SPECIFICATIONS FOR 132KV OUTDOOR CIRCUIT BREAKERS.

A. SYSTEM INFORMATION

A-1  System Conditions

The networks are mainly of outdoor type. The basic parameters are set out below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal system voltage between phases</td>
<td>132 kV</td>
</tr>
<tr>
<td>Earthing of neutral at transformers</td>
<td>Solid</td>
</tr>
<tr>
<td>System earthing</td>
<td>Effectively earthed</td>
</tr>
<tr>
<td>System Frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>System highest voltage</td>
<td>145 kV</td>
</tr>
<tr>
<td>Symmetrical short circuit current at rated voltage RMS (ultimate)</td>
<td>25/40 kA</td>
</tr>
<tr>
<td>Impulse withstand voltage – Main Transformer</td>
<td>550 kV</td>
</tr>
<tr>
<td>Impulse withstand voltage – Other Equipment</td>
<td>650 kV</td>
</tr>
<tr>
<td>Power frequency voltage (1 min.)- Main Transformer</td>
<td>230 kV</td>
</tr>
<tr>
<td>Power frequency voltage (1 min.)- Other Equipment</td>
<td>275 kV</td>
</tr>
</tbody>
</table>

A-2  Power supply for electrical operation

{Edit/modify as applicable}

i) Control /alarm /emergency DC Voltage 110/220 V
ii) Supply voltage of auxiliary equipment AC Voltage 400/230 V
iii) Supply voltage of auxiliary equipment DC Voltage 110/220 V
iv) Power line carrier DC Voltage 48 V

A-3  Pollution levels of Insulators and Bushings

25 mm/kV (Pollution Class III).
A-4  Minimum Substation Clearances

Air insulated outdoor and indoor busbars and connections shall have electrical clearances as listed in the following table: -

<table>
<thead>
<tr>
<th>Highest system voltages between phases</th>
<th>kV</th>
<th>145</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum clearance between live metal and earth</td>
<td>mm</td>
<td>1350</td>
</tr>
<tr>
<td>Minimum clearance between live metal of different phases</td>
<td>mm</td>
<td>1350</td>
</tr>
<tr>
<td>Minimum safety clearance between the nearest point not at earth potential of an insulator to ground (Pedestrian Access)</td>
<td>mm</td>
<td>2300</td>
</tr>
<tr>
<td>Minimum safety clearance between live metal and positions to which access is permissible with other conductive equipment</td>
<td>mm</td>
<td>3650</td>
</tr>
</tbody>
</table>

A-5  Service Conditions

(a)  Maximum ambient temperature          -  40°C
(b)  Maximum 24h average temperature      -  <35°C
(c)  Temperature rise due to solar absorption of 1000 W/m² -  10°C
(d)  Maximum relative humidity          -  90%
(e)  Environmental conditions          -  Humid tropical climate with polluted atmosphere.
(f)  Operational altitude          -  <1000 masl
(g)  Maximum wind velocity          -  < 34m/s

B.  MINIMUM REQUIREMENTS FOR MANUFACTURERS

The bidder shall ensure, that each equipment offered, is manufactured by a manufacturer with a minimum of ten (10) years successful experience in manufacturing comparable equipment, in rated voltage and capacity.

The equipment offered shall be a standard product of the manufacturer. If the offered equipment is manufactured under license, the service experience of equipment manufactured by the parent company shall not be counted as service experience of the licensee equipment.

Bidder shall provide adequate evidence of compliance to above requirements to the satisfaction of the CEB. Bids non-complying with above requirements or with incomplete evidence of compliance would be rejected.
C. TECHNICAL SPECIFICATIONS.

C-1 The circuit breakers shall be of the SF6 gas type and shall comply with IEC 62271-100. They shall be able to carry the rated current, interrupting all current from zero to the symmetrical and asymmetrical fault currents as well as small capacitive and inductive currents and short line faults and also of operation against short-circuit under the stipulated site conditions. The circuit breakers shall be able to interrupt the fault currents with the associated inherent rate-of-rise of re-striking voltages and amplitude factors.

C-2 The circuit breakers shall be porcelain insulated, suitable for outdoor operation and mounted on hot-dip galvanised steel structures. All members of steel parts shall be hot dip galvanised. [Should be edited/modified as applicable]

C-3 The arrangement of the breaker at Site shall be such that adequate access for normal routine maintenance and the replacement of any complete apparatus shall be available.

C-4 Evidence shall be provided that enclosure subject to pressures in excess of normal atmospheric pressure during service operation have withstood approved pressure tests without leakage, permanent distortion or any temporary distortion such as might cause undue operation of the circuit-breaker.

C-5 Mechanical indicating devices shall be provided which indicate whether the breaker is in the “open”, “closed”, position, and which show the state of the energy storage also. Electrical and mechanical interlocking shall be provided.

C-6 Anti pumping circuit - Means shall be provided to prevent pumping while the closing circuit remains energised in case the circuit breaker either fails to latch or is tripped during closing.

C-7 Energy storage system shall be spring type and shall ensure uniform, positive closing and opening. Pneumatic systems operating on compressed air and hydraulic systems operating with oil are not accepted. If the energy storage system is not fully recharged within a predetermined time, further operation shall be blocked and suitably indicated. The capacity of the energy storing system shall be large enough to permit two operations (CO-CO) if the electrical supply fails. In the event of failure of the power for the energy storage drive, it shall be possible to operate the breaker by external means. Closing mechanism shall be recharged automatically for further operations as soon as the circuit breaker has completed the closing operation.
C-8 The design of the circuit breaker mechanisms shall be such that the circuit-breaker cannot be operated inadvertently due to external shock forces resulting from short circuits, operations of other circuit-breakers, due to fault current stresses, vibration or any other cause.

C-9 Circuit breakers shall be able to perform three-phase or single phase auto-reclose operation, as applicable according to the application of the circuit breaker. The Circuit breaker shall have an operation duty cycle of: O - 0. 3 secs- C-O-3 min- C-O.

C-10 The insulating medium of circuit breakers shall be SF₆ gas, live-tank, trip free, single-break type and shall not take more than 3 cycles (60 msecs.) for opening.

C-11 SF₆ Circuit breakers shall incorporate precautions to minimise the presence of moisture and SF₆ decomposition products. Static and moving gas seals shall be designed to prevent the leakage of gas or ingress of moisture throughout the service of the interrupting module. The enclosure of the module shall be strong enough to withstand the internal pressures generated when switching, and shall incorporate an over-pressure relief device, proved to be capable of allowing the safe discharge of any excess pressure that may arise.

C-12 Gas pressure monitoring devices (density type) shall be incorporated to provide an alarm and to block operation. SF₆ pressure low, lock-out shall be used for control of breaker failure protection or similar tripping arrangements.

C-13 All circuit breakers shall be connected for remote control as described. This shall comprise “ON-OFF” control and “OPENED”, “CLOSED” and “DISCREPANCY” indications locally and in the control room of the station. Local electrical opening and closing of the breaker shall be permitted only when the control selector switch is in the “LOCAL” position. The operating mechanism shall be provided with an operations counter. All supervision and control facilities shall be located in a central local operating cubicle.

C-14 All circuit breakers shall be supplied with a sufficient number of auxiliary contacts for remote indication and any control and interlocking scheme required. At least two normally open and two normally closed spare auxiliary contacts shall be easily convertible from normally open to normally closed. (Number of switches to be indicated N/O and N/C as required).

C-15 Thermostatically controlled heaters for continuous operation at the rated AC voltage shall be provided on all operating mechanisms installed outdoors, to prevent condensation.
C-16 A sufficient number of cable entry glands shall be foreseen on all operating mechanisms. Terminal blocks shall be supplied and installed as appropriate.

C-17 Circuit Breakers shall be covered by type test certificates by a recognised third party testing authority such as KEMA/ CESI, or a member of STL, certifying the operation of the circuit breaker at duties corresponding to the operation of the rated breaking capacities of the circuit-breakers. The test duties shall not be less than the requirements of IEC 62271-100. Test certificates shall be submitted with the Bid.

C-18 Bidders should include a statement of the cumulative breaking capacity (number of operations), which circuit breakers are capable of, before maintenance is required.

C-19 Test certificates demonstrating the ability of the circuit breakers for the above mentioned duties shall be submitted with the bid.

C-20 Porcelain used for bushing shall be homogenous, free from lamination, cavities and other flaws of impressions that might affect the mechanical or dielectric quality, and shall be thoroughly vitrified, tough and impervious to moisture. An inert gas shall be filled in the porcelain bushing to prevent condensation of moisture and resulting flashover on the surface of the SF6 interrupter and insulating rod housed inside.

C-21 Trip circuit supervision facility shall be available (inclusion of relay/s as applicable).

D. APPLICABLE STANDARDS

The equipment and the components supplied shall generally be in accordance with the standards specified below or later editions and/or amendments thereof:

D-1 IEC 62271-100 - High Voltage Alternating current Circuit Breakers
D-2 IEC 60694 - Common Specifications for high voltage switchgear and control gear standards
D-3 IEC 60071-1 - Insulation coordination
D-4 IEC 61166/IEE693 - Seismic acceleration withstand
D-5 IEC 60529 - Protection class
D-6 BS 729 of 1971 - Galvanizing standard
E. CIRCUIT BREAKER CONTROLS, ALARMS AND INDICATIONS

The following CB controls and indications shall be provided.

E-1 Local Controls

E-1-1 Local/Maintenance/Remote selector switch. This switch shall be lockable in any position.
E-1-2 Circuit Breaker Open/Close control switch with spring return to the center-neutral position. Circuit breaker close signal shall be interlocked with the outside conditions such as CB Isolators, etc. Provision shall be made available for wiring these external conditions. Maintenance position shall be non-interlocked for closing command. The Open/Close control switch shall be lockable in center-neutral position.

E-2 Remote Controls

E-2-1 Circuit Breaker Open Command
E-2-2 Circuit Breaker Close Command.

E-3 Indications.

E-3-1 Local Indications

1. Circuit Breaker on Local Control
2. Circuit Breaker on Remote Control
3. Circuit Breaker on Maintenance Control
4. Circuit Breaker Open
5. Circuit Breaker Closed
6. Closing spring Charged.

E-3-2 Remote Indications

In order to provide the following Circuit Breaker Remote Indications/alarms, relays with volt free contacts (Rating: 220V dc, 0.3A) shall be provided.

1. Circuit Breaker on Local Control
2. Circuit Breaker on Remote Control
3. Circuit Breaker on Maintenance Control
4. Circuit Breaker Open
5. Circuit Breaker Closed
6. Closing spring Charged
7. Closing spring FAIL to charge
8. SF6 gas density LOW Stage I (Warning)
9. SF6 gas density LOW Stage II (Breaker operating blocked)
F. OPERATING CUBICLE

F-1 Circuit breaker operating mechanism, auxiliary switches and associated relays, control switches, control cable terminations, and other ancillary equipment shall be accommodated in a Steel or Aluminum, vermin proof and weather proof cubicle. Degree of protection shall be IP55 according to IEC 60529.

F-2 Cubicle shall be of rigid construction. The cubicle shall be galvanized in accordance with BS 729 of 1971. All fastenings shall be integral with the panel or door and provision made for locking. Doors and panels shall be rigid and fitted with weatherproof sealing material suitable for the climatic conditions specified.

F-3 Cubicle shall be well ventilated through vermin proof louvers comprising a brass gauze screen attached to a frame and secured to the inside of the cubicle. In addition, thermostatically controlled heaters with a setting of at least 15°C to 40°C for continuous operation at the rated AC voltage 230V, 50Hz should be provided in series with a single pole M.C.B., mounted within the cubicle.

F-4 Access doors of panels shall be provided with "glass windows" where necessary to view the instruments without opening the cubicle. The arrangement of equipment within the cubicle shall be such that access for maintenance or removal of any item shall be possible with minimum disturbance of associated apparatus.

F-5 The control circuits for closing operations, trip circuits and spring winding motor shall be electrically isolated from each other. Circuit shall be separated on a control, trip, indication, alarm etc. basis as appropriate shall be arranged to facilitate external connections and to provide appropriate isolating points for circuit checking and fault finding.

F-6 The functional identification of all connections in control, indication, alarm circuits and device numbers shall be in accordance with relevant IEC standards. Both ends of each wire shall carry wire numbers as shown on the wiring diagram or in the wiring/connection table. Wires associated with tripping circuits shall be provided with red ferrules marked “TRIP”.

F-7 Circuit breaker control position selector and circuit breaker operating control switches shall be installed in the cubicle. Circuit breaker control from this position will be used under maintenance and emergency conditions only.
F-8 An approved schematic diagram of the part of the control system shall be affixed to the inside of the cubicle access door. The diagram shall be marked on durable non-fading material suitable for specified site conditions.

F-9 Labels, written in English language shall be provided for all instruments relays, control switches, push buttons, indicating lights, etc. Relays shall be clearly labeled according to their function and their equipment. Labels shall be preferably on a white background with black engraved letters.

F-10 Rating plates: Circuit breaker and its operating device shall be provided with a rating plate or plates as per IEC standards.

F-11 Operation: Closing and opening characteristics of interrupters and operating mechanism shall be supplied with offer.

G. LINE TERMINALS

Circuit breakers shall be supplied with the line terminal clamps to suit the existing busbars or the lines. Details of the existing terminal are given in Annex ....

{Details/diagrams should be provided}

H. TESTS

H-1 Type Tests.

The equipment shall pass, or shall have passed, all the relevant Type tests (including the mandatory tests listed below) required to prove compliance with the requirement of IEC standards 62271-100 (Clause 6) and 60694.

H-1-1 Mandatory type tests

1. Dielectric tests
2. Radio interference voltage tests
3. Measurement of the resistance of the main circuit
4. Temperature-rise tests
5. Short-Time withstand current and peak withstand current tests.
6. Tightness tests
7. EMC tests
8. Mechanical operation test at ambient temperature
9. Short-circuit current making and breaking tests
H-1-2 Mandatory type tests (where applicable)

1. Verification of the degree of protection
2. Extended mechanical endurance tests on circuit-breakers for special service conditions
3. Low and High temperature tests
4. Humidity tests
5. Static terminal load tests
6. Short-line fault tests
7. Out-of-phase making and breaking tests
8. Electrical endurance tests
9. Single-phase and double earth fault tests

H-2 Routine Tests

All routine tests shall be performed in accordance with IEC 62271-100 (Clause 7) and 60694 standards.

1. Dielectric tests on main circuit
2. Dielectric tests on auxiliary and control circuits
3. Measurement of resistance of main circuit
5. Design and visual tests
6. Mechanical operation tests

H-3 Tests after delivery

Tests after delivery shall be performed on circuit breaker totally assembled in their final location by CEB. The tests as far as practicable, shall include the following,

1. Leakage tests
2. Gauge tests
3. Stored energy system test
4. Electrical test on current path
5. Clearance and mechanical adjustment check tests
6. Timing tests
7. Power frequency withstand voltage tests.

Test reports will be sent to the manufacturer for information and necessary advices.
I. PACKING AND DELIVERY

I-1 Packing:

I-1-1 Precautions shall be taken to ensure that the equipments are safe for transportation by sea. Packing in cases shall be so carried out that there will be no movements of the contents.

I-1-2 All the metal parts which are liable for corrosion during transport shall be “cocooned“ or covered using waterproof material, sealed at the joints and the enclosure shall be provided with an appropriate desiccators.

I-1-3 Precaution shall be taken to protect shafts and journals where they rest on wooden or other supports likely to contain moisture. At such points wrappings impregnated with anti rust composition or vapor phase inhibitors shall be used of sufficient strength to resist chafing and indentation due to movement which is likely to occur in transit. The form of the protective wrapping shall be suitable for the period of shipment and storage at site to erection.

I-1-4 Each crate or package shall contain a packing list in a waterproof envelope and copies in triplicate shall be forwarded to CEB prior to dispatch. All items of the plant shall be clearly marked for easy identification against the packing list.

I-1-5 All cases, packages, etc., shall be clearly marked on the outside to indicate the total weight, to show where the weight is bearing and the correct position of the slings and shall bear an identification mark relating them to the appropriate shipping documents. All stencil marks on the outside of cases shall be either of a waterproof material or protected to prevent obliteration in transit.

I-1-6 CEB engineers who would participate for factory testing / training shall inspect and approve the packing before the items are dispatched but the supplier (Manufacturer) shall be entirely responsible for ensuring that the packing is suitable for transit and such inspection will not exonerate the supplier (manufacturer) from any loss or damage due to faulty packing.

I-2 Delivery:

I-2-1 The Circuit breakers and spare parts shall be delivered in assembled or partly assembled form and filled with SF6 (If Applicable).

I-2-2 The delivery period shall be indicated in the offer.

I-2-3 Clearing and transport to the site will be done by CEB.
J. ERECTION AND COMMISSIONING.

J-1 Erection and Commissioning

J-1-1 Erection and commissioning of the Circuit Breakers will be done by CEB Staff.

J-1-2 A complete erection manual which shall comply with relevant IEC/IEEE standard together with drawings, connection details shall be supplied. Any clarification that will be required by Ceylon Electricity Board during erection of equipment shall be provided free of charge. Erection tools including gas charging unit, gas charging adapters, grease, lube oil, etc. shall be included in the offer.

J-1-3 Erection manual shall consist of at least the following.
   a) Complete erection procedure and drawings required for the erection
   b) Complete dismantling procedure and drawings required for dismantling
   c) Bolt torque and critical adjustments
   d) A schedule of recommended site tests to establish correct operation.
   e) Procedures for carrying out any adjustments that may be necessary to obtain correct operation.
   f) Recommendation for any relevant measurements that should be made and recorded to help with future maintenance decisions.
   g) Instructions for final inspection and putting into service.

K. MAINTENANCE.

K-1 The Circuit Breakers shall be so designed and manufactured that, besides periodic inspection of pressure, leakage, measurement of time-motion characteristics, the maintenance shall be very simple and minimum. Contact parts and the arc controls devices, which are subjected to erosion, shall be easily accessible, simple to dismantle, and to inspect. Any special tools and consumable required for maintenance shall be listed and furnished with the offer.

K-2 Three copies of operating and maintenance manuals together with all relevant drawings and circuit diagrams shall be supplied.

K-3 Operating and Maintenance manual shall include all necessary instructions for operation and maintenance including the following,

   a) A general description of the equipments with particular attention to the technical description of its characteristics and operation so that the user has an adequate understanding of the main principles involved.
b) A description of the safety features of the equipment and the operation of the interlocks and padlocking features

c) As relevant, a description of the action to be taken to manipulate the equipment for operation, isolation, earthing, maintenance and testing.

d) Recommended extent and frequency of maintenance considering switching operations, total number of operation and time in service, environmental conditions, and measurement and diagnostic tests.

e) Recommended place for the maintenance work (Indoor, outer door, in factory, on site) and procedure for inspection, diagnostic tests, examination and overhaul.

f) Description of special equipment or tools required for the maintenance work.

g) Description of Safety precautions to be observed during the maintenance work.

h) Limits of values and tolerances which when exceeded should be corrected by the maintenance staff. At least the limits and tolerances of the following shall be given,

(i) Pressure, density levels

(ii) Operating times

(iii) Resistance of the main circuit

(iv) Quantities and quality of liquid or gas

(v) Manufacturers references of liquid or gas

(vi) Permissible torques of all nuts and bolts

(vii) Important dimensions

i) List of special tools, lifting and access equipment.

j) Description of tests after maintenance work.

k) How to proceed with the equipment at the end of its operating life, taking into consideration environmental requirements.

l) It is mandatory that the maintenance manual shall include a list of all the components (not sub assemblies) and order number for each of such components. If any manufacturer does not offer individual spares such offers are liable to be rejected.

L. SPARES.

L-1 The manufacturer shall be responsible for ensuring the continued availability of spare parts required for maintenance for a period of not less than 10 years from the date of final manufacturing of the Circuit breakers and Control gear and shall guarantee it.

L-2 Prices for mandatory spare parts and the spare parts given in the annexure (Annex B) as specified spare parts shall be quoted. The cost of these spare parts are taken into the evaluation. In addition, the manufacturer's recommended spares for 10 years
operation, which are not indicated in the annexure shall also be quoted separately. (A detailed spare part list shall be provided).

L-3 Any special tools required for routine maintenance and / or special maintenance including complete disassembly / assembly of the circuit breaker and the operating mechanism shall be separately quoted. Prices shall be quoted separately for each of these items.

L-4 CEB will decide on the final quantity of spares to be procured. Manufacturer may give recommendations on spares procurement.

M. TRAINING.

The Offer shall include the cost for providing training for two engineers for a period not less than one week at the manufacturer’s works. Ceylon Electricity Board will bear the cost for airfare and accommodation of these trainees.

Training shall be on the following,

a) Design concept of the Circuit breaker and operating mechanism of the offered type.
b) Selection of appropriate type and rating of circuit breakers
c) Testing of circuit breakers. (Design tests, production tests and test after delivery)
d) Operation of the offered type of switchgear units and circuit breakers.
e) Installation and commissioning of the offered type of circuit breakers. (If any modification at site is required for the installation, the trainees shall be given the full details of such modification including the drawing.)
f) Hands on training on maintenance of the circuit breakers. Particular attention shall be given for special maintenance and adjustments and usage of special tools in such maintenance work.
g) Safe maintenance policies including safety rules and safety documents.
h) Diagnostic testing and maintenance of the circuit breakers {Switchgear inspection methodologies, partial discharge measurements, timing tests, mechanism of deterioration, switchgear defects and defect control systems, SF6 Gas monitoring (if applicable) and evaluation of test results }.
h) SF6 gas monitoring (if applicable) techniques. (Monitoring methods shall be demonstrated)
i) Inspection and testing of new circuit breakers at manufacturers work. (Witness tests of new circuit breakers.).
N. VALUES AND DATA.

Attached as Annex A.

O. WARRANTY.

Warranty period of at least 18 months after delivery or one year after commissioning against design and manufacturing defects shall be applied for all the equipment and the spares supplied under the Bid. This warranty shall cover the defects due to design and manufacturing of the equipment. Manufacturer/ supplier shall agree to supply such defective items or rectify such defects free of charge during the warranty period.

CEYLON ELECTRICITY BOARD
GENERATION DIVISION

Generation Headquarters
New Kelani Bridge Road,
Kolonnawa.
SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS – 132kV C. B.

1. Manufacturer :………………………………………………………………

2. Country of Origin :………………………………………………………………

3. Type / model :………………………………………………………………………..

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>REQUIRED</th>
<th>TENDERED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Standards</td>
<td>IEC 62271-100</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Rated Voltage</td>
<td>145 kV</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Rated nominal Current</td>
<td>(value) A</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Rated Frequency</td>
<td>50Hz</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Number of breaks per phase</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Type of insulation medium</td>
<td>SF 6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Rated Insulation Withstand Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>at one minute power frequency</td>
<td>275 kV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>at impulse (1.2/50ms)</td>
<td>650 kV</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Rated short time withstand current (3s)</td>
<td>40kA</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Rated peak withstand current</td>
<td>(value) kA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Rated duration of short-circuit;</td>
<td>3s</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Rated transient recovery voltage kVp for terminal faults</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) 0% rated short circuit breaking current</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Time co-ordinate t3 (µs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Rate of rise (kV/µs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Rated line charging breaking current (A)</td>
<td>…… A</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Rated cable charging breaking current (A)</td>
<td>…… A</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Rated out of phase breaking current (kA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Rated operating sequence</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>O-0,3s-CO-3min-CO</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O-0,3s-CO-15s-CO</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

Authorised Signature
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>REQUIRED</th>
<th>TENDERED</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Closing time (ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Dead Time (ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Opening time at 100% breaking current (ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Minimum time for arc extinction to contact remake for auto reclosing (ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Number of auxiliary contacts in addition to the breaker control</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) N/O contacts per pole</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) N/C contacts per pole</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Ratings of the auxiliary contacts</td>
<td>1 A / 2 A (select)</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Rated supply voltage of closing and opening devices and of auxiliary circuits;</td>
<td>220Vdc</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Rated supply frequency of closing and opening devices and of auxiliary circuits;</td>
<td>DC</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Rated short-circuit breaking current</td>
<td>…… kA</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Transient recovery voltage related to the rated short-circuit breaking current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Rated short circuit making current</td>
<td>…… kA</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Rated SF6 gas pressure kPa gauge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Rated operating sequence</td>
<td>O-0,3s-CO-3min-CO</td>
<td>O-0,3s-CO-15s-CO</td>
</tr>
<tr>
<td>29</td>
<td>Rated time quantities</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Opening Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arcing Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Breaking Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Closing Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITEM</td>
<td>DESCRIPTION</td>
<td>REQUIRED</td>
<td>TENDERED</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>30</td>
<td>Is circuit breaker re-strike free</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Electrical life of the circuit breaker at the rated breaking capacity before an overhaul</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>No of trip coils</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
| 33   | a) Rated Voltage of the trip coil  
      b) Rated voltage of the close coil |          |          |
| 34   | Type of the operating mechanism | Spring   |          |
| 35   | Number of close/trip operations possible on one charge | Close 1, trip 2 |          |
| 36   | Rated voltage of charging motor (V AC) | 230V ±10% |          |
| 37   | Quantity of SF 6 gas per pole (kg) |          |          |
| 38   | Creepage distance of  
      a) Interrupter  
      b) Support insulator (If required) |          |          |
| 39   | Number of years the same type of circuit breakers in commercial operation. |          |          |
| 40   | Total weight of the pole including the operating mechanism. |          |          |
| 41   | Total period of guarantee from the delivery date | 18 months |          |
| 42   | Total period of guarantee from the date of commissioning | 12 months |          |

…………………………………….

**Authorised Signature**  
**Company Seal**

**Name of the Bidder**

**Date:-** ………………., 2011.
**Annex - B**

**Spare parts requested with 132kV Circuit Breakers.**

*(Only the applicable Items)*

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Required Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td><strong>Interrupter</strong></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Gaskets and oil rings for interrupter</td>
<td>.... Sets</td>
</tr>
<tr>
<td>1.2</td>
<td>Pressure relief valve</td>
<td>.... Sets</td>
</tr>
<tr>
<td>1.3</td>
<td>Damper</td>
<td>.... Sets</td>
</tr>
<tr>
<td>1.4</td>
<td>Complete pole</td>
<td>.... No.</td>
</tr>
<tr>
<td>1.5</td>
<td>Equalizing valve if applicable</td>
<td>.... Nos</td>
</tr>
<tr>
<td>1.6</td>
<td>Pressure switch</td>
<td>...... Nos</td>
</tr>
<tr>
<td>1.7</td>
<td>Differential pressure switch</td>
<td>.... Nos</td>
</tr>
<tr>
<td>1.8</td>
<td>Dismantling tools and maintenance tools</td>
<td>..... Set</td>
</tr>
<tr>
<td>1.9</td>
<td>Any other recommended spares (please attach the list)</td>
<td>.... Set</td>
</tr>
<tr>
<td>2.0</td>
<td><strong>Operating Mechanism</strong></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Charging/Compressor Motor</td>
<td>.... Nos</td>
</tr>
<tr>
<td>2.2</td>
<td>Closing Coil</td>
<td>2 Nos</td>
</tr>
<tr>
<td>2.3</td>
<td>Tripping Coil</td>
<td>4 Nos</td>
</tr>
<tr>
<td>2.4</td>
<td>Damper</td>
<td>1No</td>
</tr>
<tr>
<td>2.5</td>
<td>Any other recommended spares (please attach the list)</td>
<td>1 Set</td>
</tr>
</tbody>
</table>

........................................

**Authorised Signature**

**Date:- ............. 2011**