAL-QUALIFYING REQUIREMENTS**

1. **Minimum Average Annual Turnover (MAAT):-** The minimum annual average turnover for the preceding best three years (36 months) out of last five financial years should not be less than **Rs. 36.34 Lacs**. (Balance sheet / Documentary proof for last five years should be enclosed). The balance sheet and all other financial documents attested/ certified by CAs to substantiate fulfillment of FQR should be with UDIN.
2. For Financial Qualification Criteria, lead partner of JV Firms should meet minimum 50% of Financial Qualification Requirement (FQR) and collectively meet total FQR. All partners of JV Firms should have the experience for activities of construction/ manufacturing of items or equipments/supply of items or equipments or products, meant for transmission utilities only.
3. Experience of having successfully completed similar Supply's during last 7 years ending last day of month previous to the one in which applications are invited should be either of the following;
  - a) Three similar completed supply costing not less than the amount Rs. 9.69 Lac.  
Or
  - b) Two similar completed supply costing not less than the amount Rs. 12.11 Lac.  
Or
  - c) One similar completed supply costing not less than the amount Rs. 19.38 Lac
4. The bidder have to submit affidavit of all ongoing projects which are not completed and Net worth of the ongoing project which are not completed at the time of bidding.  
(Not completed project means project in Government, Government undertaking or Private sector also include the LOA/Agreement which are allotted/ executed but Supply has not started at the time of bidding)
5. The bidder has to submit the latest Balance sheet and CA Certificate (along with the UDIN no.) for the Net Worth at the time of bidding.

6. Experience certificate should be issued by an officer not below the rank of Executive Engineer mentioning nature of Supply, Agreement No., Amount of Supply, Scheduled time of completion of Supply and Actual time of completion etc. Completion certificate from officer shall be enclosed by contractor.
7. **Access to Finances:** The Bidder must demonstrate access to or availability of financial resources such as liquid assets, unencumbered real assets, lines of credit, and other financial means, other than any contractual advance payments to meet the following cash flow requirements Rs. 7.27 Lac supported by documents in form access to credit facilities.

**(C) Additional Documents**

- (a) Copy of PAN no. of the firm/ Company or PAN no. of all its partner's in case of partnership firm or PAN no. of the individual, in case of proprietorship.
- (b) The Tenderers should have submitted copy of Goods & Service Tax (GST) Registration.
- (c) The Employee Provident Fund (EPF) Registration Number shall be a mandatory PQR. (Documentary proof of the same shall be enclosed with tender document).
- (d) RTGS/ NEFT Details of the bidder are to be submitted.
- (e) Latest Solvency certificate not more than 3 months old issued by bank (20% of bid value) should be submitted.
- (f) The balance sheet and all other financial documents attested/certified by CAs to substantiate fulfillment of FQR should be with UDIN, failing which the tender will be summarily rejected without any further reference.
- (g) Registration. No. under Shops & Estt. Act/issuing authority.
- (h) Details of Partners/Directors of the Firm/Company.
- (i) Experience record and details of orders pending/executed for various utilities.
- (j) Detail of Manufacturing/Fabrication facilities.
- (k) Factory Registration/license details.
- (l) Valid 'A' Class Electrical Contractor License.

**Annexure-III**

**COMPLETION PERIOD:**

The Supply shall be completed within 04 Months from the date of approval of drawing/GTP. The bidder will submit the drawing/GTP with in 15days from the date of PO/LOA.

**ENGINEER INCHARGE:**

Superintending Engineer, Operation & Maintenance Circle, Srinagar(G) shall be the Supervision/Engineer In-charge of the Supply.

**PERFORMANCE GUARANTEE PERIOD:**

The Supply under contract shall be under performance guarantee for 24 months from the date of completion of Supply. In case the Supply under performance guarantee period is found poor/unsatisfactory, Contractor will replace the same free of cost.

**PERFORMANCE GUARANTEE DEPOSIT:**

In order to ensure faithful completion of the contract, the successful Contractor shall furnish Performance guarantee in the shape of FDR/TDR/CDR/Bank Guarantee equal to 10% of contract value duly pledged in the name of **Executive Engineer 220KV Operation & Maintenance Division, ChambaTehri (G)** at the time of Agreement which shall be released after successful performance guarantee period of 24 months from the date of completion of Supply satisfactorily. If the performance guarantee is above Rs. 50,000.00 then the Contractor shall furnish only P B.G.

**The site engineer of company should be available at site whenever called by PTCUL at time of erection and commissioning of the Circuit Breaker.**

## Annexure-IV

### CIRCUIT BREAKERS

#### 1.0 General

- 1.1 The circuit breakers and accessories shall conform to IEC: 62271-100, IEC : 60694 and other relevant IEC standards except to the extent explicitly modified in the specification and shall also be in accordance with requirements specified.
- 1.2 245/145KV circuit breakers offered would be of Sulphur Hexafluoride (SF6) type and 33 KV Circuit Breaker would be SF6 type as per IEC.
- 1.3 The circuit breaker shall be complete with terminal connectors, operating mechanism, control cabinets, piping, interpole cable, cable accessories like glands terminal blocks, marking ferrules, lugs, pressure gauges, density monitors (with graduated scale), galvanized support structure for CB and control cabinets, their foundation bolts and all other circuit breakers accessories required for carrying out all the functions the CB is required to perform.  
All necessary parts to provide a complete and operable circuit breaker installation such as main equipment, terminals, control parts, connectors and other devices whether specifically called for herein or not shall be provided.
- 1.4 The support structure of circuit breakers as well as that of control cabinet shall be hot dip galvanized. All other parts shall be painted as per shade 697 of IS-5.

#### 2.0 DUTY REQUIREMENTS:

- 2.1 Circuit breaker shall be C2 - M2 class as per IEC 62271-100. The circuit breakers shall be capable of performing their duties without opening resistors.
- 2.2 The circuit breaker shall meet the duty requirement for any type of fault or fault location also for line switching when used on a 245/133 kV effectively grounded system, and perform make and break operations as per the stipulated duty cycle satisfactorily.
- 2.3 The breaker shall be capable of interrupting the steady state and transient magnetizing current corresponding of power transformers.
- 2.4 The circuit breaker shall also be capable of:
- i) Interrupting line/cable charging current as per IEC without use of opening resistors.
  - ii) Clearing short line fault (Kilometric faults) with source impedance behind the bus equivalent to symmetrical fault current specified.
  - iii) Breaking 25% of the rated fault current at twice rated voltage under phase opposition condition.
- 2.5 The Breaker shall satisfactorily withstand the high stresses imposed on them during fault clearing, load rejection and re-energization of lines with trapped charges.

#### 3.0 TOTAL BREAK TIME:

- 3.1 The total break time as specified under this Chapter shall not be exceeded under any of the following duties:
- i) Test duties 1, 2, 3,4,5 (TRV as per IEC: 62271-100)
  - ii) Short line fault L75, L90 (-do-)
- 3.2 The Bidder may please note that total break time of the breaker shall not be exceeded under any duty conditions specified such as with the combined variation of the trip coil voltage, (70%-110%), pneumatic/hydraulic pressure and arc extinguishing medium pressure etc. While furnishing the proof of the total break time of complete circuit breaker, the Bidders may specifically bring out the effect of non-simultaneity between contacts within a pole or between poles and show how it is covered in the guaranteed total break time.

**3.3** The values guaranteed shall be supported with the type test reports.

#### **4.0 CONSTRUCTIONAL FEATURES:**

The features and constructional details of circuit breakers shall be in accordance with requirements stated hereunder:

##### **4.1 Contacts**

**4.1.1** The gap between the open contacts shall be such that it can withstand at least the rated phase to ground voltage for 8 hours at zero gauge pressure of SF-6 gas due to the leakage. The breaker should be able to withstand all dielectric stresses imposed on it in open condition at lock out pressure continuously (i.e. 2 p.u. across the breaker continuously).

**4.2** If multibreak interrupters are used, these shall be so designed and augmented that a uniform voltage distribution is developed across them. Calculations/test reports in support of the same shall be furnished. The Thermal and voltage withstand of the grading elements shall be adequate for the service conditions and duty specified.

##### **4.3 The SF-6 Circuit Breaker shall meet the following additional requirements:**

- a) The circuit breaker shall be single pressure type. The design and construction of the circuit breaker shall be such that there is a minimum possibility of gas leakage and entry of moisture. There should not be any condensation of SF-6 gas on the internal insulating surfaces of the circuit breaker.
- b) All gasketed surfaces shall be smooth, straight and reinforced, if necessary, to minimize distortion and to make a tight seal, the operating rod connecting the operating mechanism to the arc chamber (SF-6 media) shall have adequate seals. The SF6 gas leakage should not exceed 1% per year. In case the leakage under the specified conditions is found to be greater than 1% after one year of commissioning of circuit breaker, the manufacturer will have to supply free of cost, the total gas requirement for subsequent ten (10) years, based on actual leakage observed during first year of operation after commissioning.
- c) In the interrupter assembly there shall be an absorbing product box to minimize the effect of SF6 decomposition products and moisture. The material used in the construction of the circuit breakers shall be such as fully compatible with SF6 gas decomposition products.
- d) Each pole shall form an enclosure filled with SF-6 gas independent of two other poles ( 245kV CB) and the SF6 density of each pole shall be monitored. For CBs of voltage class of 145kV or less, a common SF6 density monitor shall be acceptable, however for 33 KV density switch with detachable density monitor is also acceptable.
- e) The dial type SF6 density monitor shall be adequately temperature compensated to model the pressure changes due to variations in ambient temperature within the body of circuit breaker as a whole. The density monitor shall have graduated scale and shall meet the following requirements:
- f) It shall be possible to dismantle the density monitor for checking/replacement without draining the SF-6 gas by providing suitable interlocked non return valve coupling.

- g) Each Circuit Breaker shall be capable of withstanding a vacuum of minimum 8 millibars without distortion or failure of any part.
- h) Sufficient SF6 gas including that will be required for gas analysis during filling shall be provided to fill all the circuit breakers installed. In addition spare gas shall be supplied in separate unused cylinders as per requirement.

**4.4** Provision shall be made for attaching an operational analyser after installation of circuit breakers at site to record contact travel, speed and making measurement of operating timings, preinsertion timings of closing resistors if used, synchronization of contacts in one pole. In case operation analyser is already available at a particular site, the contractor shall have to supply a suitable adapter/transducer so that the offered circuit breaker can be used with the operational analyser.

**5.0 SULPHUR HEXAFLUORIDE GAS (SF-6 GAS):**

- a) The SF6 gas shall comply with IEC 376, 376A and 676B and shall be suitable in all respects for use in the switchgear under the operating conditions.
- b) The high pressure cylinders in which the SF6 gas is shipped and stored at site shall comply with requirement of the relevant standards and regulations.
- c) Test: SF6 gas shall be tested for purity, dew point air, hydrolysable fluorides and water content as per IEC 376, 376A and 376B and test certificate shall be furnished to Employer indicating all the tests as per IEC 376 for each lot of SF 6 gas in stipulated copies as indicated in Chapter-GTR. Gas bottles should be tested for leakage during receipt at site.

**6.0 INSULATORS:**

- a) The porcelain of the insulators shall conform to the requirements stipulated under Chapter-GTR.
- b) The mechanical characteristics of insulators shall match with the requirement specified under this Chapter.
- c) All insulators shall conform to IEC-61264 (for pressurized hollow column insulators) and IEC-233 (for others). All routine and sample tests shall be conducted on the hollow column insulators as per these standards with requirements and procedure modified as under:
  - i) Pressure test as a routine test.
  - ii) Bending load test as a routine test.
  - iii) Bending load test as a sample test on each lot.
  - iv) Burst pressure test as a sample test on each lot
  - v) In addition to above, ultrasonic test shall be carried out as additional routine test.
- d) Hollow Porcelain for pressurized columns/chambers should be in one integral piece in green and fired stage.

**7.0 SPARE PARTS AND MANDATORY MAINTENANCE EQUIPMENT:**

The bidder shall include in his proposal spare parts and maintenance equipment. Calibration certificates of each maintenance equipment shall be supplied along with equipment.

**8.0 OPERATING MECHANISM AND CONTROL**

**8.1 General Requirements**

**8.1.1** Circuit breaker shall be operated by spring charged mechanism. The mechanism shall be housed in a weather proof and dust proof control cabinet.

**8.1.2** The operating mechanism shall be strong, rigid, not subject to rebound and shall be readily accessible for maintenance for a man standing on ground.

**8.1.3** The mechanism shall be antipumping and trip free (as per IEC definition) under every method of closing.

- 8.1.4** The mechanism shall be such that, the failure of any auxiliary spring will not prevent tripping and will not cause trip or closing operation of the power operating devices.
- 8.1.5** A mechanical indicator shall be provided to show open and close position of the breaker. It shall be located in a position where it will be visible to a man standing on the ground level with the mechanism housing closed. An operation counter shall also be provided in the control cabinet.
- 8.1.6** Working parts of the mechanism shall be corrosion resisting material, bearing which require grease shall be equipped with pressure type grease fittings. Bearing pin, bolts, nuts and other parts shall be adequately pinned or locked to prevent loosening or changing adjustment with repeated operation of the breaker.
- 8.1.7** The bidder shall furnish detailed operation and maintenance manual of the mechanism along with the operation manual for the circuit breaker. The instruction manuals shall contain exploded diagrams with complete storage, handling, erection, commissioning, troubleshooting, servicing and overhauling instructions.
- 8.2 Control:**
- 8.2.1** The close and trip circuits shall be designed to permit use of momentary contact switches and push buttons.
- 8.2.2** Each breaker pole shall be provided with two (2) independent tripping circuits, pressure switches and coils, each connected to a different set of protective relays.
- 8.2.3** The breaker shall normally be operated by remote electrical control, electrical tripping shall be performed by shunt trip coils. However, provision shall be made for local electrical control. For this purpose a local/remote selector switch and close and trip control switch/push buttons shall be provided in the Breaker central control cabinet.
- 8.2.4** The trip coils shall be suitable for trip circuit supervision during both open and close position of breaker. The trip circuit supervision relay would be provided on relay panels.
- 8.2.5** Closing coil and associated circuits shall operate correctly at all values of voltage between 85% and 110% of the rated voltage. Shunt trip coil and associated circuits shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity of the circuit breaker and at all values of supply voltage between 70% and 110% of rated voltage. However, even at 50% of rated voltage the breaker shall be able to open. If additional elements are introduced in the trip coil circuit their successful operation and reliability for similar applications on outdoor circuit breakers shall be clearly brought out in the additional information schedules.
- 8.2.6** Density Meter contacts and pressure switch contact shall be suitable for direct use as permissive in closing and tripping circuits. Separate contacts have to be used for each of tripping and closing circuits. If contacts are not suitably rated and multiplying relays are used then fail safe logic/schemes are to be employed. DC supplies for all auxiliary circuits shall be monitored and provision shall be made for remote annunciations and operation lockout in case of DC failures. Density monitors are to be so mounted that the contacts do not change on vibration during operation of circuit Breakers.
- 8.2.7** The auxiliary switch of the breaker shall be positively driven by the breaker operating rod.
- 8.2.8** The preferred basic control schematic of the Circuit breaker is enclosed with the bid documents and it is expected to be followed by the bidder. This however, does not absolve the bidder from the responsibility for safe and reliable operation of the breaker in its lifetime.
- 8.3 Spring operated mechanism:**
- a) Spring operated mechanism shall be completed with motor in accordance with Chapter-GTR. Opening spring and closing spring with limit switch for automatic charging and other necessary accessories to make the mechanism a complete operating unit shall also be provided.
- b) As long as power is available to the motor, a continuous sequence of the closing and opening operations shall be possible. The motor shall have adequate thermal rating for this duty.



- c) After failure of power supply to the motor one close open operation shall be possible with the energy contained in the operating mechanism.
- d) Breaker operation shall be independent of the motor which shall be used solely for compressing the closing spring. Facility for manual charging of the closing spring shall also be provided. The motor rating shall be such that it requires not more than 30 seconds for full charging of the closing spring.
- e) Closing action of circuit breaker shall compress the opening spring ready for tripping.
- f) When closing springs are discharged after closing a breaker, closing springs shall be automatically charged for the next operation and an indication of this shall be provided in the local and remote control cabinet.
- g) Provisions shall be made to prevent a closing operation of the breaker when the spring is in the partial charged condition. Mechanical interlocks shall be provided in the operating mechanism to prevent discharging of closing springs when the breaker is already in the closed position.
- h) The spring operating mechanism shall have adequate energy stored in the operating spring to close and latch the circuit breaker against the rated making current and also to provide the required energy for the tripping mechanism in case the tripping energy is derived from the operating mechanism.

#### **9.0 SUPPORT STRUCTURE:**

- a) The Structure design shall be such that during operation of circuit breaker vibrations are reduced to minimum.
- b) If required, the Contractor shall provide suitable platform with steps on both sides of the circuit breaker for easy accessibility for monitoring the density/pressure of gas.

#### **10.0 TERMINAL CONNECTOR PAD:**

The circuit breaker terminal pads shall be made up of high quality electrolytic copper or aluminum. The terminal pad shall have protective covers which shall be removed before interconnection.

#### **11.0 INTERPOLE CABLING:**

**11.1** All cables to be used by contractor shall be armoured and shall be as per IS-1554 (1100 Volts Grade). All cables within & between circuit breaker poles shall be supplied by the CB manufacturer.

**11.2** Only stranded conductor shall be used. Minimum size of the conductor shall be 2.5 sq. mm (Copper).

**11.3** The cables shall be with oxygen index Min-29 and temperature index as 250<sup>o</sup> C as per relevant standards.

#### **12.0 FITTINGS AND ACCESSORIES**

**12.1** Following is a partial list of some of the major fittings and accessories to be furnished by Contractor in the Central Control cabinet. Number and exact location of these parts shall be indicated in the bid.

- i) Cable glands (Double compression type), Lugs, Ferrules etc.
- ii) Local/remote changeover switch.
- iii) Operation counter.
- iv) Pneumatic/hydraulic pressure gauges.
- v) Control switches to cut off control power supply.
- vi) Fuses as required.
- vii) The number of terminals provided shall be adequate enough to wire out all contacts and control circuits plus 24 terminals spare for future use.
- viii) Antipumping relay.
- ix) Pole discrepancy relay.
- x) D.C. Supervision relays.
- xi) Rating and diagram plate in accordance with IEC incorporating year of manufacture.

- 12.2** Additional fitting for pneumatically operated circuit breaker.
- a) Unit compressed air system in accordance with Clause 16.0
  - b) Breaker air receivers.
  - c) Pressure gauge, spring loaded safety valve and pressure switch with adjustable contacts.
  - d) Pressure switch to initiate an alarm if the pressure in the auxiliary reservoir remains below a preset level for longer than it is normally necessary to refill the reservoir.
  - e) Stop, non-return and other control valves, pipings and all accessories upto breaker mechanism housing.

**13.0 ADDITIONAL DATA TO BE FURNISHED ALONGWITH THE OFFER:**

- a) Drawing, showing contacts in close, arc initiation, full arcing, arc extinction and open position.
- b) The temperature v/s pressure curves for each setting of density monitor along with details of density monitor.
- c) Method of checking the healthiness of voltage distribution devices (condensers)provided across the breaks at site.
- d) Data on capabilities of circuit breakers in terms of time and number of operations at duties ranging from 100% fault current to load currents of the lowest possible value without requiring any maintenance or checks.
- e) The effect of non-simultaneity between contacts& between poles and also show how it is covered in the guaranteed total break time.
- f) Sectional view of non-return couplings if used for SF6 pipes.
- g) Details & type of filters used in interrupter assembly and also the operating experience with such filters.
- h) Details of SF-6 Gas:
  - i) The test method used in controlling the quality of gas used in the circuit breakers particularly purity and moisture content.
  - ii) Proposed tests to assess the conditions of the SF6 within a circuit breaker after a period of service particularly with regard to moisture contents of the gas.
- i) A complete catalogue on operation analyzer satisfying all the requirements of this Chapter.
- j) The bidders shall furnish along with the bid, curves supported by test data indicating the opening time under close open operation with combine variation of trip coil voltage and pneumatic/hydraulic pressure.
- k) Detailed literature and Schematic diagrams of switching mechanism for closing resistor showing the duration of insertion shall also be furnished along with the calculations in respect of thermal rating of resistors for the duties specified under clause 2.2 of this chapter.
- l) All duty requirements as applicable to 420 kV & 245 kV CBs specified under Clause 2.0 of this Chapter shall be provided with the support of adequate test reports to be furnished alongwith the bid, failing which the bid is likely to be rejected.
- m) Field test report or laboratory test report in case of CB meant for reactor switching duty.

**14.0 TESTS:**

**14.1** In accordance with the requirement stipulated under Chapter-GTR the circuit breaker along with its operating mechanism shall conform to IEC: 62271-100.

**14.2** The test reports of the type tests and the following additional type test shall also be submitted for Purchaser's review:

- i) Corona extinction voltage test (as per Annexure-A of Chapter-GTR).
- ii) Out of phase closing test as per IEC: 62271-100.
- iii) Line charging breaking current for proving parameters as per clause No. 15.14 of this Chapter.

- iv) Test to demonstrate the Power Frequency withstand capability of breaker in open condition at Zero Gauge pressure (Ref. Clause 4.1.1) and at lockout pressure.
- v) Seismic withstand test (As per Annexure-B of Chapter-GTR) in unpressurised condition.
- vi) Verification of the degree of protection.
- vii) Low & high temperature test (if applicable).
- viii) Humidity test (if applicable).
- ix) Static Terminal Load Test.
- x) Critical Currents test (if applicable).
- xi) Switching of Shunt Reactors.

#### 14.3 Routine Tests

Routine test as per IEC: 62271-100 shall be performed on all circuit breakers.

In addition to the mechanical and electrical test specified by IEC, the following tests shall also be performed.

- 1) Speed curves for each breaker shall be obtained with the help of a suitable operation analyser to determine the breaker contact movement during opening closing, auto-reclosing and trip free operation under normal as well as limiting operating conditions (control voltage pneumatic/hydraulic pressure etc.). The tests shall show the speed of contacts directly at various stages of operation, travel of contacts, opening time, closing time, shortest time between separation and meeting of contacts at break make operation etc. This test shall also be performed at site for which the necessary operation analyser along with necessary transducers, cables, console, etc. where included in scope supply shall be furnished and utilized. In case of substations where operation analyzer is existing the bidder shall utilize the same. However necessary adopter and transducer etc. if required shall have to be supplied by the bidder.
- 2) Measurement of Dynamic Contact resistance measurement for arcing & main contacts. Signature of Dynamic contact resistance measurements shall be taken as reference for comparing the same during operation and maintenance in order to ascertain the healthiness of contracts.

#### 14.4 Site Tests

1. Routine test except power frequency voltage dry withstand test on main circuit breaker shall be repeated on the completely assembled breaker at site.

#### 15.0 TECHNICAL PARAMETERS FOR CIRCUIT BREAKER:

| S.No  | Details   | Unit                          | 220 KV system             | 33 KV system              |
|-------|---|-------------------------------|---------------------------|---------------------------|
| 1     | Rated current   | A                             | 2000                      | 1600                      |
| 2     | Operating mechanism   |                               | Spring-spring             | Spring-spring             |
| 3     | Rated fault current and its duration                                | kA                            | 40 (1 sec.)               | 25 (3 sec.)               |
| 4     | Rated short circuit making current                                  | kA <sub>p</sub>               | 100                       | 62.5                      |
| 5     | Rated opening duty cycle  |                               |                           |                           |
| 5 (a) | For auto – reclosing type   |                               | O-0.3 sec- CO- 3 min.- CO | O-0.3 sec- CO- 3 min.- CO |
| 5(b)  | For non-auto reclosing type   |                               | -                         | CO-15 sec. – CO           |
| 6     | Lightning (full wave) impulse withstand voltage (1.2/50 micro sec.) | kV <sub>p</sub>               | 1050                      | 170                       |
| 8     | One min. power frequency withstand voltage                          | kV <sub>rm</sub> <sub>s</sub> | 460                       | 70                        |
| 9     | Minimum corona extinction voltage in open                           | kV <sub>rm</sub> <sub>s</sub> | 156                       | -                         |

|           |  |            |                                  |     |
|-----------|--|------------|----------------------------------|-----|
|           | and close position   |            |                                  |     |
| <b>10</b> | Maximum radio interference voltage for frequency between 0.5 to 2 MHz in open and close position | Micro-volt | 1000 (at 156 KV <sub>rms</sub> ) | -   |
| <b>11</b> | First pole to clear factor   |            | 1.3                              | -   |
| <b>12</b> | Maximum line charging current (rms)  | A          | 125                              | 10  |
| <b>13</b> | Rated cable charging breaking current capacity (rms)   | A          | 250                              | 50  |
| <b>14</b> | Break time:  |            |                                  |     |
| <b>a</b>  | - total break time upto rated breaking current   | ms         | 65                               | 105 |
| <b>b</b>  | - rated break time   | ms         | 60                               | 100 |
| <b>15</b> | Maximum noise level  | dB         | 140                              | 140 |
| <b>16</b> | Closing time   | ms         | 100                              | 100 |
| <b>17</b> | DC control voltage   | V          | 110                              | 110 |
| <b>18</b> | Auxiliary contacts continuous current rating   | A          | 10                               | 10  |
| <b>19</b> | Auxiliary contact breaking capacity (for circuit time constant $\geq 20$ ms)                     | A          | 2                                | 2   |

## 16.0 TESTING AND COMMISSIONING

**16.1** An indicative list of tests is given below. Contractor shall perform any additional test based on specialties of the items as per the field Q.P/instructions of the equipment Supplier or Employer without any extra cost to the Employer. The Contractor shall arrange all instruments required for conducting these tests along with calibration certificates and shall furnish the list of instruments to the Employer for approval.

- a) Insulation resistance of each pole.
- b) Check adjustments, if any suggested by manufacturer.
- c) Breaker closing and opening time.
- d) Slow and Power closing Operation and opening.
- e) Trip free and anti pumping operation.
- f) Minimum pick-up voltage of coils.
- g) Dynamic Contact resistance measurement.
- h) Functional checking of compressed air plant and all accessories.
- i) Functional checking of control circuit interlocks, tripping through protective relays and auto reclose operation.
- j) Insulation resistance of control circuits, motor etc.
- k) Resistance of closing and tripping coils.
- l) SF6 gas leakage check.
- m) Dew Point Measurement.
- n) Calibration of pressure switches and gas density monitor.
- q) Checking of mechanical 'CLOSE' interlock, wherever applicable.