MAHAVITARAN
Maharashtra State Electricity Distribution Co. Ltd.

SPECIFICATION NO.STORES/MSC-II/RMU/2011 (Revised 2017)

TECHNICAL SPECIFICATION

FOR

11 kV and 22 kV RING MAIN UNIT

TO BE USED IN

DISTRIBUTION SYSTEM

IN

MAHARASHTRA

I N D E X

Technical Specifications of 11kV and 22kV, Ring Main Unit

SPECIFICATION NO.STORES/MSC-II/RMU/2011(Revised 2017)

1.0 SCOPE

1.1 This specification covers Design, Engineering, Manufacture, Assembly, Stage testing, Inspection , Testing before supply, packing and delivery at stores of 22kV and 11 kV Ring Main Units extensible and non extensible type (Outdoor & Indoor) comprising 2 numbers Load Break Isolators and one Circuit breaker for Distribution Transformer protection. The Unit should be extensible on both sides for future requirement. The RMU to be supplied against this specification are required for vital installations where continuity of service is very important. The design, materials and manufacture of the equipment shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.

1.2 The RMU offered shall be compact, maintenance free, easy to install reliable, safe and easy to operate and complete with all parts necessary for their effective and trouble-free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.

1.3 It is not the intent to specify herein complete details of design and construction. The offered equipment shall conform to the relevant standards and be of high quality, sturdy, robust and of good design and workmanship complete in all respects and capable to perform continuous and satisfactory operations in the actual service conditions at site and shall have sufficiently long life in service as per statutory requirements. In actual practice, not withstanding any anomalies, discrepancies, omissions, in-completeness, etc. in these specifications, the design and constructional aspects, including materials and dimensions, will be subject to good engineering practice in conformity with the required quality of the product, and to such tolerances, allowances and requirements for clearances etc. as are necessary by virtue of various stipulations in that respect in the relevant Indian Standards, IEC standards, I.E. Rules, I.E.Act and other statutory provisions.

1.4 The Tenderer/supplier shall bind himself to abide by these considerations to the entire satisfaction of the purchaser and will be required to adjust such details at no extra cost to the purchaser over and above the tendered rates and prices.

1.5 Tolerances:

Tolerances on all the dimensions shall be in accordance with provisions made in the relevant Indian/IEC standards amended upto date and in this specifications. Otherwise the same will be governed by good engineering practice in conformity with required quality of the product.

1.6 Recommended spares:

The tenderer shall furnish in his offer a list of recommended spares with unit rates for each set of equipment that may be necessary for satisfactory operation and maintenance of circuit breaker and Isolators for a period of 5 years. The purchaser reserves right of selection of items and quantities of these spares to be ordered. The cost of such spares shall not be considered for tender evaluation.

1.7 Erection and maintenance tools

The tenderer shall submit a list and unit rates of all the special tools, equipment and instruments required for erection, testing, commissioning and maintenance of the equipment. The purchaser shall decide the quantity of tools to be ordered. Prices of these tools shall not be considered for tender evaluation. However, the list of necessary tools/equipment which will be supplied free of cost with each Ring Main Unit may be furnished separately.

2.0 SERVICE CONDITIONS:

2.1 System particulars:

2.1.1	Nominal system voltage	...	11 kV and 22 kV
2.1.2	Corresponding highest system voltage	...	12 kV and 24 kV
2.1.3	Frequency	...	50 Hz ± 3%
2.1.4	Number of phases	...	3
2.1.5	Neutral earthing	...	Solidly grounded
2.1.6	Fault level (minimum)	...	20 kA for 3 sec for 11kV 16 kA for 3 sec for 22 kV

2.2 Equipment supplied against the specification shall be suitable for satisfactory operation under the following tropical conditions:-

2.2.1	Max. ambient air temperature	:	50 Deg. C
2.2.2	Max. relative humidity	:	100 %
2.2.3	Max. annual rainfall	:	1450 mm
2.2.4	Max. wind pressure	:	150 kg/sq.m.
2.2.5	Max. altitude above mean sea level	:	1000 mtrs.
2.2.6	Isoceraunic level	:	50
2.2.7	Seismic level (Horizontal acceleration)	:	0.3 g.
2.2.8	Climatic Condition	:	Moderately hot and humid tropical climate conducive to rust and fungus growth.
2.2.9	Reference Ambient Temperature for temperature rise		50 deg C

Note : The climatic conditions are prone to wide variations in ambient conditions and hence the equipment shall be of suitable design to work satisfactorily under these conditions.

3.0 APPLICABLE STANDARDS

The RMU Switchgear shall comply with the requirements stated in the following standards and specifications amended upto date :

IEC 62271- 200/ IEC 60 298/ IS 12729 : 1988	General requirement for Metal Enclosed Switchgear
IEC 265	Medium Voltage Switches
IEC 60129/ IEC 62271 – 102/ IS 9921	Alternating Current disconnectors (Load Break Isolators) and earthing switch
IEC 62271-100/IEC 60056/ IS 13118 : 1991	Specification for alternating current breakers
IEC 62271 – 1/ IEC 60694	Panel design, SF6/ Vacuum Circuit Breakers
IEC 60044 –1/ IEC 60185/ IS 2705:1992	Current Transformers
IEC 60265/IS 9920 : 1981	High voltage switches
IEC 376	Filling of SF6 gas in RMU
IEC 60273/ IS : 2099	Dimension of Indoor & Outdoor post insulators with voltage > 1000 V
IEC 60273/ IS 13947 (Part 1)	Degree of protection provided by enclosures for low voltage Switchgear and control gear.
All Indian Electricity Rules/ Bills amended upto date applicable for clearances, safety and operation of the equipment.	

The RMU meeting with the requirements of any other authorities standards, which ensures equal or better quality than the standard mentioned above shall also be acceptable. If the equipments, offered by the bidder conform to other standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. In case of any difference between provisions of these standards and provisions of this specification, the provisions contained in this specification shall prevail. One copy of such standards with authentic English Translations in Hard Copy shall be furnished along with the offer.

4. General Requirement:

The Ring Main Unit shall be installed at 22 kV and 11 kV junction points such as 630 KVA, 315 KVA distribution transformers centres to isolate faulty section. The RMU shall be both Non extensible/extensible. Two Load break isolators for incoming & outgoing cables and one Circuit breaker for transformer protection shall be enclosed in the main tank using SF6 gas as insulating and vacuum as arc quenching medium or SF6 gas as both insulating and arc quenching medium.

The main tank shall be stainless steel sheet of minimum 2mm thickness and robotically welded with a pressure relief arrangement.

Both the load break switches and circuit breaker shall be suitable for motorization in future

The total breaking time for transient fault should not exceed 40-60 mS (CB + Relay+ trip coil).

The main tank (Inner enclosure of Circuit Breaker & Load break Isolators assembly) and all Switchboard assembly shall be housed in a single compact metal clad suitable for both indoor/outdoor applications.

The design of enclosure for Switchgear, RMU & Switchboard housing shall be in accordance with IEC 298. The design of RMU shall be in accordance with the Specific Technical Requirement as given in the Annexure-I enclosed with the Specification.
The switchgear and switchboard shall be designed such that the position of the different devices shall be visible to the operator on the front of switchboard and easy to operate and prevent access to all live parts during operation without the use of tools. There shall be no access to exposed conductors.

An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF6 gas to regenerate the SF6 gas following arc interruption. A temperature compensating gas pressure indicator offering a simple indication shall constantly monitor the SF6 insulating medium.

Sulphur Hexa Fluoride Gas (SF6 GAS):

The SF6 gas shall comply with IEC 376,376A and 376B and shall be suitable in all respects for use in RMUs under the stipulated service conditions. The SF6 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 the bidder indicating all the tests as per IEC 376 for each lot of SF6 Gas.

5.0 Configurations recommended:

The following configurations of RMUs are recommended:

a) Non Extensible

Non extensible RMU with one number of 200A circuit breaker for transformer protection upto 630 KVA and two number of Load Break Isolators for network sectionalising with earth isolator.

b) Extensible

Extensible RMU with one number of 200A circuit breaker and two Load break isolators with earth isolator arrangement having provision for adding one number of 200A circuit breaker for one extensible and two 200 A circuit breakers for two extensible RMU.

6.0 ENCLOSURE :

6.1.1 Outer Enclosure :

The RMU enclosure (Outer) shall be made up of CRCA of 2 mm thickness or galvanised of 1.6 mm thickness. The rating of enclosure shall be suitable for operation on three phase, three wire, 22 kV or 11 KV, 50 cycles, A.C. System with short-time current rating of 20KA for 3 seconds for 11kV and 16 kA for 3 seconds for 22 kV supply with Panels. The complete RMU enclosure shall be of degree of protection **IP 54** (Main Door close) and **IP 41** (Main Door open).

The enclosure shall provide full insulation, making the Switchgear insensitive to the environment like temporary flooding, high humidity etc. The active parts of the Switchgear shall be maintenance-free and the unit shall be minimum -maintenance.

The complete RMU unit shall be powder coating of Dark Grey Code 632 as per BS 381C.

Each switchboard shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics.

The RMU metal parts shall be made of high thickness high tensile steel which must be grit/short blasted, thermally sprayed with Zinc alloy (not for galvanised) , phosphate and subsequently painted with Polyurethane based powder paint, the overall (including outer and inner paint layer), the thickness of paint layer shall be not less than 150 microns.

6.1.2 Inner enclosure (Main tank)

The tank shall be robotically welded stainless steel sheet of minimum 2mm thickness. The tank shall be sealed and no handling of gas is required throughout the 25 years of service life. However, the SF6 gas pressure inside the tank shall be constantly monitored by a temperature compensating gas pressure indicator offering a simple go, no-go indication. The gas pressure indicator shall be provided with green pressure and red pressure zones. There shall be one Non – return valve to fill up the gas. The manufacturer shall give guarantee for maximum leakage rate of SF6 gas will be lower than 0.1 % / year. An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF6 gas to regenerate the SF6 gas following arc interruption. The degree of protection of the inner enclosure shall be IP 67.

Oil or Air filled Switchgear will not be considered. The temperature rise test shall be carried out on complete RMU unit and test reports shall be submitted with the offer.

The compact RMU Unit shall be provided with a pedestal made up of M.S. Angle to mount the unit on plain surface. The height of the bottom of cable box shall be 310 mm to provide the turning radius for the HT cable termination.

6.2 BUSBARS :

The three nos of continuous Busbars made up of EC grade tinned copper of rating current 630A shall be provided. The Short time rating current shall be 20 kA for 3 seconds for 11 kV and 16 kA for 3 seconds for 22 kV. The Busbar connections shall Anti- oxide greased.

6.3 Load Break Switches (Isolators)

The Load Break Isolators for Incoming and Outgoing supply must be provided and the load break isolators are fully insulated by SF6 gas. The operating mechanism shall be spring assisted mechanism with operating handle for ON /OFF. Earth positions with arrangement for padlocking in each position. Also independent manual operations with mechanically operated indicator. The earth switch shall be naturally interlocked to prevent the main and earth switch being switched ‘ON’ at the same time. The selection of the main and earth switch is made by a lever on the facia, which is allowed to move only if the main or earth switch is in the off position. The load break isolators should have the facility for future remote operation. Each load break switch shall be of the triple pole, simultaneously operated, non automatic type with quick break contacts and with integral earthing arrangement. The rated current of Isolator shall be 630 Amps continuous at maximum ambient temperatures. No Derating shall be allowed. For the isolator at an Ambient temperature of 50 °C, which means that Isolator rating should be 630 A

maximum ambient temperature of 50 °C. The relevant type test report to prove the temperature rise below 55 °C shall be submitted by the bidder with the offer.

6.4 EARTHING OF ISOLATORS AND DISTRIBUTION TRANSFORMER BREAKERS (EARTH SWITCH).

The unit shall consist of a 630 Amp Tee Off spring assisted three position rotating arc type SF6 circuit breaker unit, with integral fault making/dead breaking earth switch, the function shall be naturally interlocked to prevent the main and earth switch from being switched `ON` at the same time and the CB not allowed to close in `Earth On` position. The selection of the main/earth switch lever on the fascia, which is allowed to move only if the main or earth switches in the off position. The lever may be padlocked in either the main or earth position.

The cables shall be earthed by an integral earthing switch with short-circuit making capacity, in compliance with IEC 129 standard. The earthing switch shall be operable through the main circuit mechanism and manual closing shall be driven by a fast-acting mechanism, independent of operator action.

6.5 CIRCUIT BREAKER (SF6 or Vacuum media for arc quenching).

The 3 pole circuit breaker for the protection of Distribution transformers shall be enclosed in the main tank. The rated breaking and making current at rated voltage shall be as follows:

For 11kV system : Rated breaking capacity shall be 20 kA for 3 second.
Rated making current shall be 50 kA for 3 second
For 22 kV System : Rated breaking capacity shall be 16 kA for 3 second.
Rated making current shall be 40 kA for 3 second

The manual operation of the circuit breaker shall not have an effect on the spring charging mechanism.

The circuit breaker shall be fitted with a mechanical flag, which shall operate in the event of fault occurrences. The breaker indications **ON** and **OFF** positions shall be indicated by suitable flag. For **ON** position indication by Red flag and **OFF** position indication by Green flag shall be provided.

The circuit breaker shall be operated by the same unidirectional handle or switch. The rated operating sequence shall be **O-3min-CO-3 min- CO**.

The protection on the circuit breaker:
The circuit breaker unit fitted with 3 nos protection CT's (tape wound) of ratio 100-50A/1 A, 5P10 class, having low burden and trip coil and auxiliary switch assembly allowing the use of a **self powered non directional IDMT (I**nverse Definite Minimum Time) **Over Current and Earth Fault Relays (Micro processor based)**. One Three Element Relay having two O/C elements and one E/F element shall be provided for this purpose. All these relays shall be of 3 seconds IDMT characteristics, the O/C elements current setting variable from 10% to 200% of CT secondary ratings, and the E/F elements having current setting variable from 10% to 40%. The protection curves and all other settings shall be adjustable from touch panel.

6.6 BUSHINGS

All the bushings shall be of same height, parallel, on equal distances from the ground and protected by a cable cover. It is preferable to have bushings accessible from the rear side of the RMU.

6.7 CABLE BOXES

All cable boxes shall be air insulated suitable for dry type cable terminations. The cable boxes at each of the two ring switches suitable HV cables of size 3C x 300 sq.mm and circuit breaker cable suitable up to 3C x 300 sq.mm. Necessary Right angle Boot should be supplied to the cable terminations. Compound filled cable boxes are not acceptable. The cable box shall be arc resistant as per IEC 62271-200 amended uptodate. The internal arc fault test on cable box shall be carried out for 11 kV system for 20 kA for 1 second and for 22 kV system for 16 kA for 1 second. The clearance between phase to phase and phase to earth shall be as per IEC 61243 – 5 amended upto date. The cable termination and gland arrangements shall be appropriate for the type and style of cables used at the time.

6.8 VOLTAGE INDICATOR LAMPS AND PHASE COMPARATORS

The RMU shall be equipped with a voltage indication. There should be a facility to check the synchronization of phases with the use of external device. It shall be possible for the each of the function of the RMU to be equipped with a permanent voltage indication as per IEC 61958 to indicate whether or not there is voltage on the cables.

The capacitive dividers will supply low voltage power to sockets at the front of the unit, an external lamp must be used to indicate live cables.

Three outlets can be used to check the synchronization of phases with the use of an external device.

6.9 EXTENSIBLE

Each combination of RMU shall have the provision for extension by load break isolators / breakers in future, with suitable trenching chamber, accessories and necessary Busbars. Extensible isolators and circuit breakers shall be individually housed in separate SF6 gas enclosures. Multiple devices inside single gas tank / enclosure will not be acceptable. In case of extensible circuit breakers, the Breaker should be capable of necessary short circuit operations as per IEC standard i.e. 20 KA for 3 second for 11kV system and 16 kA for 3 second for 22 kV system. The Breaker should have a rated current carrying capacity of 200 A.

6.10 WIRING & TERMINALS:

The wiring should be of high standard and should be able to withstand the tropical weather conditions. All the wiring and terminals (including take off terminals wiring for future automation, DC, Control wiring), Spare terminals shall be provided by the contractor. The wiring cable must be standard single-core multi stranded, non-sheathed, Core marking

(ferrules), stripped with non-notching tools and fitted with end sleeves, marked in accordance with the circuit diagram with printed adhesive marking strips.
All wiring shall be provided with single core multi-strand copper conductor wires with P.V.C insulation and shall be flame retardant low smoke type.

The wiring shall be carried out using multi-strand copper conductor super flexible PVC insulated wires of 1.1 KV Grade for AC Power, DC Control and CT circuits. Suitable coloured wires shall be used for phase identification and interlocking type ferrules shall be provided at both ends of the wires for wire identification. Terminal should be suitably protected to eliminate sulphating. Connections and terminal should be able to withstand vibrations. The terminal blocks should be stud type for controls and disconnecting link type terminals for CT leads with suitable spring washer and lock nuts.

Flexible wires shall be used for wiring of devices on moving parts such as swinging Panels (Switch Gear) or panel doors. Panel wiring shall be securely supported, neatly arranged readily accessible and connected to equipment terminals, terminal blocks and wiring gutters. The cables shall be uniformly bunched and tied by means of PVC belts and carried in a PVC carrying trough.

The position of PVC carrying trough and wires should not give any hindrance for fixing or removing relay casing, switches etc., Wire termination shall be made with solder less crimping type of tinned copper lugs. Core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted with both ends of each wire. Ferrules shall fit tightly on the wire when disconnected. The wire number shown on the wiring shall be in accordance with the IS.375.

All wires directly connected to trip circuits of breaker or devices shall be distinguished by addition of a red colour unlettered ferrule.

Inter-connections to adjacent Panels (Switch Gear) shall be brought out to a separate set of Terminal blocks located near the slots or holes to be provided at the top portion of the panel. Arrangements shall be made for easy connections to adjacent Panels (Switch Gear) at site and wires for this purpose shall be provided and bunched inside the panel. The bus wire shall run at the top of the panel. Terminal block with isolating links should be provided for bus wire. At least 10% of total terminals shall be provided as spare for further connections. Wiring shall be done for all the contacts available in the relay and other equipment and brought out to the terminal blocks for spare contacts. Colour code for wiring is preferable in the following colours.

Voltage supply	Red, Yellow, Blue for phases, Black for Neutral
CT circuits	similar to the above
250V AC circuits	Black for both phases and neutral
Earthing	Green

The wiring shall be in accordance to the wiring diagram for proper functioning of the connected equipment. Terminal blocks shall not be less than 650V grade and shall be piece-moulded type with insulation barriers.

The terminal shall hold the wires in the tight position by bolts and nuts with lock washers. The terminal blocks shall be arranged in vertical formation at an inclined angle with sufficient space between terminal blocks for easy wiring.

The terminals are to be marked with the terminal number in accordance with the circuit diagram and terminal diagram. The terminals should not have any function designation and are of the tension spring and plug-in type.

6.11 EARTHING

The RMU outdoor metal clad, Switch Gear, Load break isolators, Distribution Transformer, R.S.Joists, M.S. Channels / M.S. Angles etc, shall be equipped with an earth bus securely fixed along the base of the RMU.

When several units of the RMU (Extra Isolators / Breakers) are mounted adjoining to each other, the earth bus shall be made continuous and necessary connectors and clamps for this purpose shall be included in the scope of supply. The size of earth busbar of **tinned copper flat** shall be as per IEC/IS standards and shall be fixed inside the **RMU.** Provision shall be made on end of RMU for connecting the earth bus to the earth grid by erecting suitable 2 earth pipes of 40mm diameter MS rod of 3 meters in pits. Both the earth pipes are also to be connected in a grid formation. Necessary terminal clamps and connectors shall be included in the scope of supply.

6.12 TAKE OFF TERMINAL UNITS FOR FUTURE AUTOMATION :

The RMU should be provided with necessary take off terminal units for future automations. Remote operation of the RMU's line switches must be possible using motors fitted to the operating mechanism.

It shall be possible to fit the motors either directly in manufacturing plant or on site as and when required. Installation on site shall be possible with the RMU fully energised and manufacturer should provide detailed instructions for installation to the control mechanism.

The fitting of the motors to the mechanism must not in any way impede or interfere with the manual operation of the switches or circuit breaker.

The tenderer may wish to advice of options and cost for remote supervisory control units of the RMU and MV network supervisory control system.

Complete Ring Main Unit shall be capable of withstanding 630A current without any damage being caused, in accordance with the recommendations IEC 694 and IEC 298.

6.13 FAULT PASSAGE INDICATORS / Earth Fault Indicators (FPI/EFI):

These shall facilitate quick detection of faulty section of line. The fault indication may be on the basis of monitoring fault current flow through the device. The unit should be self-contained requiring no auxiliary power supply. The FPI shall be integral part of RMU.

6.14 TROPICALISATION:

Due regard should be given to the climatic conditions under which the equipment is to work. Ambient temperature normally varies between 20 °C and 32 °C, although direct sun temperature may reach 45 °C. The climate is very humid and rapid variations occur, relative humidity between 90% and 100% being frequently recorded, but these values generally correspond to the lower ambient temperatures. The equipment should also be designed to prevent ingress of vermin, accidental contact with live parts and to minimize

the ingress of dust and dirt. The use of materials, which may be liable to attack by termites and other insects, should be avoided.

6.15 Safety of people

Any accidental overpressure inside the sealed chamber will be limited by the opening of a pressure limiting device in the enclosure. Gas will be released to the rear of the unit away from the operator. Manufacturer shall provide type test report to prove compliance with IEC 298 appendix AA 'Internal fault'.

6.16 Operating lever

An anti-reflex mechanism on the operating lever shall prevent any attempts to re-open immediately after closing of the switch or earthing switch.

All manual operations will be carried out on the front of the switchboard.

The effort exerted on the lever by the operator should not be more than 250 N for the switch and circuit breaker.

The overall dimensions of the RMU shall not be increased due to the use of the operating handle. The operating handle should have two workable positions 180° apart.

6.17 Front plate

The front shall include a clear mimic diagram which indicates different functions.

The position indicators shall give a true reflection of the position of the main contacts. They shall be clearly visible to the operator.

The lever operating direction shall be clearly indicated in the mimic diagram.

The manufacturer's plate shall include the switchboard's main electrical characteristics.

6.18 Danger Board :

The danger Board plate as per relevant IS shall be riveted on the front plate of the RMU.

7 TYPE and ROUTINE TESTS :

7.1 Type tests:

The equipment offered in the tender should have been successfully type tested at NABL laboratories in India or equivalent International Laboratories in line with the relevant standard and technical specification, within the last 5 (five) years from the date of offer. The bidder shall be required to submit complete set of the type test reports in physical format along with the offer.

In case these type tests are conducted earlier than five years, all the type tests as per the relevant standard shall be carried out by the successful bidder at NABL in presence of purchaser's representative free of cost before commencement of supply. The undertaking to this effect should be furnished along with the offer without which the offer shall be liable for rejection.

The list of type tests is as follows:

7.1 Short time current withstand test and peak current withstand test.

7.2 Lightening Impulse voltage with-stand test

7.3 Temperature rise test.

7.4 Short Circuit current making and breaking tests.

7.5 Power frequency voltage withstand test (dry).

7.6 Capacitive current switching test confirming to IEC.

7.7 Mechanical operation test.

7.8 Measurement of the resistance of the main circuit.

7.9 Degree of protection of main tank and outer enclosure

7.10 Switch, circuit breaker, earthing switch making capacity.

7.11 Switch, circuit breaker breaking capacity.

7.12 Internal arc withstand.

7.13 Checking of partial discharge on complete unit.

The details of type test certificate according to the composition of the Switchboard shall be submitted with the offer.

In addition, for switches, test reports on rated breaking and making capacity shall be supplied.

For earthing switches, test reports on making capacity, short-time withstand current and peak short-circuit current shall be supplied.

7.2 ACCEPTANCE & ROUTINE TESTS:

All acceptance and routine tests as stipulated in the respective applicable standards amended up-to-date for all the equipment shall be carried out by the supplier in the presence of purchaser's representative without any extra cost to the purchaser before despatch.

The tenderer shall have full facilities to carry out all the acceptance and routine test as per the applicable standards.

After finalisation of the program of type/acceptance/routine testing, the supplier shall give 15 days advance intimation to the purchaser, to enable him to depute his representatives for witnessing the tests.

The routine tests should be carried out by the manufacturer at his works in presence of EE (testing) MSEDCL and EE (IW) , STORES, MSEDCL.

The routine tests are as follows:

1. Conformity with drawings and diagrams,
2. Measurement of closing and opening speeds,
3. Measurement of operating torque,
4. Checking of filling pressure,
5. Checking of gas-tightness,
6. Dielectric testing and main circuit resistance measurement.
7. Power frequency voltage
8. Resistance test for the circuit
9. Mechanical operation tests.

All major type tests shall have been certified at an independent authority with the tests carried outside country of manufacture shall be translated in English and submitted in hard copy.

The supplier in the presence of MSEDCL's representative shall carry out all above acceptance and routine tests. The supplier shall give at least 15 days advance intimation to the MSEDCL to enable them to depute their representative for witnessing the tests. The cost towards transport, stay and other expenses shall be borne by the supplier.

The MSEDCL reserves the right for carrying out any other tests of a reasonable nature at the works of the supplier/laboratory or at any other recognized laboratory/research institute in addition to the above mentioned type, acceptance and routine tests at the cost of the MSEDCL to satisfy that the material complies with the intent of this specification.

8.0 INSPECTION:

The inspection may be carried out by the purchaser at any stage of manufacture. The successful tenderer shall grant free access to the purchaser's representative/s at a reasonable notice when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser, shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

The supplier shall keep the purchaser informed, in advance, about the manufacturing programme so that arrangement can be made for stage inspection.

The purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought out items. The supplier shall keep the purchaser informed, in advance, about such testing programme.

9.0 PROTOTYPE SAMPLE:

The successful bidders should manufacture 3 Nos. of prototype RMUs as per the specification and keep ready at their works for the purpose of sample inspection and testing. The MSEDCL at their option may sent a team of Engineers to the works. Prior intimation of this inspection may not be given to the Bidder.

10.0 MANUFACTURING FACILITIES:

As RMU are having sealed pressure system in compliance with IEC 298, manufacturer shall have complete facility with state of the art equipments for ensuring the quality of product delivered strictly adhering to IEC 298 GUIDELINES. Following are the work station at manufacturer place to ensure the adherence: -

1. Robotic welding station for stainless steel main tank ensuring the leak rate less than 0.1% per annum
2. Work stations with adjustable work benches and torque wrenches, giving flexibility to workmen for proper tightness of internal components of sealed tank.
3. State of the Gas leak testing system ensuring the quality of sealing and have precision to measure leak rate less than 0.1% per annum.

4. High voltage testing station to have high voltage power frequency test and partial discharge measurement.
5. Computerized system to measure time travel characteristic of breaker before sealing the tank.

11.0. QUALITY ASSURANCE PLAN:

The bidder shall invariably furnish following information along with his offer.

(1) Statement giving list of important raw materials including but not limited to
(a) Contact material
(b) Insulation
(c) Sealing material
(d) Contactor, limit switches, etc. in control cabinet.

Name of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials in presence of Tenderer's representative, copies of test certificates.

2) Information and copies of test certificates as in (i) above in respect of bought out accessories.

3) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
4) Special features provided in the equipment to make it maintenance free.
5) List of testing equipment available with the Bidder for final testing of RMU and associated combinations vis-à-vis, the type, special, acceptance and routine tests specified in the relevant standards. The supplier shall, within 15 days from the date of receipt of Purchase Order submit following information to the MSEDCL
i) List of raw materials as well bought out accessories and the names of sub-suppliers selected from those furnished along with offer.

ii) Necessary test certificates of the raw material and bought out accessories**.**

iii) Quality Assurance Plan (QAP) with hold points for MSEDCL's inspection. The quality assurance plan and hold points shall be discussed between the MSEDCL and supplier before the QAP is finalized.

The supplier shall submit the routine test certificates of bought out items and raw material, at the time of routine testing of the fully assembled breaker.

12.0 DRAWINGS:

All drawings shall conform to relevant IEC Standards Specification. All drawings shall be in ink.

The Tenderer shall submit along with his tender dimensional general arrangement drawings of the equipments, illustrative and descriptive literature in triplicate for various items in the RMUs, which are all essentially required for future automation.

The Tenderer shall submit following documents along with the tender :

i) Schematic diagram of the RMU panel
ii) Instruction manuals
iii) Catalogues of spares recommended with drawing to indicate each items of spares
iv) List of spares and special tools recommended by the supplier.
v) Copies of Type Test Certificates as per latest IS/IEC.
vi) Drawings of equipments, relays, control wiring circuit, etc.
vii) Foundation drawings of RMU.
viii) Dimensional drawings of each material used for item Vii.
ix) Actual single line diagram of RMUs with or without extra combinations shall be made displayed on the front portion of the RMU so as to carry out the operations easily.

Operation, Maintenance and erection instruction manual in English language shall be also supplied alongwith each RMU to the respective consignee as per the despatch instructions given from Material Management Cell under CE (Stores), Corporate Office, Mumbai. The successful tenderer to submit the drawings, bill of materials, packing lists, etc. in time and get these approved from the office of Chief Engineer (STORES), I st floor, Prakashgad, MSEDCL, Mumbai.

13.0 NAME PLATE:

Each RMU and its associated equipments shall be provided with a nameplate legible and indelibly marked with at least the following information.

(a) Name of manufacturer, (b) Type, (c) Serial number, (d) Voltage , (e) Current,
(f) Frequency , (g) Symmetrical breaking capacity, (h) Making capacity
(i) Short time current and its duration, (j) Purchase Order number and date
(k) Month and Year of supply, (l) Rated lighting impulse withstand voltage

14. PACKING & FORWARDING :

The equipment shall be packed in crates suitable for vertical/horizontal transport as the case may be and the packing shall be suitable to withstand handling during the transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable materials shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.
Each consignment shall be accompanied by a detailed packing list containing the following information:

Name of the consignee.

Details of consignment.

Destination.

Total weight of consignment.

Sign showing upper/lower side of the crate.

Handling and unpacking instructions.

a) Bill of material indicating contents of each package.

All the equipment covered in this specification shall be delivered to the various stores centres of the MSEDCL as will be intimated to the successful tenderers. The equipment shall be delivered to these stores centres only by road transport and shall be suitably packed to avoid damages during transit in the case of indigenous supplies.

The tenderer shall quote delivery periods for various equipment and shall stick to the committed delivery. The delivery period will be counted from the date of receipt of letter of award of the contract. It is therefore, the responsibility of the successful tenderer to submit the drawings, bill of materials, packing lists, etc. in time and get these approved from the office of Chief Engineer (STORES), I st floor, Prakashgad, MSEDCL, Mumbai.

It may clearly be noted that the delivery period will under no circumstances be linked up with other formalities like drawing approval, etc.

15.0 TRAINING

All successful tenderers for switchgear shall provide training facilities for the MSEDCL's Engineers. The training shall be for not less than 8 man weeks. Syllabus and other details of the training shall be finalised in consultation with the MSEDCL. Boarding, lodging and traveling expenses for the deputed trainees will be borne by the MSEDCL. Charges for training shall be quoted in the offer separately. These will not be considered for evaluation of the offer.

16.0 PERFORMANCE GUARANTEE:

All equipment supplied against this specification shall be guaranteed for a period of 66 months from the date of receipt at the consignee's Stores Centre or 60 months from the date of commissioning, whichever is earlier. However, any engineering error, omission, wrong provision, etc. which do not have any effect on the time period, shall be attended to as and when observed/pointed out without any price implication.

17.0 DOCUMENTATION:

17.1 After issue of letter of acceptance, the successful tenderers shall submit 3 identical sets of complete drawings along with detailed bill of materials for approval, to the Chief Engineer, (Stores), Ist floor, Prakashgad, MSEDCL, Bandra(E),Mumbai-400 051. If any modifications are required on these, the same will be conveyed to the supplier who shall modify the drawings accordingly and furnish final drawings for approval. In no case delivery extension will be granted for any delay in drawing approval.

17.2 The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation will be permitted without the written approval of the Distribution department. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the supplier's risk.

17.3 After approval of the drawings and bills of materials, the suppliers shall submit detailed packing lists for approval. After approval, copies of these packing lists shall be forwarded to the respective consignees. Copies of packing lists shall also be submitted to the Chief

Accounts Officer (SB), MSEDCL, Prakashgad, Bandra(East) along with the bills for payment.

17.4 Before dispatch of equipment to various consignees, the suppliers shall furnish sets of final drawings, including bills of materials and wiring schedules and also sets of technical literature and commissioning manuals. These shall be in Five sets and shall be furnished to the office of CE(Stores), Ist floor, Prakashgad, Bandra(E), Mumbai positively before the dispatch of equipment. All drawings shall preferably be of A3 size. No drawing of width more than 35 cm will be acceptable. One set each of the final drawings, bill of materials, wiring schedules and commissioning manuals shall invariably be forwarded to the consignee along with each switchgear consignment and shall be listed out in the packing list, when submitted for approval.

17.5 In case the supplier fails to furnish contractual drawings and manuals even at the time of supply of equipment, the date of furnishing of drawings/manuals will be considered as the date of supply of equipment for the purpose of computing penalties for late delivery.

18.0 SCHEDULES:

18.1 The tenderer shall fill-in the following schedules which is part and parcel of the tender specification and offer. If the schedules are not submitted duly filled-in with the offer, the offer shall be liable for rejection.

Schedule 'A'	...	Guaranteed and technical particulars.
Schedule 'B'	...	Schedule of Tenderer's experience.

18.2 Any additional information may be furnished separately by the tenderer, if felt necessary by him.

19.0 GUARANTEED TECHNICAL PARTICULARS

The bidder should fill up the details in schedule A – 'Guaranteed Technical Particulars' and the statement such as "as per drawing enclosed", "as per MSEDCL requirement", "as per IS", "as per specification" etc. shall be considered as details not furnished and such offers will be rejected.

20.0 QUALIFYING REQUIREMNET:

20.1 The Tenderer should have proven experience of not less than 10 years in design, manufacture, supply and testing at work for equipment / materials offered for equal or higher voltage class. The equipment/ material offered by tenderer should be in the successful operation, at least for five years as on the date of submission of the tender.

20.2 The tenderer should have adequate in house testing facilities for conducting acceptance tests in accordance with relevant IS.

20.3 Tenderer should have a minimum turnover of 60% of the value of the material offered in any one financial year during the previous 3 years. However, being commercial aspect, CPA is requested to verify this point.

20.4 The tenderer should furnish all the relevant documentary evidence to establish the fulfilment of the above requirement.

20.5 The bidders not meeting the requirement at clause No. 20.1 can also participate, provided they have valid ongoing collaboration with a manufacturer who has at least 10 years experience in the design, manufacture and testing of the equipment of the type and class

offered which have been in satisfactory service for a period of at least five years. In such an event the bidder shall furnish along with the bid the documentary evidence for the same and undertaking from the bidder and collaboration accepting joint and several liability for all obligations under the contract.

Annexure-I

Specific Technical Requirement for 11KV/ 22 KV Ring Main Units

Sr. No.	Description	22 kV	11 kV
1.0	***SWITCHGEAR ASSEMBLY***		
1.1	Make	Mfg to give details	Mfg to give details
1.2	Type	Outdoor	Outdoor
1.3	Reference Standard	IEC 56, IEC 129,IEC298, IEC694, IEC 265	IEC 56, IEC 129,IEC298, IEC694, IEC 265
1.4	Voltage (Normal/Max.) kV	22kV/24 kV	11kV/12 kV
1.5	Phase (Nos.)	3 nos	3 nos
1.6	Frequency (HZ)	50 ± 3 Hz	50 ± 3 Hz
1.7	Short Circuit rating		
	a) Breaking Symmetrical (KA)	16 kA	20 kA
	b) Breaking Asymmetrical (KA)	16 kA	20 kA
	c) Short time for 1 Sec. (KA)	16 kA	20 kA
	d) Short time for 3 Sec. (KA)	16 kA	20 kA
1.8	Insulation Level		
	a) Impulse withstand (KV peak)	125 kVp	75 kVp
	b) 1 Minute 50 Hz. Voltage withstand (KV rms)	50 kV	28 kV
1.9	Metal Clad Construction	Yes	Yes
1.10	a) Degree of protection for outer enclosure: b) Degree of protection for main tank	IP 54 IP 67	IP 54 IP 67
1.11	Switchgear completely wire and tested at factory (yes/No)	Yes	Yes
2.0	**CONSTRUCTION**		
2.1	Overall Dimensions	Mfg to give details	Mfg to give details
a	Total Non Extensible 3 Way RMU		
	i) Width (W) (mm)	Mfg to give details	Mfg to give details
	ii) Depth (D) (mm)		
	iii) Height (mm)		
2.2	Overall Weight of Total Non Extensible 3 way RMU Unit	Mfg to give details	Mfg to give details
3.0	**Bus bar**		
3.1	Make	Mfg to give details	Mfg to give details
3.2	Material & Grade	Copper	Copper
3.3	Reference Standard	IEC 129	IEC 129
3.4	a) Cross sectional area (mm2)	400 sq.mm	400 sq.mm
	b) Size (mm2)		
3.5	Continuous Current		

	a) Standard	630 A	630 A
	b) At site conditions and within cubicle	630A	630A
3.6	Maximum temperature rise over ambient (c)	55 °C (above ambient of 50 °C)	55 °C (above ambient of 50 °C)
3.7	Short time current for 1 Sec. (KA rms)	16	20
3.8	Minimum clearance from bare bus bar connection	Mfg to give details	Mfg to give details
	a) Phase to phase (mm)		
	b) Phase to Earth (mm)		
3.9	Bus Bar provided with		
	a) Insulation Sleeve	Yes	Yes
	b) Phase barriers	Yes	Yes
	c) Cast Resin shrouds for joints	Yes	Yes
3.10	Busbar connection		
	a) Silver Plated	Yes	Yes
	b) Made with anti-oxide grease	Yes	Yes
3.11	Bus Bar support spacing (mm)	Mfg to give details	Mfg to give details
3.12	Bus support insulators		
	a) Make		
	b) Type		
	c) Reference Standard		
	d) Voltage Class (KV)		
	e) Minimum creepage distance (mm)		
	f) Cantilever strength Kg/mm2		
	g) Net Weight (Kg)		
3.13	SF6 gas pressure (filing pressure at 20 deg. C)	Mfg to give details	Mfg to give details
4.0	**SF6/VCB CIRCUIT BREAKER**		
4.1	Make	Mfg to give details	Mfg to give details
4.2	Type (Vacuum/ SF6)	Mfg to give details	Mfg to give details
4.3	Reference Standard	IEC 56	IEC 56
4.4	Rated Voltage	22 kV	11 kV
4.5	Rated Frequency	50 Hz	50 Hz
4.6	No. Of Poles	3	3
4.7	Rated Current		
	a) Normal (Standard) Amps	200 A	200 A
	b) Rated (Site) Amps	200 A	200 A
4.8	Maximum temperatures rise over ambient.(deg. C)	55 °C (above ambient of 50 °C)	55 °C (above ambient of 50 °C)
4.9	Rated operating Duty	O- 3min- CO-3min- CO	O- 3min- CO-3min- CO
4.10	Rupturing capacity at rated voltage (MVA)	400	400

4.11	Breaking Capacity at rated voltage & operating duty		
	a) Symmetrical (KA rms)	16	20
	b) Asymmetrical (KA rms)	16	20
4.12	Rated making current (KA peak)	40	50
4.13	a) Short time current for 1 Sec.(KA rms)	16	20
	b) Short time current for 3 Sec.(KA rms)	16	20
4.14	Transient Recovery Voltage		
	a) Rate of rise (KV/ms)	0.34 KV/micro sec(as per IEC)	0.34 KV/micro sec(as per IEC)
	b) Peak Voltage (KV)	23 (35 % DC component)	23 (35 % DC component)
4.15	Insulation Level		
	a) Impulse Voltage with stand on 1/50 full wave	125	75
	b) 1 minute 50Hz voltage withstand	50	28
4.17	Opening time Maximum No load condition (ms)	40-60	40-60
4.18	Opening and closing time under SF6 gas loss or vacuum loss condition (ms)	40-60	40-60
4.19	At 100% Breaking capacity		
	a) Opening time – max (ms)	40-60	40-60
	b) Arcing time – max (ms)	6-9	6-9
	c) Total break time (ms)	40-60	40-60
4.20	At 60% Breaking capacity		
	a) Opening time – max (ms)	40-60	40-60
	b) Arcing time – max (ms)	6-9	6-9
	c) Total break time (ms)	40-60	40-60
4.21	At 30% Breaking capacity		
	a) Opening time – max (ms)	40-60	40-60
	b) Arcing time – max (ms)	6-9	6-9
	c) Total break time (ms)	40-60	40-60
4.22	At 10% Breaking capacity		
	a) Opening time – max (ms)	40-60	40-60
	b) Arcing time – max (ms)	6-9	6-9
	c) Total break time (ms)	40-60	40-60
4.23	Number of breaks per pole	Single	Single
4.24	No of breaker operations permissible without requiring inspection replacement of contacts and other main parts.		
	a) At 100% rated current	2000 & 40 Nos at 16 kA	2000 & 40 Nos at 20 kA
	b) At 100% rated breaking current		
4.25	Type of contacts		
	a) Main	Copper chromium, Butt type	Copper chromium, Butt type

	b) Arcing	Copper chromium	Copper chromium
4.26	Material of contacts		
	a) Main	Copper chromium	Copper chromium
	b) Arching	NA for VCB 1260 N (126 kg)	NA for VCB 1260 N (126 kg)
	c) Whether contacts silver plated	NA	NA
	d) Thickness of silver plating	NA	NA
4.27	Operating mechanism- closing		
	a) Type	STORED ENERGY	STORED ENERGY
	b) No of breaker operations stored	One Tripp free	One Tripp free
	C) Trip free or fixed trip	NA (Anti reflex on Earthing)	NA (Anti reflex on Earthing)
	d) Anti pumping features provided		
	e) Earthing for operating mechanism and metal parts furnished	Mfg to give details	Mfg to give details
	f) Earth terminal size and material	Mfg to give details	Mfg to give details
4.28	Operating mechanism- tripping		
	a) Type	Mfg to give details	Mfg to give details
	b) No of breaker operations stored	One	One
	c) Trip free or fixed trip (V)	Tripp free	Tripp free
	d) Anti pumping features provided (%)	NA	NA
	e) Earthing for operating mechanism and metal parts furnished	Mfg to give details	Mfg to give details
	f) Earth terminal size and material		
4.29	Spring charging mechanism		
	2) Make	Mfg to give details	Mfg to give details
	3) Type		
	4) Size		
	5) Rating		
4.30	Breaker suitable for capacity switching 4 operating duty 5Max.rating of capacitor bank that can be safely controlled	Yes	Yes
4.31	Tripping coil		
	a) Voltage	Mfg to give details	Mfg to give details
	b) Permissible voltage variation (%)		
	c) Tripping current at rated voltage (A)		
	d) Power at rated voltage (W)		
	e) 2-Over current trip with TLF (5A) and 1-earth fault furnished as specified		
4.32	Breaker /Accessories such as control switch indication Lamps etc. furnished	Mfg to give details	Mfg to give details

	as specified :(please attach separate sheet giving details of all accessories, inter locks and safety shutters)		
	a) Mechanical safety Interlock	Yes	Yes
	b) Automatic Safety Interlock	No	No
	C) Operational Interlock	Yes	Yes
	d) Emergency manual trip	Yes	Yes
	e) Operation counter	Yes	Yes
	f) Charge /discharge indicator	Yes	Yes
	g) Manual spring charging facility	Yes	Yes
4.33	Impact load foundation design (to include dead load plus impact value On opening at maximum interrupting rating) (KG)	Mfg to give details	Mfg to give details
5.0	**Isolators**		
5.1	Make	Mfg to give details	Mfg to give details
5.2	Type	Mfg to give details	Mfg to give details
5.3	Reference standard	IEC129	IEC129
5.4	Rated voltage (KV)	24	12
5.5	Rated Frequency HZ	50	50
5.6	No. Of poles (No)	3	3
5.7	Rated current		
	) Normal (Standard) Amps	630	630
	j) Derated (site) Amp	630	630
5.8	Maximum temperature rise over ambient Deg. C	55 °C (above ambient of 50 °C)	55 °C (above ambient of 50 °C)
5.9	Rated operation duty	O – 3min-CO-3min-CO	O – 3min-CO-3min-CO
5.10	Rupturing Capacity at rated voltage MVA	Mfg to give details	Mfg to give details
5.11	Rated making current KA peak	Mfg to give details	Mfg to give details
5.12	Short time current		
	a) For 1 sec KA rms	16	20
	b) For 3 sec KA rms	16	20
5.13	Impulse voltage withstand on 1/50 full wave	125	75
5.14	Maximum over voltage factor when switching off a) Loaded feeder cable	Mfg to give details	Mfg to give details
5.15	Operating SF6 Gas pressure	0.5 bar G at 20 deg C	0.5 bar G at 20 deg C
5.16	No of isolator operation permissible without requiring inspection, replacement of contacts and other main parts At 100% rated current	Yes	Yes

	At 100% rated breaking current		
5.17	Isolator provided with the following Mechanical safety Mechanical ON, OFF, CABLE EARTH indicators Operation counter Manual spring charging facility	Yes	Yes
5.18	Impact load for foundation design (To include dead load plus impact Values on opening at maximum interrupting rating) Kg	Mfg to give details	Mfg to give details
6.0	**CURRENT TRANSFORMER**		
6.1	Make	Mfg to give details	Mfg to give details
6.2	Type & voltage level	Mfg to give details	Mfg to give details
6.3	Reference standard	IEC 298	IEC 298
6.4	C.T. ratio as specified	100-50/1 A	100-50/1 A
6.5	Rated frequency	50	50
6.6	Short circuit withstand i) Short time current for 1 sec. KA rms j) Short time current for 3 sec. KA rms k) Dynamic current KA peak	Mfg to give details	Mfg to give details
6.7	Class of insulation	Mfg to give details	Mfg to give details
6.8	Temperature rises over ambient. Deg. C	Mfg to give details	Mfg to give details
6.9	Basic insulation level		
6.10	For tripping CT RATIO Class of accuracy		
	Rated Burden VA		
	Knee Point Voltage V		
	Excitation Current at Vk/2 Amps		
	Rated Saturating Current Amps		
	Over Current Rating		
	Continuous % Over Load %		
7.0	**Cable terminations**		
7.1	Circuit Breaker		
	Type	Mfg to give details	Mfg to give details
	Materials		
	Dimensions		
	Size		
	Height of Cable box from ground Level		
	Arrangement for supplying bus end cable box furnished for extensible ring main Unit	Mfg to give details	Mfg to give details

	Arrangement for mounting an extra cable box on each equipment furnished		
7.2	Isolator		
	Type	Mfg to give details	Mfg to give details
	Materials		
	Dimensions		
	Size		
	Height of Cable box from ground Level		
	Arrangement for supplying bus end cable box furnished for extensible ring main Unit		
	Arrangement for mounting an extra cable box on each equipment furnished	Mfg to give details	Mfg to give details
8.0	**Name Plate**		
8.1	Material	Mfg to give details	Mfg to give details
8.2	Thickness		
8.3	Size for		
	Breaker Cubicle		
	Instruments / Devices		
9.0	**Painting**	Mfg to give details	Mfg to give details
9.1	Finish of Breaker		
	Inside		
	Outside		
9.2	Finish of Isolator		
	Inside		
	Outside		
10.0	**Drawing / Data**		
10.1	General arrangement for Panel Board	Mfg to give details	Mfg to give details
10.2	Foundation plan		
10.3	SF6/VCB tripping and material Schematic		
10.4	Bill of Material		
10.5	SF6/VCB LT panel wiring diagram		

SCHEDULE "A"
GUARANTEED TECHNICAL PARTICULARS
Of 22 kV, 11KV 3 WAY SF6 EXTENSIBLE/ NON EXTENSIBLE RMU

Sr. No.	**Particulars**	
1.0	**SWITCHGEAR ASSEMBLY**	
1.1	Name of manufacture	Text
1.2	Rating & Type	Text
1.3	Corresponding highest system voltage (in kV)	Numerical
1.4	Rated frequency (in Hz)	Numerical
1.5	No. of phases	Numerical
1.6	Service conditions shall be as per Cl. No. 2.0 of Technical Specification (Yes/ No)	Boolean
1.7	Applicable Standards shall be as per Cl. No. 3.0 of Technical Specification (Yes/ No)	Boolean
1.8	Short circuit rating a) Breaking Symmetrical (KA)	Numerical
	b) Breaking Asymmetrical (KA)	Numerical
	c) Short time for 1 Sec. (KA)	Numerical
	d) Short time for 3 Sec. (KA)	Numerical
1.9	Insulation level a) Impulse withstand (KV peak)	Numerical
	b) 1 Minute 50 Hz. Voltage withstand (KV rms)	Numerical
1.10	Metal clad construction is provided for switchgear assembly (Yes/No)	Boolean
1.11	c) Degree of protection for outer enclosure: Degree of protection for main tank :	Text
1.12	Switchgear completely wire and tested at factory (Yes/No)	Boolean
2.0	**CONSTRUCTION**	
2.1	Overall Dimensions of a Non Extensible 3 Way RMU (Width (W) (mm)X Depth(mm) X Height (mm))	Text
2. 2	Overall Weight of Total Non Extensible 3 way RMU Unit (in kg)	Numerical
2.3	Moisture absorption material provided in the main tank	Text
2.4	Non return valve shall be provided at the bottom of SF_6 gas pressure indicator (Yes/No)	Boolean
2.5	Insulating & arc quenching medium used in tank	Text
2.6	Monitoring facility of SF_6 gas pressure inside the tank shall be provided (Yes/No)	Boolean
3.0	**Bus bar**	Text
3.1	Make	
3.2	Material & Grade	Text
3.3	Reference Standard	Text
3.4	a) Cross sectional area (mm^2)	Numerical
	b) Size (mm^2)	Numerical
3.5	Continuous current in Ampere a. Standard b. At site conditions and within cubicle	Numerical
3.6	Maximum temperature rise over ambient (Deg c)	Text
3.7	Short time current for 1 Sec. (KA rms)	Numerical

3.8	Minimum Clearances between a) Phase to phase (mm) b) Phase to Earth (mm)	Numerical
3.9	Bus bar is provided with a) Insulation Sleeve (Yes/ No)	Boolean
	b) Phase barriers (Yes/ No)	Boolean
	c) Cast Resin shrouds for joints (Yes/ No)	Boolean
3.10	Busbar connection a) Silver Plated (Yes/ No)	Boolean
	b) Made with anti-oxide grease (Yes/ No)	Boolean
3.11	Bus Bar support spacing (mm)	Numerical
3.12	Bus support insulators	
	a) Make & Type	Text
	b) Reference Standard	Text
	c) Voltage Class (KV)	Numerical
	d) Minimum creepage distance (KV/mm)	Numerical
	e) Cantilever strength Kg/mm2	Numerical
	f) Net Weight (Kg)	Numerical
3.13	SF6 gas pressure (filing pressure at 20 deg. C)	Numerical
4.0	**SF6/VCB CIRCUIT BREAKER**	
4.1	Make & Type (Vacuum/ SF6)	Text
4.2	Reference Standard	Text
4.3	Rated Voltage (in KV)	Numerical
4.4	Rated Frequency (in Hz)	Numerical
4.5	No. of Poles	Numerical
4.6	Rated Current in Ampere a) Standard	Numerical
	b) Rated (Site) Amps	Numerical
4.7	Maximum temperatures rise over ambient.(deg. C)	Text
4.8	Rupturing capacity at rated voltage (in MVA)	Numerical
4.9	Rated Operating Duty	Text
4.10	Breaking Capacity at rated voltage a) Symmetrical (KA rms) b) Asymmetrical (KA rms)	Numerical Numerical
4.11	Rated Making current (KA peak)	
	a) Short time current for 1 Sec.(KA rms)	Numerical
	b) Short time current for 3 Sec.(KA rms)	Numerical
4.12	Transient Recovery Voltage	
	a) Rate of rise (KV/ms)	Text
	b) Peak Voltage (KV)	Text
4.13	Insulation Level	
	a) Impulse Voltage with stand on 1/50 full wave	Text
	b) 1 minute 50Hz voltage withstand	Text
4.14	Opening time Maximum No load condition (ms)	Text
4.15	Opening and closing time under SF6 gas loss or vacuum loss condition (ms)	
4.16	At 100% Breaking capacity	
	a) Opening time – max (ms)	Text

	b) Arcing time – max (ms)	Text
	c) Total break time (ms)	Text
4.17	At 60% Breaking capacity	
	a) Opening time – max (ms)	Text
	b) Arcing time – max (ms)	Text
	c) Total break time (ms)	Text
4.18	At 30% Breaking capacity	
	a) Opening time – max (ms)	Text
	b) Arcing time – max (ms)	Text
	c) Total break time (ms)	Text
4.19	At 10% Breaking capacity	
	a) Opening time – max (ms)	Text
	b) Arcing time – max (ms)	Text
	c) Total break time (ms)	Text
4.20	Number of breaks per pole	Text
4.21	No of breaker operations permissible without requiring inspection replacement of contacts and other main parts.	
	a) At 100% rated current	Numerical
	b) At 100% rated breaking current	Numerical
4.22	Material and Type of contacts	Text
	a) Main	Text
	b) Arcing	Text
	c) Whether contacts silver plated (Yes/No)	Boolean
	d) Thickness of silver plating	Text
4.23	Operating mechanism- closing	
	a) Type	Text
	b) No of breaker operations stored	Text
	c) Trip free or fixed trip	Text
	d) Anti pumping features provided	Text
	e) Earthing for operating mechanism and metal parts furnished	Text
	f) Earth terminal size and material	Text
4.24	Operating mechanism- tripping	
	a) Type	Text
	b) No of breaker operations stored	Text
	c) Trip free or fixed trip (V)	Text
	d) Anti pumping features provided (%)	Text
	e) Earthing for operating mechanism and metal parts furnished	Text
	f) Earth terminal size and material	Text
4.25	Spring charging mechanism	
	a) Make& Type	Text
	b) Rating & Size	Text
4.26	Breaker suitable for capacity switching 4 operating duty 5Max.rating of capacitor bank that can be safely controlled	Text
4.27	Tripping coil	Text
	a) Voltage in Volts	Numerical
	b) Permissible voltage variation (%)	Numerical
	c) Tripping current at rated voltage (A)	Numerical
	d) Power at rated voltage (W)	Numerical
	e) 2-Over current trip with TLF (5A) and 1-earth fault furnished as specified	Text

4.28	Breaker /Accessories such as control switch indication Lamps etc. furnished as specified :(please attach separate sheet giving details of all accessories, inter locks and safety shutters)	
	a) Mechanical safety Interlock (Yes/No)	Boolean
	b) Automatic Safety Interlock (Yes/No)	Boolean
	c) Operational Interlock (Yes/No)	Boolean
	d) Emergency manual trip (Yes/No)	Boolean
	e) Operation counter (Yes/No)	Boolean
	f) Charge /discharge indicator (Yes/No)	Boolean
	g) Manual spring charging facility (Yes/No)	Boolean
4.29	Impact load foundation design (to include dead load plus impact value On opening at maximum interrupting rating) (KG)	Text
5.0	**Isolators**	Text
5.1	Make & Type	Text
5.2	Reference standard	Text
5.3	Rated voltage (in KV)	Numerical
5.4	Rated Frequency (in Hz)	Numerical
5.5	No. Of poles (No)	Numerical
5.6	Rated current	
	a) Normal (Standard) Amps	Numerical
	b) Derated (site) Amp	Numerical
5.7	Maximum temperature rise over ambient Deg. C	Text
5.8	Rated operation duty	Text
5.9	Rupturing Capacity at rated voltage MVA	Numerical
5.10	Rated making current KA peak	Numerical
5.11	Short time current	
	a) For 1 sec KA rms	Text
	b) For 3 sec KA rms	Text
5.12	Impulse voltage withstand on 1/50 full wave	Text
5.13	Maximum over voltage factor when switching off a) Loaded feeder cable	Text
5.14	Operating SF6 Gas pressure	Text
5.15	No of isolator operation permissible without requiring inspection, replacement of contacts and other main parts At 100% rated current At 100% rated breaking current	Text
5.16	Isolator provided with the following Mechanical safety (Yes/No) Mechanical ON, OFF, CABLE EARTH indicators (Yes/No) Operation counter (Yes/No) Manual spring charging facility (Yes/No)	Boolean
5.17	Impact load for foundation design (To include dead load plus impact Values on opening at maximum interrupting rating) Kg	Text
5.18	The load break isolators shall have facility for future remote operations (Yes/No)	Boolean
6.0	**CURRENT TRANSFORMER**	
6.1	Make, Type & voltage level	Text
6.2	Reference standard	Text

6.3	C.T. ratio	Text
6.4	Rated frequency (in Hz)	Numerical
6.5	Short circuit withstand i) Short time current for 1 sec. KA rms j) Short time current for 3 sec. KA rms k) Dynamic current KA peak	Text
6.6	Class of insulation	Text
6.7	Temperature rises over ambient. Deg. C	Text
6.8	Basic insulation level	Text
6.9	Class of accuracy	Text
6.10	Rated Burden VA	Numerical
6.11	Knee Point Voltage in Volts	Numerical
6.12	Excitation Current at Vk/2 Amps	Numerical
6.13	Rated Saturating Current Amps	Numerical
6.14	Over Current Rating	Text
6.15	Continuous % Over Load %	Text
7.0	**Cable terminations**	
7.1	Circuit Breaker	
	Type & Materials	Text
	Dimensions	Text
	Size	Text
	Height of Cable box from ground Level	Text
	Arrangement for supplying bus end cable box furnished for extensible ring main Unit	Text
	Arrangement for mounting an extra cable box on each equipment furnished	Text
7.2	Isolator	
	Type & Materials	Text
	Dimensions	Text
	Size	Text
	Height of Cable box from ground Level	Text
	Arrangement for supplying bus end cable box furnished for extensible ring main Unit	Text
	Arrangement for mounting an extra cable box on each equipment furnished	Text
8.0	**Name Plate**	
8.1	Material	Text
8.2	Thickness	Text
8.3	Size for	Text
8.4	Breaker Cubicle	Text
8.5	Instruments / Devices	Text
9.0	**Painting**	
9.1	Finish of Breaker	Text
	Inside	Text
	Outside	Text
9.2	Finish of Isolator	Text
	Inside	Text
	Outside	Text
10.0	**Drawing / Data**	
10.1	General arrangement for Panel Board	Text
10.2	Foundation plan	Text

	SF6/VCB tripping and material Schematic	Text
	Bill of Material	Text
	SF6/VCB LT panel wiring diagram	Text
11	Front plate shall be provided at per Cl. No. 6.17 of Technical specification	Text
12	All Type Test Reports carried out at NABL and Routine Test Report shall be submitted along with the offer (Yes/No)	Boolean
13	All Drawings , Plant and Machinery, List of order executed/ Under execution shall be furnished separately in physical format along with the offer (Yes/No)	Boolean
14	The information required under Quality Assurance Plan shall be submitted along with the offer (Yes/No)	Boolean
15	Recommended configurations shall be as per Cl. No. 5.0 of Technical Specification (Yes/ No)	Text
16.	**Earthing** Rating, Material and size of Earth Busbar	Text
17	The fault passage indicators shall be provided to RMU (Yes/No)	Boolean
18	Pressure limiting device shall be provided at to the enclosure to avoid accidental overpressure inside the sealed chamber (Yes/No)	Boolean

SCHEDULE –"B"

SCHEDULE OF TENDERER'S EXPERIENCE

Tenderer shall furnish here a list of similar orders executed/under execution by him to whom a reference may be made by Purchaser in case he considers such a reference necessary.

Sr. No.	Name of Client & Description order	Value of order alongwith size & quanity	Period of supply and commissioning	Name & Address to whom reference may be made
1	2	3	4	5

NAME OF FIRM _____

NAME & SIGNATURE OF THE TENDERER_____

DESIGNATION _____

DATE _____