

**ASSAM ELECTRICITY GRID CORPORATION LIMITED**

OFFICE OF THE MANAGING DIRECTOR

Regd. Office: (FIRST FLOOR), BIJULEE BHAWAN,
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CIN: U40101AS2003SGC007238 GSTIN: 18AAFCA4973J9Z3

PHONE: 0361-2739520 Web: www.aegcl.co.in**CORRIGENDUM-III**

BID IDENTIFICATION NO: AEGCL/MD/CGM(O&M)/CAR/Srikona/Aug/33 KV/EQP. /2023/BID
TENDER DETAILS/NAME OF WORK: Supply of 33 KV Equipment for Augmentation Works at 132 KV Srikona
GSS

With reference to the above, the item description in BOQ (**Schedule No. 1-Supply and Schedule No. 2-Freight and Insurance**) is amended to be read as below:

Sl. No.	Item description
1	Supply of Current Transformers (1 phase, 0.2 class live tank type) including all accessories and terminal connectors as required (so as to retrofit in the existing foundation) and as per Bid specification
1.01	36 kV, 1200-600 /1-1-1
2	Supply of 33kV, 25KA, 1250 A motor operated isolators including terminal connectors and complete with all fittings and fixtures as required (so as to retrofit in the existing foundation) and as per Bid specification
2.01	With Earth switch
2.02	Without Earth switch
3	Lightning Arrester with surge monitor & terminal connectors complete as required (so as to retrofit in the existing foundation) and as per Bid specification
3.01	33 kV Lightning Arrester
4	33kV Gang Operated SF6/Vacuum Circuit Breaker including all accessories and terminal connectors as required (so as to retrofit in the existing foundation) and as per Bid specification
4.01	33kV Gang Operated SF6/Vacuum Circuit Breaker

Note:

1. The interested bidders are requested to quote in the existing BoQ uploaded in the e-tender portal keeping in mind the aforementioned amended item descriptions. The modified descriptions (as above) shall be incorporated by AEGCL in the evaluation stage.
2. Technical Specifications for Vacuum Circuit Breaker are enclosed as Annexure-I.

All other terms and conditions of the bid document shall remain same.

Sd/-

Chief General Manager (PP&D)
Assam Electricity Grid Corporation Limited

Memo No: AEGCL/MD/ CGM(O&M)/CAR/Srikona/Aug/33 KV/EQP./2023/24(a) Date: 12.04.2023

Copy to:

1. IT Cell, O/o the MD, AEGCL, for publication of the corrigendum in AEGCL's Website (Soft copy enclosed)

12/04/2023
Chief General Manager (PP&D)
Assam Electricity Grid Corporation Limited

Annexure-I

BIDDING DOCUMENT FOR

**“Supply of 33 kV equipment for augmentation works at 132 kV Srikona
GSS”**



(E-Tender)

(VOL – II: Technical Specifications for Vacuum Circuit Breakers)

BID IDENTIFICATION NO:

AEGCL/MD/ CGM(O&M)/CAR/Srikona/Aug/33kV/EQP. /2023/BID

**ASSAM ELECTRICITY GRID
CORPORATION LIMITED**

TECHNICAL SPECIFICATION OF 36 KV OUTDOOR TYPE PORCELAIN CLAD VACUUM CIRCUIT BREAKERS (PCVCB)

4.7 GENERAL TECHNICAL REQUIREMENTS

4.7.1 INTRODUCTION

The circuit breakers should be complete in all respects with insulators, bimetallic connectors, interrupting chamber, operating mechanism control cabinet, interlocks, auxiliary switches indicating devices, supporting structures, accessories, etc., described herein and briefly listed in the schedule of requirements. The scope of supply shall also include necessary special tools and plants required for erection as indicated, if any.

4.7.2 STANDARDS

The circuit breaker shall conform in all respects to the requirements of latest issue of IS/IEC specifications except for modifications specified herein. The equipment manufactured according to any other authoritative standards which ensure an equal or better quality than the provision of IS/IEC specifications shall also be acceptable. The salient point of difference between the proposed standard and provision of these specification shall be clearly brought out in the tender. A copy of English version of such specifications shall be enclosed with the tender.

The list of standards mentioned in this specification and to which the circuit conform is given below:

1.	IEC-62271-100	High Voltage A.C. Circuit Breakers
2.	IEC-60137	Bushing for alternating Voltages above 1000 volts
3.	IEC-60071	Insulation Co-ordination
4.	IEC-60694	Common clauses for high voltages switchgear and control gear standards
5.	IEC-60815	Specification for Creepage distances
6.	IS-13118	Specifications for high voltage alternating current circuit breakers
7.	IS-2099	High voltages porcelain bushings
8.	IS-4379	Identification of the contents of industrial gas cylinders
9.	IS-3072	Installation and maintenance of switchgear
10.	IEC-60267	Guide for testing of circuit breakers with respect to out of phase switching
11.	IS-802	Code of practice for use of structural steel in overhead transmission lines
12.	IEC-17A Study Group Dec.1981	Sealing of interrupters / breakers
13.	IS-1554	PVC insulated cables up to and including 1000 volts
14.	IS-5	Colours for ready mixed paints and channels
15.	Ref. Standard IES	Internal Electro-Technical Commission Bureau Central Data Commission, Electro Technique International, 1, Ruede Verembe, Geneva, Switzerland
16.	IS	Indian Standard Bureau of India Standard, Manak Bhawan 9, Bahadurshah Zafar Marg, New Delhi – 110002, India

4.7.3 SERVICE CONDITONS

CLIMATIC CONDITONS

The breakers and accessories to be supplied against this specification shall be suitable for satisfactory continuous operation as per section-I.

AUXILIARY POWER SUPPLY

Auxiliary electrical equipment shall be suitable for operation on the following supply system.

- a) Power Devices (like motors): 415 V, 3 phase 4 wire 50 hz, neutral grounded AC supply

- b) DC Alarm, Control and Protective Devices: 220/110 V/30 V DC, ungrounded 2 wire (Substation wise exact details shall be furnished by the successful bidder after survey)
- c) Lighting: 240 V, single phase 50 Hz AC supply

Bidder's scope includes supply of interconnecting cables, terminal boxes, etc. The above supply voltage may vary as indicated below and all devices shall be suitable for continuous operation over the entire range of voltages

- i) AC Supply Voltage + 10% -15% Frequency $\pm 5\%$
- ii) DC Supply -15% to + 10%

4.7.4 GENERAL REQUIREMENT OF 36 KV/OUTDOOR VACUUM CIRCUIT BREAKERS

The vacuum type circuit breaker shall have vacuum interrupters, designed to provide a long contact life at all currents up to rated making and breaking current during switching operation. The vacuum interrupters sealed for life shall be encapsulated by porcelain insulators for outdoor installation requirement of the circuit breakers. The offered breakers shall be suitable for outdoor operation under climatic conditions specified without any protection from sun, rain and dust storm.

The vacuum interrupters of each phase shall be housed in a separate porcelain insulator. The three identical poles shall be mounted on a common base frame and the contact system of three poles should be mechanically linked to provide three pole gang opening/closing for all type of faults.

- i) The offered equipment shall be practically maintenance free over a long period.
- ii) All mechanical parts and linkages shall be robust in construction and maintenance free, over at least 10,000 switching operations, except for lubrication of pins/articulated joints at interval of 5 years or 5000 operations.
- iii) Similar parts shall be strictly interchangeable without special adjustment of individual fittings. Parts requiring maintenance shall be easily accessible, without requiring extensive dismantling of adjacent parts.
- iv) The operating mechanism will be self-maintained and of proper operation endurance not less than the mechanical life of circuit breaking unit. It shall be spring operated type described hereinafter.
- v) The circuit breaker shall be supplied complete with all auxiliary equipment, meant necessary for the safe operation, routine and periodic maintenance. All internal wiring including those of spare auxiliary contacts shall be complete and wired up to terminal blocks.
- vi) The breaker shall be totally re-strike free under all duty conditions. The details of any device incorporated to limit or control the rate of rise of re-striking voltage across the circuit breaker contacts shall be stated.
- vii) The breaker shall be reasonably quiet in operation and the noise level shall not exceed 140 decibels.
- viii) The breaker shall be suitable for three phase re-closing operation.
- ix) An operation counter, visible from the ground level even with the mechanism housing closed shall be provided.

4.7.5 FIXED AND MOVING CONTACT

The fixed and moving contacts of the breaker have to ensure permanent full contact during closing. All making and breaking contacts shall be hermetically sealed and free from atmospheric effects.

The main contacts should have low contact resistance.

4.7.6 RECOVERY VOLTAGE AND POWER FACTOR

The circuit breaker shall be capable of interrupting rated power with recovery voltage equal to the rated maximum line to line service voltage at rated frequency and at a power factor equal to or exceeding 0.15. In case of multiple break circuit breaker, devices/method adopted for ensuring uniform voltage distribution across all the breaks shall be indicated and actual voltage distribution recorded during interruption tests shall be furnished with the bid.

4.7.7 RESTRIKING RECOVERY

The complete data for the phase factor, amplitude factor, etc., for rate of rise of re-striking voltage shall be furnished in the tender.

4.7.8 LINE CHARGING INTERRUPTING CAPACITY

The circuit breaker shall be designed so as to be capable of interrupting line charging currents without undue rise in the voltage on the supply side without re-strike and without showing sign of undue strains.

The maximum permissible switching over voltage shall not exceed 2.5 p.u. The guaranteed over voltage, which will not be exceeded while interrupting the rated line charging current for which the breaker is designed to interrupt shall also be stated. The results of the tests conducted along with the copies of the oscillographs to prove ability of the breakers to interrupt the rated as well as lower values of the line charging current shall be furnished with the tender.

4.7.9 TRANSFORMER CHARGING CURRENT BREAKING CAPACITY

The breaker shall be capable of interrupting inductive currents, such as those occurring while switching off unloaded transformers, without giving rise to undue over voltage and without re-strikes. The maximum over voltage value, which will not be exceeded under such conditions shall be stated in the tender.

4.7.10 BREAKING CAPACITY FOR SHORTLINE FAULTS

The interrupting capacity of the breaker for short line faults shall be stated in the tender. The details of the test conducted for proving the capability of the breaker under a short line fault occurring from one phase to earth conditions shall also be stated in the tender. The rated characteristics for short line faults shall be in accordance with stipulation contained in clause 4.105 of IEC 62271-100.

4.7.11 AUTOMATIC RAPID RECLOSING

36 kV circuit breaker shall be suitable for 3 pole rapid re-closing.

4.7.12 OUT OF PHASE SWITCHING

The circuit breaker shall be capable of satisfactory operation even under conditions of phase opposition that may arise due to faulty synchronization. The maximum power that the breaker can satisfactorily interrupt under "Phase Opposition" shall be stated in the bid".

4.7.13 TEMPERATURE RISE

The maximum temperature attained by any part of the equipment when in service at side and under continuous full load conditions and exposed to the direct rays of the sun shall not exceed the permissible limits fixed by IEC. When the standards specify the limits of temperature rise these shall not be exceeded when corrected for the difference between ambient temperature specified in the approved specification.

The limits of temperature rise shall also be corrected for altitude as per IEC and stated in the bid.

4.7.14 INSULATORS SUPPORTS AND HOUSING

The porcelain used shall be homogenous, free from cavities and other flaws. The insulators shall be designed to have ample insulation, mechanical strength and rigidity for satisfactory operation under conditions specified above. The puncture strength of bushing shall be greater than the flash over value. The design of bushing shall be such that the complete bushing in a self-contained unit and no audible discharge shall be detected at a voltage upto a working voltage (Phase Voltage) plus 10%. The support insulator shall conform to IEC-60137. Minimum clearance between phases, between live parts and grounded objects shall be as per IS-3072-1975 and should conform to Indian Electricity Rules-1956. The minimum creepage distance for severely polluted atmosphere shall be 25 mm/KV as per IEC-815-1985.

The details for atmospheric pollution of various sub-stations where these breakers are to be installed shall be as per specification. The air clearance of bushing should be such that if the bushings were tested at an altitude of less than 1000 meters, air clearance would withstand the application of higher voltages (IS-2099-1973 para 6.1). In order to avoid breakdown at extremely low pressures the support insulators should not be covered by moisture and conducting dust. Insulators should therefore be extremely clean and should have antitracking properties. Sharp contours in conducting parts should be avoided for breakdown of insulation. The insulators shall be capable to withstand the seismic acceleration of 0.3 g in horizontal direction.

4.7.15 OPERATING MECHANISM GENERAL REQUIREMENTS

The operating mechanism shall be stored energy type and capable of giving specified duty of the breaker (sequence of opening and closing) as specified under O-0.3 sec-CO-3 min-CO. The breaker shall also pass the operational test which ascertains the capabilities of operating mechanism. The operating mechanism shall be capable to perform the following functions efficiently.

- i) To provide means where the circuit breaker can be closed rapidly, at all currents from zero to rated making current capacity.
- ii) To hold the circuit breaker in closed position by toggles or latches till the tripping signal is received.
- iii) To allow the circuit breaker to open without delay immediately on receiving tripping signal.
- iv) To perform auto re-closure duty cycle.
- v) To perform the related functions such as indication, contacts, etc.

Operating mechanism should also be suitable for three phase auto re-close duty. The closing spring shall be automatically charged by motor immediately after closing operation. In case of failure of supply to the spring charging motor, the spring shall be chargeable by hand-crank.

a) TRIPPING/CLOSING COILS

The circuit breakers shall be provided with two trip coils and one closing coil per breaker. First trip coil shall be utilized for tripping the breaker on main protection fault detection. Whereas second trip coil shall be used to trip the breaker when first trip coil fails to trip the breaker and backup protection comes into operation and shall also be used to trip the breaker on command. Provision shall be given for trip circuit supervision both in pre close and post close condition of the breaker. All the breakers shall have provision for independent electrical operation of trip coils from local as well as remote through local/remote selector switch.

b) TRIP FREE FEATURES

When the breaker has been instructed to close by manual instructions using push button, the operating mechanism will start operating for closing operations. If in the meantime a fault has taken place, the relay provision shall be such that it should close the trip circuit simultaneously interrupting the live circuit of closing coil which has been instructed for close command.

The trip free mechanism shall permit the circuit breaker to be tripped by the protective relay even if it is under the process of closing. An anti-pumping device to prevent the circuit breaker from reclosing after an automatic opening shall be provided to avoid the breaker from pumping i.e., anti-pumping relay should interrupt the closing coil circuit.

c) Controls

The circuit breaker shall be controlled by a control switch located in the control cabinet. The control arrangement shall be such as to disconnect the remote-control circuits of the breaker, when it is under test. Local control devices, selector switch and position indicator shall be located in weather and vermin-proof cabinet with degree of protection not less than IP-55. The circuit breaker control scheme shall incorporate trip circuit supervision arrangement. Local/remote selector switch shall be provided for all breakers for selection of "Local" control/remote control.

Provision shall be made for local manual, electrical and spring controls. Necessary equipment's for local controls shall be housed in the circuit breaker cabinet of weather-proof construction. In addition to this, a hand closing device for facilitating maintenance shall also be provided.

Each circuit breaker shall have a mechanical open/closed and spring charge indicator in addition to facilities for provisions for semaphore indicators for breakers which are required for the mimic diagram in the control room. Lamps for indicating, 'close/open' position of the breaker shall also be provided.

The contact pressure spring and tripping spring shall be chargeable during closing operation to ensure the breaker is ready to open. Mechanically ON/OFF indicator, spring charged indicator and operation counter shall be provided on the front of the control cubicle.

For tripping, the spring provided shall ensure the trippings Mechanical indicator, to show the 'open' and 'close' position of the breaker shall be provided in a position where it will be visible to a man standing on ground with mechanism housing open. An operation counter, visible from the ground even with the mechanism housing closed, shall be provided. Electrical tripping of the breaker shall be performed by shunt trip coils.

Closing coil shall operate correctly at all value of voltage between 85% and 110% of the rated voltage. Shunt trip coils shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity and at all values of supply voltage between 85% and 110% of rated voltage. The variation in A.C. supply voltage shall be -15% to +10% while variation in frequency shall be ± 3 . Working parts of the mechanism shall be non-corrosive material. Bearings which require grease shall be equipped with pressure type fillings.

Bearing pins, bolts, nuts and other parts shall be adequately pinned or locked to prevent loosening or changing adjustment with repeated operation of the circuit breaker. It shall be possible to trip the circuit breaker even in the event of failure of power supply.

Operating mechanism and all accessories shall be enclosed in control cabinet. A common marshalling box for the three poles of the breaker shall be provided, along with supply of tubing, cables from individual pole operating boxes to the common marshalling box, local.

4.7.16 SPRING OPERATED MECHANISM

The motor compressed spring mechanism shall consist of a closing spring which is wound or compressed by an electric motor immediately after the breaker closes.

After the breaker has tripped, the tripping spring shall remain in the released position as long as the breaker is open, but the closing spring shall remain wound and ready for closing operation. The operating mechanism shall have all the necessary auxiliaries, apparatus for operation and supervision, like motor starter with thermal overload release, one closing coil, two trip coils, push button for local electrical operation, local/remote control selector switch, push button for direct mechanical tripping, auxiliary switches, anti-pumping contactors, operation counter, socket for inspection, lamp and heater with switch. Spring charging motor shall be standard single phase universal motor suitable for 220 volts supply.

- i) Operating voltages for closing/tripping coils shall be 220/110/48/24 Volts DC **or as per actual DC voltage available at existing substations which is to be verified by supplier after award of contract.**
- ii) Operating voltages for heater elements shall be 220V AC 50 HZ. Other features of the spring-operated mechanism shall be as follows.
 - a) The spring operating mechanism shall have adequate energy stored in the operating to close and latch the circuit breaker against the rated making current and also to provide the required energy for tripping

- mechanism in case the tripping energy is derived from the operating mechanism.
- b) The mechanism shall be capable of performing the rated operating duty cycle of O-0.3Sec-CO-3 Min-CO...
 - c) The spring charging motor shall be AC or DC operated and shall not take more than 30 sec., to fully charge the closing spring made for automatic charging. Charging of spring by the motor should not interfere with the operation of the breakers.
 - d) The motor shall be adequately rated to carry out a minimum of one duty cycle. Also, provision shall be made to protect the motor against overloads.
 - e) In case of failure of power supply to spring charging motor, the mechanism shall be capable of performing one open-close-open operation.
 - f) Mechanical interlocks shall be provided in the operating mechanism to prevent discharging of the closing springs when the breaker is already in closed position. Provision shall be made to prevent a closing operation to be carried out with the spring partially charged.
 - g) Facility shall be provided for manual charging of closing springs.

4.7.17 CONTROL CABINET

The switchgear operating mechanism, the control equipment such switch for closing and tripping the breakers, various control relays, antipumping device, a set of terminal blocks for wiring connections, MCB's for disconnecting the control auxiliary power supplies including relays, etc., shall be enclosed in a cabinet to be mounted on a suitable structure at a convenient working height at the end of the breaker in the outdoor switchyard. The supporting structure and the enclosure shall be capable of withstanding the typical tropical climatic conditions, change of ambient temperature, severe dust-storms, very high relative humidity those are prevailing at the site of location of switchgear.

i) ENCLOSURE

The enclosure shall be made out of stretched level steel plates not less than 3 mm thick and of light section structural steel. It should be weather proof as well as vermin proof.

The enclosure shall provide protection against dust and foreign objects. Each cabinet section shall have full width and full-length hinged doors mounted on the front that swing fully open. The doors shall be provided with latches to securely hold it with the cabinet. Doors shall be of sturdy construction, with resilient material covering, fully perimetrically contacting the cabinet frame to provide dust protection and prevent metal to metal contact except at the latch points. Filtered ventilation shall be provided along with the rigid supports for control and other equipment, measuring instruments, mounting cabinet members and equipment shall not restrict easy access to terminal blocks for terminating and testing external connection or to equipment for maintenance.

All screws and bolts used for assembling and mounting wire and cable termination, supports, devices and other equipment shall be provided with lock washers or other locking devices. All metal parts shall be clean and free of weld splatter, rust and mill scale prior to application of double coat of zinc chromate primer which should be followed by an under coat to serve as base and binder for the finishing coat. The shade of exterior and interior shall be as per GTR. The mounting structure shall be galvanized and shall be as per IS- 802-II-1978.

ii) HEATERS

Suitable heaters shall be mounted in the cabinet to prevent condensation. Heaters shall be controlled by thermostat and shall be provided with ON/OFF switches and fuses. Heaters shall be suitable for 240 V AC supply voltage.

iii) LIGHTING

At least one 13-watt CFL fixture and lamp working on 240 V 50 c/s AC supply shall be provided in each switchgear control cubicle section and shall be located suitably to provide adequate interior lighting of the cubicle. A single-pole 6 Amp. lighting switch shall be provided for each cubicle along with 5/15 amp.

The lighting and convenient outlet circuits shall be completely wired in conduit and terminated on cubicle terminal blocks.

iv) WIRING AND CABLING

- a) Unless otherwise specified control wire shall be stranded tinned copper switchboard wire with 1.1 kV PVC insulation conforming to the requirements of IS-1554.
- b) All the control circuit and secondary wiring shall be wired completely and brought out to terminal block ready for external connections in the control cabinet. The cross-section of control wire shall not be less than 2.5 mm² copper (14 SWG).
- c) All spare auxiliary contacts of the circuit breaker shall be supplied wired up to terminal block. Each terminal in terminal block shall be suitable for at least 2 x 2.5 mm² copper conductor.
- d) All wiring termination on terminal blocks shall be made through lugs.
- e) All wires shall be identified with non-metallic sleeve or tube type markers at each termination.
- f) Terminal blocks shall be made up of moulded non-inflammable plastic material with blocks and barriers moulded integrally have white marking strips for circuit identification and moulded plastic covers. Disconnecting type terminal blocks will be provided.

v) GROUNDING

A ground bus of copper bar not less than 6 mm by 25 mm shall be provided for grounding the cabinet.

4.7.18 ACCESSORIES

Each circuit breaker assembly shall be supplied with the following accessories.

- i) Line and earthing terminals and terminal connectors.
- ii) Control housing with:
 - a) One auxiliary switch with adequate number of auxiliary contacts, but not less than 20 nos. (10 NO + 10NC) for each breaker. These shall be over and above the No. of contacts used for closing, tripping and reclosing and interlocking circuit of the circuit breaker. All auxiliary contacts shall be capable of use as "Normally closed" or "Normally open" contacts. Special auxiliary contacts required for the reclosing circuit if any, shall also be provided. There shall be provision, to add more auxiliary contacts at a later date, if required.
 - b) Operation counter
 - c) Position indicator (Close/Open)
 - d) Necessary cable glands
 - e) Fuses
 - f) Manual trip device and local test push buttons
 - g) Terminal blocks and wiring for all control equipment and
 - h) Adequate number of heaters for continuous operation to prevent moisture condensation in the housing of operating mechanism
 - i) Selector switch for local/remote control.

4.7.19 SUPPORTING STRUCTURE

The circuit breakers shall be supplied complete with necessary galvanized steel supporting structures, foundation and fixing bolts, etc., the galvanizing shall be as per IS. The mounting of the breaker shall be such as to ensure the

safety of the operating staff and should conform to Indian Electricity Rules, 1956. Minimum ground clearance of live part from ground level shall be 3700 mm from finished ground level.

The bidder shall submit detailed design calculations and detailed design calculations and detailed drawings in respect of supporting structures suitable for the equipment offered.

All material for making connections between the circuit breaker and its control shall also be included in the scope of supply. Facility to earth the circuit breaker structure at two points shall be provided.

4.7.20 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulation oil, as far as accessible, shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paint.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limits specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling.

All ferrous hardware, exposed to atmosphere, shall be hot dip galvanized.

4.7.21 GALVANISING

All ferrous parts including all sizes of nuts, bolts, plain and spring washers, support channels, structures, shall be hot dip galvanized conforming to latest version of IS:2629 or any other equivalent authoritative standard.

4.7.22 CABLE TERMINATION

Suitable cable glands for terminating the multicore cable, shall be provided wherever required.

4.7.23 TERMINAL CONNECTIONS AND EARTH TERMINALS

Each circuit breaker connected with incoming and outgoing feeders shall be provided with solderless clamp type connectors suitable for ACSR conductor.

Each circuit breaker pole and control cabinet shall be provided with appropriate number of grounding terminals and clamps for receiving ground connections.

Each circuit breaker pole and control cabinet shall be provided with appropriate number of grounding terminals and clamps for receiving ground connections.

4.7.24 INTERLOCKS

Necessary interlocks to prevent closing or opening of the breaker under low pressure of the contact spring and devices for initiating alarm shall be provided. The detailed interlocking scheme based upon single line diagram as applicable for the substation shall be provided by the contractor

Requirement of interlock shall be as given below:

- i) Isolator should not be operated unless the associated breaker is in open position.
- ii) The circuit breaker shall close only after all isolators associated with it have been in closed position.

In case of double bus bar arrangement following additional requirement for interlocking shall be provided.

- i) One bus bar selector isolator of any bay excepting the bus coupler bay shall close only when,
 - a) The circuit breaker of corresponding bay is open and locked.
 - b) The other bus isolator of that bay is open.
- ii) When one bus isolator of any bay excepting the bus coupler bay is closed. The other shall close only when the bus coupler circuit breaker and both the bus isolators are closed.
- iii) Bus isolator of bus coupler bay shall operate only when the bus coupler breaker is open.
- iv) The bypass isolator of feeder shall close when the feeder circuit breaker and its adjoining isolators are closed.

4.7.25 EARTHING SYSTEM

All switchgear enclosures should be bolted metal to metal and should carry the full earth return current. Connection between phases at the earthing points shall be dimensioned for carrying full earth return current i.e., actual service current not rated current.

4.7.26 VACUUM INTERRUPTER ASSEMBLY

Each pole of the circuit breaker shall be provided with vacuum interrupter, one for each phase, hermetically sealed for life and encapsulated by ceramic insulators. The interrupter shall be provided with steel chromium arc chamber to prevent vaporized contact material being deposited on the insulating body. A further shield giving protection to the metal bellows shall also follow the travel of the moving contacts to seal the interrupter against the surroundings atmosphere.

It shall have high and consistent dielectric strength of vacuum unaffected by environment and switching operations. Bronzed joints should ensure retention of vacuum for life time. It shall have low and stable contact resistance due to absence of oxidation effects and shall ensure low power loss. The arcing voltage shall be low and minimum contact erosion.

4.7.27 GUARANTEED TECHNICAL PARTICULARS

Guaranteed and technical particulars as called for in Section-II shall be furnished along with the tender. Particulars which are subject to guarantee shall be clearly marked.

4.7.28 TESTS

TYPE TESTS

Each circuit breaker shall comply with requirements of type tests prescribed in IEC publication No. 62271-100

- i) Short time and peak withstand current test.
- ii) Short circuit breaking capacity and making capacity.
- iii) Capacitive current switching test: Cable charging current breaking test (Ur less than or equal to 52 kV).
- iv) Dielectric test i.e., power frequency withstand and impulse withstand test
- v) Temperature rise test.
- vi) Mechanical Endurance Test at ambient temperature.
- vii) Measurement of resistance of the main circuit.

ROUTINE TESTS

Routine Tests as per IEC- 62271-100 shall be carried out on each breaker in presence of purchaser's representative at the manufacturer's expenses at his works except, where agreed to otherwise. All test reports should be submitted and should be got approved from the purchaser before dispatch of the equipment.

SITE TESTS ON CONTROL AND AUXILIARY CIRCUIT

The following tests shall be conducted at site.

- i) Voltage tests on control and auxiliary circuit.
- ii) Measurements of resistance of the main circuit.
- iii) Mechanical Operation Tests.

4.7.29 NAME PLATE

Equipment should be provided with name plate giving full details of manufacture, capacities and other details as specified in the relevant ISS or other specification stipulated.

4.7.30 TECHNICAL PARAMETERS**36 KV CIRCUIT BREAKERS**

Description		Values
i) Rate voltage (KV rms)	:	36 KV
ii) Rated frequency (Hz)	:	50
iii) System neutral earthing	:	Solidly grounded system
iv) Type of arc quenching medium	:	Vacuum
v) Rated normal current at site conditions (Amps)	:	1250 Amps
vi) Number of poles	:	3
vii) Installation	:	Outdoor type
viii) Temperature rise	:	As per IEC 56 (Table-4) Page-19
ix) Rated short circuit	:	
a) Interrupting capacity at 36 KV	:	25 KA
b) The percentage DC components	:	As per IEC-62271-100
c) Duration of short circuit	:	1 Sec.
x) Rated short circuit making	:	62.5 KA
xi) First pole to clear factor	:	1.5
xii) Rated short time current	:	25 KA
xiii) Rated duration of short circuit	:	3 Seconds
xiv) Total break time for any current up to the rated breaking current with limiting condition of operating and quenching media pressure (ms)	:	<80 ms
xv) Closing time (ms)	:	<150 ms
xvi) Mounting	:	Hot dip galvanized lattices steel support structured bolted type
xvii) Phase to phase spacing in the switch yard i.e., interpole spacing for breaker (min) in mm	:	470±10
xviii) Required ground clearance from the lowest line terminal if both the terminals are not in same horizontal plane (mm)	:	3700
xix) Height of concrete plinth (mm)	:	150

xx) Minimum height of the lowest part of the support insulator from ground liner (mm)	:	3194
xxi) Minimum creepage distance of support insulator (mm)	:	900
xxii) Minimum corona extinction voltage (kv rms)	:	92
xxiii) Standard value of rated transient recovery voltage for terminal fault	:	As per IEC-56
xxiv) Standard value of rated line Characteristics for short line faults	:	
RRRV	:	KV/ms=0.214
Surge Peak Factor	:	K=1.6 A
Impedance	:	450
xxv) Rated operating duty cycle	:	O-0.3 Second - CO-3 Minutes-CO
b) Auto reclosing	:	Suitable for three phases Auto reclosing duty
xxvi) Rated insulation level under heavy pollution condition 1.2/50 micro second lightning Impulse withstand voltage (KV peak) to earth	:	170KV
xxvii) Power frequency withstand voltage KV (rms) to earth (KV rms)	:	70 KV
xxviii) Rated characteristic for out of Phase breaking	:	
a) Out of phase breaking capacity	:	25% of rated breaking capacity
b) Standard values of transient recovery	:	As per IEC-56
c) Operating mechanism and Trip free mechanism	:	Spring operated, Anti pumping and Trip free mechanism
d) Power available for operating mechanism	:	Three phase 415 Volts 50 C/S or single phase 50 C/S 240 volts
xxix) a) Rated supply voltage of closing and operating devices and auxiliary circuits	:	1) 220 V DC/30 VDC 2) 240 Volts AC 50 C/S single phase 3) 415 volts 50 Hz three phase
b) Permissible voltage variation voltage variation	:	1) In case of DC Power supply voltage variation shall be between 85% to 110% of normal voltage. 2) In case of AC power supply voltage variation shall be of the normal voltage as per IS-15% to +10%.
c) Permissible frequency	:	±3% from normal 50 Hz as per IS 2026 part-I 1977 para 4.4
d) Combined variation of frequency and voltage	:	±10%
xxx) Auxiliary contacts (number & rating)	:	12 NO and 12 NC on each pole having continuous current rating of 10 Amps. DC

		breaking rating capacity shall be 2 Amps with circuit time constant less than 20 ms at 220/30 volts DC
xxxi) Number of trip coils	:	Two trip coils and 1 close coil with anti-pumping arrangement
xxxii) Rated terminal load	:	100 kg. Static. The breaker shall be designed to withstand the rated terminal load, wind, load, earthquake load and short circuit forces
xxxiii) Noise level of the equipment	:	Not exceeding 140 db

4.7.31 DRAWINGS AND INSTRUCTION MANUALS

Following drawings for each item are to be supplied as part of the contract.

- i) General outline drawings, showing dimensions, front and side elevations and plan of the circuit breaker and its local control panel.
- ii) Outline drawing of bushings showing dimensions and number of sheds and creepage distance.
- iii) Assembly and sub-assembly drawings with numbered parts.
- iv) Sectional views showing the general constructional features, operating mechanism and arc extinguishing chamber, etc.
- v) Dimension and assembly of important auxiliaries.
- vi) Detailed drawings of operating mechanism. And inter-phase mechanism.
- vii) Test certificates.
- viii) Detailed drawings of mounting structure.
- ix) Spare parts and catalogue
- x) Wiring diagram showing the local and remote-control scheme of breaker including alarms indication devices instruments relay and timer wiring.
- xi) Write up on working of control schematic of breaker.
- xii) Foundation plan including weights of various components and impact loadings for working foundation design. Three copies for each pkg. of the above drawings and instruction manuals covering instructions for installations, operation and maintenance shall be supplied by the contractor(s) without any extra cost.