



**THE BRIHAN MUMBAI ELECTRIC SUPPLY & TRANSPORT UNDERTAKING
(OF THE BRIHANMUMBAI MAHANAGARPALIKA)**

Specification No. 1340114

SECTION 1: GENERAL

1.1 Tender Document

- 1.1.1 This tender document shall be read and understood as a whole inclusive of all annexures, drawings etc. and every section or sub-section of this document shall be incorporated in proper context with other sections contained herein.
- 1.1.2 This specification covers the basic requirements in respect of 11kV, 250 MVA, indoor/outdoor SF6 Insulated, Ring Main Units with Vacuum Circuit Breakers or SF6 Circuit Breaker with associated control and relay panels for installation at various Distribution Sub-stations in Mumbai.
- 1.1.3 This specification covers the manufacturer, testing before dispatch and supply of 11kV, 250 MVA, SF6 Insulated, Ring Main Units with Vacuum Circuit Breakers or SF6 Circuit Breakers.
- 1.1.4 All work covered by this specification shall be carried out in accordance with the General Conditions of Contract’.
- 1.1.5 Wherever the directions to the tenderers embodied herein conflict with those specified in the General Conditions of Contract, the former shall be binding in preference to the latter.

1.2 Standards

- 1.2.1 Except as specified herein, all equipment shall comply with the requirements of the latest relevant Indian Standard Specifications (as amended upto-date).
- 1.2.2 Where Indian Standard Specification does not exist, the relevant BS or IEC Standard Specification shall be taken as standard.
- 1.2.3 If the equipment offered is manufactured according to some other standard, it shall be clearly stated and a copy of the latest publication of the standard in English shall be submitted with the offer.



1.3 Legislation

- 1.3.1 The whole of the equipment shall comply in every respect with the provisions of relevant Government Legislations and/or Rules and Regulations governing manufacture, installation, operation and maintenance of the equipment.
- 1.3.2 Tenderers shall ensure that all safety measures are provided in the equipment against hazards to life and property and that the proper installation and use of the equipment shall not contravene any enactments, rules and by-laws of the Government and the Local Authority.

1.4 Departure from Specification:

- 1.4.1 If due to any reason tenderers find it necessary to depart from the provisions of any section of the specification such departures shall be clearly stated and underlined giving full reasons.
- 1.4.2 If the departures from the provisions of any section of this specification are not notified in writing it will be presumed that tenderers will abide by this specification.
- 1.4.3 Any suggestion, comment or advise to include in this document additional provisions in respect of any special device or attachment/necessary but not already specified herein, may be put forward by the tenderers giving full details of the special/additional features of the equipment together with the justification for its inclusion.

1.5 Technical Data

- 1.5.1 Tenderers shall give full specifications of the equipment/materials offered and shall supply technical literature and descriptive particulars together with drawing(s) and illustrations to indicate the type and design of the equipment/material offered.
- 1.5.2 Tenderers shall supply such technical data, characteristics and statistical information as required to study the comparative merits and performance of different types and design of the equipment / materials.

1.6 Materials and Workmanship

- 1.6.1 The equipment / materials shall conform to the best engineering practice in design, materials and construction so as to ensure reliability, economy and safe and convenient operation.



- 1.6.2 Tenderers shall supply all incidental items necessary or usual for such equipment for erection/installation purpose and correct working.
- 1.6.3 Manufacturers shall give details of the experience in the supply of similar equipment. A list of important customers who have been supplied with similar equipment with details of order executed shall be furnished. Details shall include rating of the equipment, quantity, purchase order reference etc.

1.7 Guarantee :

- 1.7.1 All RMU supplied against this specification shall be guaranteed for a period of 66 months from the date of acceptance or 60 months from the date of installation, whichever is earlier for satisfactory operation of the RMU. However, any engineering error, omission, wrong provisions, etc. which do not have any effect on the time period, shall be attended / rectified by supplier as and when observed / pointed out without any price implication to the entire satisfaction of the Undertaking.
- 1.7.2 The successful tenderer shall make good at his own expense all necessary alterations replacement to prevent any recurrence of such defects on all the equipment/materials supplied by him.
- 1.7.3 All corresponding similar materials and removable parts shall be made to gauge and shall be interchangeable with each other.
- 1.7.4 The equipment/materials may be rejected at discretion of the General Manager if the test results are not satisfactory and the permissible tolerances are exceeded.

1.8 Instructions for Installation and Commissioning:

Tenderers shall furnish the necessary instruction manual for installation and commissioning and maintenance of the equipment / materials and shall also state precautions / provisions if any to be made for proper use afterwards.



SECTION 2 : DESCRIPTION OF THE POWER SYSTEM

2.1 Grid

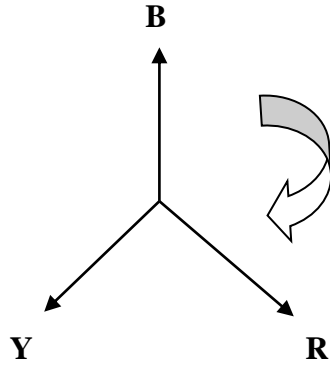
- 2.1.1 The Tata Power Company Ltd. (TPCL) and the Maharashtra State Electricity Board have their generating stations located in different parts of Maharashtra State and form an interconnected transmission system in the Mumbai-Pune Region.
- 2.1.2 Power from this system is transmitted at 220 / 110kV through overhead conductors and underground cables amongst others to TPCL's five main receiving stations at Backbay, Carnac, Parel, Dharavi and Mahalaxmi situated in the island of Mumbai, where they have installed either delta/star or star/zigzag step down transformers with star point effectively earthed for making power available to their consumers at 110 / 33 / 22kV.

2.2 Existing B.E.S.T. System

- 2.2.1 The B.E.S. & T. Undertaking on behalf of Brihan Mumbai Mahanagarpalika (who is the licensee for the distribution of electric power within the City limits of Mumbai) receives power in bulk from the Tata Power Company Ltd. at 110 / 33 / 22kV, 3 Phase, 50 Hz.
- 2.2.2 Bulk power at 110 / 33 / 22kV is transmitted from TPCL's five main receiving stations through effectively earthed underground cables to B.E.S.T.'s receiving substations situated at different localities in Mumbai where the B.E.S. & T. Undertaking has installed 110 / 33kV, 110 / 11kV, 33 / 11kV or 22 / 11kV, Star-z, star/star, delta/star power transformers of Vector group YNzn11, Ynyn0, 31 Dyn1 with neutral earthed with/without a resistance. Where the transformation is 110 / 11kV or 110 / 33kV, 22 / 11kV or 33 / 11kV, the star point of the transformers has been effectively earthed. The power transformers are provided with OLTC gear to regulate and maintain the 11kV voltage fairly constant.
- 2.2.3 Underground 11kV (effectively earthed) feeder cables radiate from the B.E.S.T. receiving substations to supply power to a large number of distribution substations and to certain consumer's substations. These feeders form a radial network under which each feeder supplies on an average **5 to 7** substation in series.
- 2.2.4 Power at 11kV is stepped down to **415/240V** at the distribution substations where the various sizes of 11kV/**415-240V**olt, delta/star transformers of vector group **71** Dyn11 are installed. The star point of this transformer is solidly earthed and is also brought out to an insulated terminal for the 3 phase, 4 wire distribution system.
- 2.2.5 The **415/240V** secondary distribution system comprises of a vast network of underground four core cables, suitably sectionalized by means of distribution pillars, to which service lines are teed off to supply power to medium and low voltage consumers.



2.2.6 The phase sequence of the 3 phases at the existing receiving substations is in accordance with the International Standards as indicated below :-





SECTION 3: SCOPE OF SUPPLY;

3.1 Scope

- 3.1.1 The equipment offered shall be 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.
- 3.1.2 The respective drawing along with notes and specification attached hereto form an integral part of this specification for all purposes.
- 3.1.3 It is not the intent to specify herein complete details of design and construction. The equipment offered 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, notwithstanding any anomalies, discrepancies, omissions, in-completeness, etc. in these specifications and attached drawings, 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 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.
- 3.1.4 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.

3.2 SERVICE CONDITIONS

3.2.1 System particulars:

- | | | | |
|----|--------------------------------------|-----|--------------------|
| a. | Nominal system voltage | ... | 11 kV |
| b. | Corresponding highest system voltage | ... | 12 kV |
| c. | Frequency | ... | 50 Hz±3% |
| d. | Number of phases | --- | 3 |
| e. | Neutral earthing | --- | Solidly grounded |
| f. | Short Circuit Current Rating | --- | 13.2 kA for 3 secs |

...



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

- a) Air Temperature in Shade
Highest temperature recorded : **40.6 °C**
Lowest temperature recorded : 11.7° C
24 Hours daily average : 26.0° C
- b) Mean highest temperature in Sun : 62.2° C
Highest temperature in Sun : 64.0° C
- c) Relative Humidity
Lowest mean RH : 70%
Highest mean RH : 100%
- d) Rainfall
Mean No. of rainy days in a year : 75.9
Mean rainfall in a year : **2146.5 mm**
Max. rainfall recorded in a year : **3481.6 mm**
Heaviest rainfall in a day recorded : 575.6 mm
- e) Wind
Mean daily wind speed - min.
in a year : 9.8 Km/Hr.
Mean daily wind speed – max.
in a year : 18.7 Km/Hr.
Highest wind speed in gust : **103 Km/Hr.**
on 17-06-04

3.2.3 Geographical Data

Mumbai city is situated on the western coast of India and is the second biggest city in the country. It has an excellent sea-port and is on the world's main routes by sea and air. It is well connected with the hinterland by road and railways.

Area	:	68 Sq.Km
Population	:	1, 24, 78,447
Longitude	:	72 40 E
Latitude	:	18 54 N
Height above M.S.L.	:	11 Metres



3.3 Local Conditions & Existing Practice :

- 3.3.1 Mumbai is a densely populated city with large industries such as cotton mills, chemical factories, engineering workshops and several varieties of large and small industries occupied in the manufacture of consumer goods and other commodities.
- 3.3.2 Although certain areas are still undeveloped, the city is divided into several zones such as residential, commercial, industrial etc. With a view to minimize nuisance and localize several mixed localities where such zoning has not been done and two or more types of activities are allowed to continue. By and large, the heavy industries are gradually shifting from the city.
- 3.3.3 The 110/33/22kV indoor substations are equipped with power transformers, switchgears, control panels, reactors and capacitors, batteries and other auxiliary equipment.
- 3.3.4 The distribution substations are normally equipped with 11kV switchgear, distribution transformers and L.V. Distribution board or pillar. 56kVAr capacitor banks are connected on the L.V. side of transformers for power factor improvement.
- 3.3.5 Each distribution substation comprises of one or more incoming and outgoing feeders and one or more transformers of 1600 kVA, 995 kVA, 630 kVA or 400 kVA. The outgoing feeders and primary of the transformers are controlled and protected by 11kV oil circuit breakers / vacuum circuit breakers in conjunction with their associated trip coils and current transformers and RMUs with self-powered relays.
- 3.3.6 The distribution substations in the city are of the following three types:
- a) Indoor Type - Where the switchgear and the transformers are located inside a building.
 - b) Outdoor Type - Where the switchgear and the transformers are located in open land and directly subjected to outside atmosphere.
 - c) Indoor/Outdoor Type - Where the switchgear is located inside a building and the transformers are located in an outdoor plot open to sky.

**SECTION 4 : CODES AND STANDARDS**

- 4.1 The design, manufacture and performance of the equipment shall comply with all currently applicable statutes, regulations and safety codes.
- 4.2 Unless otherwise specified, the equipment offered shall confirm to the latest applicable Indian, IEC, or BS Standards and in particular, to the following:-

a.	IS 13118/1991	High Voltage Alternating current circuit breaker
b.	IS:12729/2004 & IEC-694, IEC-60694	General Requirement of High-Voltage Switchgear and Controlgear Standards
c.	IEC-62271-200	A.C. Metal Enclosed Switchgear and Control gear for Rated Voltages Above 1 kV and upto and including 52kV
d.	IS 3427/1997	Metal Enclosed Switchgear and Control gear
e.	IS 3156/1992	Voltage transformers
f.	IS 2705/1992	Current transformers.
g.	IEC 529	Degree of protection provided for enclosures for electrical equipment.
h.	IEC 466	AC insulation enclosed switchgear and controlgear for rated voltage above 1kV and upto and including 38 kV.
i.	IS 5/2005	Colours for ready mixed paints and enamels.
j.	IS 353/1985	Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals
k.	IS 1248/2003	Indicating instruments.
l.	IS 6875 amended up to date	Control switches.
m.	IS 3231/1986 & 87 amended up to date	Electrical Relays for Power System Protection.
n.	IEC 60255 amended up to date,	Numerical based protection relays.
o.	IS 4794/68 & 86	Push button.
p.	IS 10201	Quality systems.
q.	IEC-62271-100, 102	High Voltage switchgear and control gear.



- 4.3 In the event of offered equipment confirming to standards other than the above, the salient points of comparison between the standard(s) adopted and the relevant IS shall be indicated in the technical offer. Copies of the standard adopted shall be invariably furnished with the offer.
- 4.4 In the event of direct conflict between various order documents, the precedence of authority of documents shall be as follows -
- i. Guaranteed Technical Particulars (GTP)
 - ii. Specification including applicable codes standards
 - iii. Approved Vendor Drawings
 - iv. Other documents, etc.



SECTION 5: REQUIREMENTS

- 5.1 The Ring Main Unit (RMU) shall be SF6 insulated for use in 11kV, three phase, 50 Hz, effectively earthed neutral system, with all live parts enclosed and suitable for pedestal mounting installation in indoor/outdoor locations.
- 5.2 The RMU's & Spares of following descriptions are required under this specification.

Item Type	Description	Quantity (#) Indoor/Outdoor
A	3-way, SF6 Insulated, Ring Main Unit fitted with SF6/VCB BREAKER consisting of one Isolator and One Tee Off Unit and one fault making, fault breaking circuit breaker with cable terminations on front side of RMU suitable for distribution automation.	
B	4-way, SF6 Insulated, Ring Main Unit fitted with SF6/VCB BREAKER consisting of one Isolator, Two Tee Off Units and one fault making, fault breaking, feeder circuit breaker with cable terminations on front side of RMU suitable for distribution automation.	
C	4-way, SF6 Insulated, Ring Main Unit fitted with SF6/VCB BREAKER consisting of one Isolator, One Tee Off Unit and two fault making, fault breaking, feeder circuit breakers and with cable terminations on front side of RMU suitable for distribution automation.	

Please refer single line diagram of 3-way and 4-way RMU drg.no.SK/PL/(2009)212

The ratio of Indoor : Outdoor quantity = 20 : 80 approximately.



- 5.3 **Spares:** The following minimum spares shall be supplied by each of the successful Tenderer on free of cost basis, for each lot of 5 nos. of RMUs and further part quantity thereof.

Item No.	Description	Quantity
1	Special and standard tools necessary for erection, testing and maintenance.	As recommended by the supplier
2	Protective current transformers suitable for controlling 11/0.415 KV 400, 630, 995 & 1600 kVA transformers.	3 nos.
3	Protective current transformers suitable for controlling outgoing 11kV feeder	3 nos.
4	Fault passage indicators	1 no.
5	Core Balance Current Transformers (CBCTs)	1 no.
6	Motors including mechanism	1 no.
7	Trip coils & closing coil	1 no each.
8	Self powered relays	1 no.
9	Indicating lamps of LED type (Clusters of 4 or more LEDs) in following colours : a) Red b) Yellow c) Blue d) Green	1 set.
10	Terminal Protector.	3 nos.

Also, following spares shall be supplied on free of cost basis by each successful tenderer irrespective of the order quantity.

Item No.	Description	Quantity
1	SF6 gas filling equipments.	1 no. *
2	SF6 gas cylinders of capacity 9 Kg.	1 no. *
3	SF6 gas detectors.	1 no. *

Note: The spares offered by the tenderer shall be with Latest International Standards.



SECTION 6: SPECIFICATIONS

6.1.1 Type: Types of RMUs used for system are as follows;

6.1.1.1 Item A:-

3-way (1 isolator+1 feeder breaker unit + 1 Tee-off unit), 11Kv, SF6 insulated Ring Main Unit fitted with SF6/VCB breaker shall be extensible and suitable for indoor/outdoor installation. Entire busbar and VCB/SF6 breaker shall be enclosed in single sealed tank.

6.1.1.2 Item B:-

4- way (1 isolator +1 feeder circuit breaker + 2 Tee-off units), 11Kv, SF6 insulated Ring Main Unit fitted with SF6/VCB breaker shall be extensible and suitable for indoor/outdoor installation. Entire busbar and VCB/SF6 breaker shall be enclosed either in single sealed tank or in sealed tank in combination of 3-way unit in one sealed tank extended by second tank for fourth unit.

6.1.1.3 Item C:-

4- way (1 isolator+ 2 feeder circuit breakers + 1 Tee off), 11Kv, SF6 insulated Ring Main Unit fitted with SF6/VCB breaker shall be extensible and suitable for indoor/outdoor installation. Entire busbar and VCB/SF6 breaker shall be enclosed either in single sealed tank or in sealed tank in combination of 3-way unit in one sealed tank extended by second tank for fourth unit.

6.1.2 Terminology used in RMU:-

6.1.2.1 Tee-off unit: -

Tee-off unit called as Transformer Circuit Breaker (TCB)/ Feeder Circuit Breaker (FCB)

6.1.2.2 FCB: - Feeder Circuit Breaker (FCB)

6.1.2.3 TCB:- Transformer Circuit Breaker (TCB)

6.1.2.4 LBS: - Load Break Switch or Isolator



6.2 Electrical Distribution System Data

6.2.1	Supply	3 phase AC, 3 wire
6.2.2	Voltage	11000 volt $\pm 10\%$
6.2.3	Frequency	50 Hz $\pm 5\%$
6.2.4	System neutral	Earthed at upstream 11kV source

6.3 11kv RMU System layout

6.3.1	RMU Configuration	As per scheme given in <i>drg.no.SK/PL/(2009)212</i> & refer types as per requirement mentioned in Section-5
6.3.2	Extensibility	Both sides
6.3.3	Load break switch, Circuit breaker & earth switch in RMU panel	All shall be non draw out type, fixed position
6.3.4.1	Insulation medium for panel	SF6 gas or Solid Shielded Insulation
6.3.4.2	Circuit Breakers	SF6 gas or Vacuum type (with disconnecter & earth switch)
6.3.4.3	Load break switches	SF6 gas or Vacuum type (With Earth Switch)
6.3.5	Maximum dimensions for 3 way panel , please refer clause no 6.1.1 (item-A)	
6.3.5.1	Width (measured from front)	1550mm
6.3.5.2	Depth	1020mm
6.3.5.3	Height	2110mm
6.3.6	Maximum dimensions for 4 way panel, please refer clause no 6.1.1 (item-B, C)	
6.3.6.1	Width (measured from front)	2100mm
6.3.6.2	Depth	1020mm
6.3.6.3	Height	2110mm



6.4 RMU panel construction

6.4.1	Panel type	Metal enclosed, framed, Compartmentalized panel construction
6.4.2	Service location	
6.4.2.1	Indoor, non air conditioned environment / Outdoor with continuous ambient temperature of 50 deg C and shall be suitable for external climatic condition Resistant to water, ultraviolet radiation	
6.4.2.2	Canopy for outdoor application. Canopy of sheet steel shall be provided with suitable mounting arrangement so as to install and remove at site easily. The canopy should have sloping arrangement to prevent accumulation of water and should also cover cable boxes. The thickness of the sheet steel shall not be less than 3 mm.	
6.4.3	Mounting	Free Standing
6.4.4	Overall enclosure protection	IP4X minimum, vermin proof IP 54 (For outdoor duty)
6.4.5	Doors	Front access with anti theft hinge arrangement, Minimum three hinges (Desirable)
6.4.6	Covers	Bolted for rear access, with handles. Support for handle shall be provided at suitable place on RMU body.
	All the accessible bolts / screws shall be vandal proof. One set of required Special tools per RMU (if any) shall be in scope of supply.	
6.4.7	Construction	Sheet metal 2.5mm thick CRCA
6.4.8	Base frame	
6.4.8.1	Base frame shall be made with ISA / ISMC and height of the same shall be 300 mm - 450 mm for Indoor & Min. 500 mm for outdoor. Height to suit the operator's convenience & subject to drawing approval. Frame shall be completely covered from all the four sides by MS plate / sheet. Cable box compartment should be extended up-to base-frame bottom to have metallic separation between each of the feeders at base frame level too. Painting should match with RMU shade.	
6.4.8.2	With fixing bolt for RMU & frame (in case the frame is supplied loose) & foundation	
6.4.8.3	HDPE cleats as cable supporting clamps for each power cable to suit the cable size from 300 sq mm A1 PILC & 240 sq mm Cu XLPE cable for feeder and 70 sq mm AI PILC & 50 sq mm Cu XLPE cable for transformer.	



6.4.9	Lifting lugs	Four numbers
6.4.10	Cable entry	Bottom
	3mm metallic, removable type, with 1no., 90 mm diameter knock out punch/hole in the centre for 3C x 300 sq mm A1 PILC, 3 C x 240 sq mm Cu XLPE and 60 mm diameter knock out punch/hole in the centre for 3Cx70 sq mm AI PILC & 3Cx50 sq mm Cu XLPE for transformer.	
6.4.11	Cable type & size	3C x 300 sq mm A1 PILC, 3 C x 240 sq mm Cu XLPE conductor PILC/XLPE with armor & PVC outer sheath for feedee and 3Cx70 sq mm AI PILC & 3Cx50 sq mm Cu XLPE for transformer.
6.4.12	Terminals for 11kv cable termination	Suitable for Ring Type Bimetallic lug.
	Right angled boots (Terminal protector)	Single piece cold shrink type (make – 3M or Raychem or equivalent)
	Brass Nut bolt	M16 or M12 suitable for the various sizes of cables mentioned in clause 6.4.11.
	Bimetallic washers	Required
6.4.13	Termination type	suitable for heat shrinkable type
6.4.14	Termination height	For Indoor / Outdoor :Min. height from gland plate shall be 900mm
6.4.15	Bus bar	Copper with sleeve (Sizing Calculation to be submitted in support of its Guaranteed S.C. rating / Capability)
6.4.15.1	Bus bar continuous rated current	630amp (at designed 40 deg.C ambient)
6.4.15.2	Bus bar short time withstand	20 KA for 3 sec
6.4.15.3	Bus bar support insulator material	SMC / DMC resin
6.4.15.4	Maximum temperature rise above reference ambient 40 deg C	As per IEC60694
6.4.16	Earth bus bar	GI flat sized not less than 25mm x 6mm for rated fault duty for 3 sec
6.4.16.1	Earth bus internal connection to all non current carrying metal parts	By 2.5 sq mm copper flexible wire, Earth connection point maximum 1 meter away from cable test facility
6.4.16.2	Earth bus external connection to owners earth	Studs on both sides with holes for M10 bolt + hardware to readily receive purchaser earth connection
6.4.16.3	Earth bus colour code	The earth bar shall be coloured green.



6.4.17	Cooling arrangement	By natural air without fan	
6.4.18	Hardware (Nut, bolts & handle)	Stainless steel (Except termination nut-bolts which are Brass / Copper)	
6.4.19	Gasket	Neoprene rubber	
6.4.20	Marshalling terminal blocks	1 Sq mm, Nylon 66 material, screw type +20% spare in each row of TB.	
6.4.21	Panel cover fixing bolts	Allen head 6mm with hexagonal slot	
6.4.22	Padlock facility	Required for all earth switches & all handles	
6.4.23	Bushings for future extensions of RMU	Should be duly insulated & covered with metallic covers in unused condition	
6.4.24	Explosion vents		
	To ensure operator's safety, design should ensure that gases / flames generated during flash over / blast in any of the compartment, must not come out from the front of RMU as well shall not go to adjacent cable compartment. Internal arc test report (for Cable compartment & other compartments) must be submitted to support above, along with RMU GA drawing indicating these vents. There shall not be any type of holes, gaps etc on the walls of cable termination compartment.		
6.4.25	Operating handle		
	Operating handle shall be considered as part of the unit and shall be provided with each RMU. Operating handle shall be of suitable size for easy manual operations of isolators and breakers. There should be an arrangement to keep the operating handle.		
6.4.26	Colour code for phases		
	Marking of phases on cable box compartment and cable box cover with Red, Yellow and Blue colours shall be as shown below (by looking towards the RMU).		
	0	0	0
	R	Y	B
6.4.27	Panel internal wiring		
	Multi strand flexible color coded Fire retardant Low Smoke (FRLS) PVC insulated Cu wire 1 sq mm (SCADA) / 2.5 sq mm (for CT's) 1100 volt grade (AC- black, DC – grey, Earth – green) with ferrules at both ends.		



6.4.28	For easy troubleshooting, proper colour codes shall be used for control wiring like red, yellow, blue and black for CT wiring, green for grounding, For all trip commands, red colour ferrule with T mark shall be provided. All control wires, jumpers shall have ferruling. All control wiring should be properly bunched and neatly cleated. In addition to normal ferruling, SD ferrules are to be used for all control wirings which are to be connected to SCADA circuit under distribution automation
6.4.29	Distribution Automation
	The wiring for control functions, status monitoring, alarms and spare contacts etc. shall be terminated into a separate TB for onward connection for SCADA purpose.

6.5 Load Break Switch (LBS) / Isolator

6.5.1	Type	Three poles operated simultaneously by a common shaft
6.5.2	Arc interruption in dielectric medium	SF6 or Vacuum
6.5.3.1	Operating mechanism for close / open	Motorized LBS Each motor shall be provided with separate MCB and Local-Remote switch.
6.5.3.2	Manual operation	Possible without removal of motor
6.5.4.1	Addition / removal of motor	Without overhaul of operating mechanism
6.5.4.2	Motor rated voltage	24V DC
6.5.5.1	Battery type & size	24V, 12AH, SMF(Sealed Maintenance Free) lead acid battery
	Battery provided in enclosure shall be minimum rated for 10 close & 10 open operations of LBS	
6.5.5.2	Battery charger rating	charger of rating 12A each
6.5.5.3	The in-built 24V DC rectifier circuit with FCBC shall be provided which will ensure RMU operation from 230V AC supply during normal condition and using 24V, 12AH SMF battery bank in case of failure of 230V incoming supply. The tenderer has to submit detailed drawing for this circuit. (SMF- Sealed Maintenance Free)	



6.5.5.4	MCBs at charger input & output supply	MCBs shall be easily accessible for operation, with proper labeling.
6.5.5.5	Charger temperature rise at heat sink at full load for 2 hours	Maximum 55 deg C above ambient of 40 deg C
6.5.5.6	Battery charger cooling method	Natural without any fans
6.5.6.1	Continuous rating of LBS	630 Amp at design 40 deg C ambient
6.5.6.2	Short time withstand capacity	20 KA for 3 sec
6.5.7	Fault making capacity	50 kA peak
6.5.8	Minimum number of operations at rated current (as per IEC 62271-102)	Mechanical Endurance – Class M1 (1000 operations) Electrical Endurance – Class E3 (100 operations)
6.5.9	Minimum number of operations at rated fault current (as per IEC IEC 62271-102)	Class E3 (Min 10 operations)
6.5.10	Fault passage indicator (FPI)	
	To be provided on one LBS for type of 3-way and 4-way panel. For all other configuration of RMU, FPI to be provided on all LBS.	
6.5.10.1	Earth Fault Indicator	CBCT – Split open type suitable for mounting without disconnection of cable .
6.5.10.2	Connection of CBCT with FPI	Cable connection of FPI with CBCT shall be of pre moulded type on the CBCT side. Cable shall be 2.5 sq.mm cu cable or fiber cable



6.5.10.3	Fault Passage Indicator	Digital type and shall operate as the current exceeds the set value. Flash indication for identifying faults with red LED with one flash for every one sec. Test & rest button. 1 NO + 1 NC potential free contact for remote indication. FPI power supply unit shall use lithium battery with minimum life of 1000 blinking hours, so that FPI shall continue to function even after main feeder has tripped.
6.5.10.4	Data by Purchaser	
6.5.10.4.1	System Fault Level	Max. upto 13.2kA
6.5.10.4.2	Type of Grounding	Solidly Grounded
6.5.10.4.3	Fault clearing time	100ms max.
6.5.10.4.4	Cable Type	300 sq mm A1 PILC, 240 sq mm Cu XLPE cable.
6.5.10.4.5	Earth Fault Indicator	
6.5.10.4.5.1	Sensing Current	100-300A
6.5.10.4.5.2	Sensing Time	30 to 100 ms in steps of 10ms.
6.5.10.4.5.3	Reset Time	1-2-3-4 hr
6.5.10.4.5.4	Resetting Facility	a) Self rest after reset time b) Self rest after restoration of voltage c) Manual d) Remote resetting
6.5.10.4.5.5	Contact Rating	1A at 230 V
6.5.10.4.5.6	Degree of Protection	IP 54
6.5.10.4.5.7	Mounting Arrangement	Surface or Flush Mounting
6.5.10.4.5.8	Ambient Temperature	-20 to 55 Deg C
6.5.10.5	Battery backup for FPI	
	The battery/s to be used for indication in EFPI should have a life of at least 5 years. In case of failure of this battery/s, free replacement is to be given.	



6.6 Circuit breaker (TCB / FCB)

6.6.1.1	Type	Three pole, operated simultaneously by a common shaft
6.6.1.2	Transformer circuit breaker - TCB	For controlling transformer, manual operation. Remote operation by SCADA
6.6.1.3	Feeder circuit breaker - FCB	For controlling cable feeder, manual operation. Remote operation by SCADA
6.6.2	Arc interruption in dielectric medium	Vacuum Bottle
6.6.3.1	Operating mechanism - TCB	Motor & Manual spring charged stored energy type remote electrical close / open operation possible.
6.6.3.2	Operating mechanism - FCB	Motor & manual spring charged stored energy type, remote electrical close / open operation possible.
6.6.3.3	Addition / removal of motor	Without overhaul of operating mechanism
6.6.3.4	Motor rated voltage	24v DC
6.6.4	Emergency trip / open push button	On panel front with Protective flap to prevent any accidental tripping of breaker.
6.6.5.1	Continuous rating at design 40 deg C	630amp
6.6.5.2	Short time withstand capacity	20 KA for 3 sec
6.6.6	Minimum number of operations at rated current (as per IEC 62271-100)	Mechanical Endurance – Class M1 (2000 operations) Electrical Endurance – Class E2
6.6.7	Fault making capacity	50 KA peak
6.6.8	Fault breaking capacity	20 KA Minimum
6.6.9	Maximum number of operations at rated Fault current (as per IEC 62271-100)	Electrical Endurance – Class E2 . To be guaranteed by manufacturer with authorized lab test reports
6.6.10	Breaker status auxiliary contact	2NO + 2NC wired to terminal block
6.6.11	Current transformer	



6.6.11.1	Single ratio 300/1 suitable for outgoing 11kV feeders and Single ratio, 100 / 1 Amp, 60/1 Amp, suitable for 1600 and 995kVA transformers and 35/1, suitable for 630 and 400kVA transformers.	
6.6.11.2	Considering three core cable terminations, mounting flexibility shall be provided for CT's (in horizontal & vertical direction both). Additionally, CAUTION marking (by sticker/ paint) shall be provided to avoid CT's installation above the screen of cable. (i.e. earth potential point.)	
6.6.11.3	VA burden of CT shall be sufficient to supply the energy required for the correct working of relay and tripping of circuit breaker. Please refer clause of 6.6.13 for protection relay.	
6.6.12	CT accuracy class	5P10 minimum
6.6.13	Protection relay	Self powered, Microprocessor based Numerical relay (LCD display is desirable), IDMT over current / earth fault protection with high set element, manual reset type Relay mounting flush to panel front
6.6.14	Relay auxiliary contacts for remote indication	Potential free contact 1NO + 1NC wired to terminal block
6.6.15	Battery Backup for Relay	
6.6.15.1	The relay shall not require any external power supply for its operation. In the absence of input energizing current, all relay settings and data stored in the memory of relay shall remain in tact. The tenderer shall mention the type and duration of battery backup (i.e. self discharge time) of the relay.	
6.6.15.2	The battery should have a life of at least 5 years. In case of failure of this battery free replacement is to be given.	



6.7 Earth switch (ES)

6.7.1	Type	Three Pole, operated simultaneously by a common shaft, for each Circuit breaker & Load break switch.
6.7.2	Switching in dielectric medium	Dry Air in sealed medium or SF6 gas
6.7.3	Operating mechanism for close & open	Manual
6.7.4	Fault making capacity	50 kA (Desirable)
6.7.5	Auxiliary contacts	1NO+1NC wired to terminal block
6.7.6	Disconnect switch (if provided in series with vacuum bottle)	Desirable to be located on purchaser cable connection side of vacuum bottle
6.7.7	Minimum number of operations at no load (as per IEC 62271-102)	Mechanical Endurance – Class M0 (1000 operations)
6.7.8	Making capacity endurance of earth switch (as per IEC IEC 62271-102)	Class E2 (Min 10 operations)

6.8 Requirements of sealed housing live parts

6.8.1	Enclosure	Stainless steel enclosure suitable for IP67
	Inner Enclosure :-The tank shall be stainless steel sheet of non magnetic non ferrite material. The tank shall be sealed and no handling of gas is required throughout the 25 years of service life. In addition, manufacturer shall confirm that maximum leakage rate of SF6 gas is lower than 0.1 % / year. The degree of protection of the inner enclosure shall be IP 67.	
6.8.2	SF6 gas pressure low alarm	To be given
6.8.3	Provision for SF6 gas pressure indication	Manometer with non return valve
6.8.4	Arc interruption method for SF6 breaker / Load break switch	Puffer type / rotating arc type
6.8.5	Potential free contacts for SF6 gas pressure low	1NO +1NC (Desirable)



6.9 Operational interlocks

6.9.1.1	Interlock type	Mechanical
6.9.1.2	Load break switch & respective earth switch	Only one in 'close' condition at a time
6.9.1.3	Circuit breaker & respective earth switch	Only one in 'close' condition at a time
6.9.2	Prevent the removal of respective cable covers if load break switch or circuit breaker is 'ON'	Electrical / Mechanical
6.9.3	Prevent the closure of load break switch or circuit breaker if respective cable cover is open	Electrical / Mechanical
6.9.4	Cable test plug for LBS/CB accessible only if Earth switch connected to earth	Mechanical
	For motorized RMUs	
6.9.5	Prevent motorized operation of LBS / CB during manual operation	Electrical / Mechanical Electrical signal shall cut-off completely during manual operation. If LBS fails to operate, the supply to motor shall be disconnected after certain time period to prevent burning of motor due to continuous supply.
6.9.6	Prevent motorized operation of more than one LBS / CB at a time	Necessary feature (Electrical)

6.10 Mimic diagram, labels & finish

6.10.1	Mimic diagram (Shall not be accepted with Stickers)	
	On panel front with description of function & direction of operation of handles/buttons	
	Operating instruction chart and Do's & Don'ts in English / Marathi language to be displayed on left / front side of panel enclosure on A1 Sheet, duly affixed on panel.	
6.10.2	Name plate on panel front	Fixing by rivet only



6.10.2.1	Material	Anodized aluminum 16SWG / SS
6.10.2.2	Background	SATIN SILVER
6.10.2.3	Letters, diagram & border	Black
6.10.2.4	Process	Etching
6.10.2.5	Name plate details	Month & year of manufacture, equipment type, input & output rating, purchaser name & order number, guarantee period
6.10.3	Labels for meters & indications	All panels and apparatus (including switches, fuses, indication lamps etc.) mounted thereon shall be clearly labeled as required indicating their purpose and the 'ON' and 'OFF' positions. The labels shall be clearly lettered on brass, ivory or suitable materials.
6.10.4	Danger plate on front & rear side	Anodized aluminum with white letters on red background
6.10.5	Painting Surface Treatment	Sand blasting or by seven tank process.
6.10.6	Paint type	Powder coated. Pure polyester base grade-A structure finish.
6.10.7	Paint shade	Battleship gray enamel paint for external &. internal surface
6.10.8	Paint thickness	Minimum 50 microns

6.11.0 Indication

6.11.1	Indication	Flush mounted
6.11.2	Operation Counter	To be provided for each LBS & Circuit breaker, with minimum four digits & non- re-settable type
6.11.3	Voltage Presence Indicator (Capacitive voltage indicator)	To be provided for each LBS & Circuit breakers per phase.
6.11.4	Spring charge status indication	On front for breaker
6.11.5	Earth switch closed indication (For Each LBS)	On front
6.11.6	Load break switch ON/OFF indication	Green for OFF / Red for ON



6.11.7	Circuit breaker On/OFF indication	Green for OFF / Red for ON
6.11.8	Circuit breaker protection relay operated on fault	Flag
6.11.9	Fault passage indication on LBS	Flag
6.11.10	SF6 gas pressure low	potential free contacts (Desirable)
6.11.11	Core Balance Current Transformer(CBCT) and Earth Fault Passage Indicator (EFPI)	Flashing LED shall be provided for indication.

6.12.0 Inspection and Testing

6.12.1	Type Tests	The product must be of type tested quality as per all tests in Indian standards / IEC standards.
6.12.1.1	Type test report validity period	Last five years from date of bid submission
6.12.1.2	Internal arc classification test	As per IEC 62271-200.
6.12.1.3	Vacuum Interrupter	Type test certificate shall be furnished by the firm. Also serial number, Make and, design of Vacuum interrupter shall be mentioned
6.12.2.1	Acceptance & Routine tests	As per the specification and relevant standards.
6.12.2.2		The purchaser/owner reserves the right of carrying out any inspection or test at the manufacturer's works.
6.12.3	Test reports of acceptance and tests before dispatch for approval	To submit six (6) copies
6.12.4	Acceptance of RMU	Subject to successful inspection and testing of RMU at the manufacturer's works as well as BEST's premises by Inspection authority.
6.12.5	Prototype Inspection	The successful tenderer shall submit a prototype in conformity with specification and approved drawings for approval before starting manufacturing of the entire ordered quantity within 8 weeks from approval of drawings. The prototype will be tested at the manufacture's works. The cost of to-and-fro charges will be borne by manufacture and also the lodging, boarding facility shall be provided by the manufacture.



6.12.6	Lot Inspection and testing	After acceptance of prototype at our end, the 1 st lot shall be offered for inspection and testing at the manufactures cost, so that, it will be delivered to our Kussara Stores within 5 weeks from the date of acceptance of prototype. However, exact schedule shall be intimated to you by M.M. department.
6.12.7	Acceptance tests	In addition to the tests specified above, the purchaser reserves the right of carrying out any inspection or reasonable tests at the manufacturer's works during all stages of manufacture of the RMU as well as such tests as may be considered necessary after installation.

6.13 Quality assurance

6.13.1	Vendor quality plan	To be submitted for purchaser approval
6.13.2	Inspection points in quality plan	To be mutually identified & agreed
6.13.3	Quality – Process Audits	BEST Undertaking shall carry out vendor process audits.
6.13.4	Approved sub vendor List	
6.13.4.1	Fault Passage Indicator	Flair / EMG - Easi
6.13.4.2	Battery Charger	Allan
6.13.4.3	Self Powered O/C & E/F Relay	Ashida ADR141S / VIP 300
6.13.4.4	Boots (Terminal protector)	3M / Raychem / equivalent
6.13.5	Vacuum Interrupter	Crompton Greaves Ltd., ABB, Bharat Electronics Ltd, Schneider Electric, Siemens.

**6.14****Rating Plate:**

Each RMU shall be provided with easily visible metallic nameplate with following particulars:

- 1) Name of the manufacturer
- 2) Serial number
- 3) Rated voltage
- 4) Rated current
- 5) Rated frequency
- 6) I.S./IEC reference nos.
- 7) Making capacity (KA)
- 8) Rated short time current
- 9) Symmetrical breaking capacity in
MVA & KA
- 10) Asymmetrical breaking capacity KA
- 11) Aux. supply for motorized operation _____V, _____A
- 12) Year of manufacture
- 13) B.E.S.T. Acceptance letter or P.O. reference.
- 14) C.T. ratio : _____, connected ON : _____.
- 15) Total weight of RMU.
- 16) Overall Dimensions of RMU

6.15**Documents:**

- 6.15.1 Type test certificate: Type test certificates from NABL(National Accreditation Board of Testing and Calibration Laboratories) or Internationally accredited laboratory shall be submitted along with tender offer, failing which, the offer will be overlooked. The separate type test circuit for the vacuum interrupter shall be provided.

6.16**Literature and Drawings:**

- 6.16.1 Tenderers shall submit, with the offer, in duplicate, the detailed drawings, calculation and literature of the RMU unit.
- 6.16.2 The successful tenderer shall be required to supply four copies of the following drawings for approval within 2 weeks of receipt of acceptance letter.
- a) General arrangement drawing of RMU
 - b) Single line diagram
 - c) Earthing arrangement drawing
 - d) Sectional drawing of RMU
 - e) Drawing showing foundation details **including base frame**
 - f) Interlocking scheme drawing
 - g) Bushings drg. of Tee off unit, Feeder breaker & Isolator



- h) Drawing of cable termination boxes with dimensions and clearance from ground level.
 - i) Wiring diagram of protection system
 - j) G.A.Drg. for Marshalling box.
 - k) G.A.Drg. for capacitive voltage indicator
 - l) Schematic diagram for isolator switch and Tee-off unit.
 - m) Motor control schematic drawing
 - n) Terminal block drawing.
 - o) General Arrangement drawings of CTs offered
 - p) Internal Mechanism of RMU
 - q) Gas filling equipment
 - r) Bill of material includes the detail specification (like make, type, model, rating, quantity) of components and fittings of RMUs
 - s) RMU literature and instruction manual
 - t) Commissioning, Operation and maintenance manual of RMU and Relay.
 - u) Commissioning, Operation and maintenance manual of CBCT and EFPI.
 - v) Manual of procedure of gas filling
 - w) Any other drawings/manual the tenderer wish to submit for approval.
- 6.16.3 It will be the responsibility of successful tenderer to get the drawings approved within specified time mentioned in the acceptance letter and any delay will be adjusted with the period for offering prototype for inspection and testing.
- 6.16.4 The successful tenderer shall submit the above mentioned drawings in quadruplicate for approval within a fortnight from the date of receipt of acceptance letter. Also, these are to be submitted in a compact disc in Autocad and PDF format.
- 6.16.5** Detailed technical literature and instruction & subsequent maintenance manual of the switchgear, associated accessories used for control and protection and the numerical relays offered by the tenderer shall be submitted alongwith the tender. Special tools / instruments if any required to be provided in the distribution substations for installation, commissioning and maintenance shall be indicated separately alongwith the offer by the tenderer.
- 6.16.6** The successful tenderer on approval of the drawings, shall furnish six sets of approved / final drawings giving details of all parts and components, detailed literature of the equipment, operating instruction and manual etc. One set of final drawings shall be furnished on reproducible tracing film. Also, one set of approved / final drawings shall be furnished in the form of a compact disc in Autocad and PDF format. The detailed literature of the equipment, operating instruction and manual etc. shall be given on another Compact Disc (in MS Office)
- 6.16.7 The successful tenderer shall submit following documents with the equipment –



- a) Eight copies of approved drawings sheet in the form of spiral binding (A3 sheet).
- b) Eight copies of installation/maintenance manual with enlarged drawings indicating important parts such as Bushings, Operating Mechanism and Cable Boxes etc.
- c) Bill of material consisting of specification (i.e. make, model/type, ratings, quantity etc.) of accessories used for RMU.
- d) Three copies of test certificates of each RMU.
- e) Test result sheets of Relay, CTs, CBCTs and EFPI.

**6.17: PACKING**

- 6.17.1 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 indoor/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 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.
- 6.17.2 Packing for accessories and spares:- Robust wooden non returnable packing case with all the above protection & identification Label.
- 6.17.3 Packing Identification Label:-
In each packing case, following details are required:
i : Descriptive name of the equipment,
ii : Individual serial number,
iii : Purchaser's name,
iv : PO number & date,
v : Destination,
vi : Manufacturer / Supplier's name,
vii : Address of Manufacturer / Supplier / it's agent,
viii : Description and Quantity,
ix: Country of origin,
x : Month & year of Manufacturing,
xi : Dimensions of container,
xii : Gross and net weights in kilograms,
xiii : All necessary slinging and stacking instructions
- 6.17.4 Additional requirement:-
Necessary tools shall be provided with the packing of each RMU unit.



SECTION 7 : PRICES, DELIVERY & VALIDITY

7.1 Prices:

- 7.1.1 Tenderers should quote the prices with IEEMA price variation applicable for switchgear without ceiling.
- 7.1.2 The prices shall be for free delivery of the RMU to our Kussara Stores, Mazgaon, Mumbai 400 010 / Dharavi Depot, including arrangement for unloading of Ring Main Unit by crane and stacking them at the proper place. The freight insurance & unloading charges payable shall be quoted separately.
- 7.1.3 The prices shall be exclusive of taxes and duties. The percentage of which as applicable at present should be clearly mentioned by the tenderers. The tenderers shall also indicate Ex-Works price for the purpose of charging Excise Duty.
- 7.1.4 These goods are meant for use in generation/distribution of electrical energy. Form 'C' is applicable and tenderers should indicate exact Sales Tax / Central Sales Tax that will be charged against issue of Form 'C' by us. Further, concessional VAT is applicable to this tender.
- 7.1.5 It will be the responsibility of the manufacturer for safe transport of materials including arrangement for unloading and keeping the same at proper place.

7.2 Delivery:

- 7.2.1 The successful tenderer shall be required to submit in quadruplicate, copies of drawings as specified in Clause No.6.21 within 2 weeks from the date of receipt of our acceptance letter and get the same approved from Divisional Engineer, Planning (Materials) Dept., B.E.S & T. Undertaking, 3rd floor, Backbay Veej Bhavan, Gen. Jagannath Bhosale Marg, 149/150, Backbay Reclamation, Mumbai – 400 021 within 4 weeks from the date of submission of drawing. The firm has to depute technical representative for discussion, if any, during the drawing approval stage, so as to avoid delay. Any delay in getting the drawing approved within the specified period will be treated as delay in delivery of the material and necessary L.D. charges will be charged as per clause no. 5 of Condition of Supply.
- 7.2.2 The successful tenderer shall submit the 8 sets of approved drawings on **A3** size paper and 2 nos. of Compact Disc (CD) to Divisional Engineer, Planning (Materials).
- 7.3 The prototype unit shall be offered for inspection and testing, so that, it will be delivered to our Kussara Stores (after witnessing the tests by our inspecting officers at the manufacturer's works) within 8 weeks from the date of approval of drawings.



- 7.4 The prototype will be inspected and tested at our workshop after delivery. In case of rejection of prototype at our end, the manufacturer shall attend / rectify defect / shortfall within 10 days from the date of rejection memo, failing which, the delayed period will be reckoned for counting L.D. charges.
- 7.5 After acceptance of prototype at our end, the 1st lot shall be offered for inspection and testing at the manufactures cost, so that, it will be delivered to our Kussara Stores within 5 weeks from the date of acceptance of prototype. However, exact schedule shall be intimated to you by M.M. department.
- 7.6 **Procedure and acceptance of delivered RMUs** :- If any defects found during acceptance tests shall be attended by the tenderer within 10 days, failing which delayed period L.D. charges will be imposed.
- 7.7 Delivery schedule given will be suitably amended from time to time, depending on our requirement. However, minimum one month's advance intimation will be given while effecting the change.

Besides, due cognisance of the lead time required for manufacturing the switchgears will be taken while changing the delivery schedule. The tenderer therefore shall quote the minimum lead time required for manufacture of RMU.

- 7.8 Validity:

The offer should be valid for acceptance up to the date of validity, mentioned on the e-tender site. The offers with lesser validity period may be overlooked.



SECTION 8 : DIVISION OF ENGINEERING RESPONSIBILITY

- 8.1 The tenderer shall ensure that, the Undertaking is closely associated with the design and manufacture of the RMU right from the beginning at any stage and the Undertaking reserves the right to inspect the circuit breaker and associated equipment during manufacture.
- 8.2 All RMU supplied against this specification shall be guaranteed for a period of 66 months from the date of acceptance or 60 months from the date of installation, whichever is earlier for satisfactory operation of the switchgear. Any engineering error, omission, wrong provisions, etc. which do not have any effect on the time period, shall be attended / rectified by tenderer as and when observed / pointed out without any price implication to the entire satisfaction of the Undertaking.
- 8.3 After delivery of materials same will be once again inspected at our Distribution Workshop Kussara. If any engineering error, omission, wrong provisions, defects etc, found during inspection then it shall be attended / rectified by tenderer within 10 days.
- 8.4 The tenderer shall indicate precautionary measures required to be taken at site during erection work.
- 8.5 The tenderer shall also provide technical guidance, training and assistance in solving associated problems which may arise during erection and commissioning of switchgear.
- 8.6 At the time of erection and commissioning of the switchgear at respective distribution substation, the successful tenderer shall depute his representative free of cost to supervise / guide the said work if called for.
- 8.7 **Training:**
- The successful tenderer shall arrange hands on training in four batches for correct operation, maintenance of RMU, for setting and operation of relay, etc. This training shall be arranged, free of cost basis, two batches training will be conducted at manufacturer's works and two batches training will be conducted at our Distribution Workshop, Kussara, Mazgaon, Mumbai -10. However, during training at manufacturer's works, the batches containing eight numbers of participant per batch and the cost of to-and-fro charges for these batches will be borne by BEST Undertaking and the lodging, boarding facility shall be provided by the supplier. The convenient date, time and number of officers / supervisors / tradesman will be decided mutually.



SECTION 9 : TERMS OF PAYMENT

These will be as under :-

- a) 95% payment within 30days from the date of submission of bills duly accompanied by a copy of our Stores Received Note to the Administrative Officer, B.E.S. & T Undertaking, Materials Management Department, Parivahan Bhavan, 4th floor, Colaba, Mumbai -400001 and
- b) Balance 5% payment after expiry of the guarantee period i.e. 60 months from the date of the installation but not later than 66 months from acceptance.

NOTE :

1. KINDLY NOTE THAT IF THE OFFERS ARE NOT FOUND TO BE AS PER THE UNDERTAKING'S TECHNICAL/ NON-TECHNICAL SPECIFICATIONS AND THE TENDERERS WHO WILL NOT ACCEPT OUR COMMERCIAL CONDITIONS IN TOTO SUCH OFFERS ARE LIKELY TO BE OVERLOOKED AND WILL NOT BE RANKED.
2. OFFERS OF TENDERERS WHO DO NOT ACCEPT OUR COMMERCIAL CONDITIONS IN TOTO WILL NOT BE CONSIDERED FOR RANKING.

**SECTION 10 : SCHEDULE OF DEPARTURES FROM SPECIFICATION**

Tenderers shall mention in this schedule all departures from the various sections of the specification. In the absence of any mention in this schedule, the sections of this specification shall be binding on the tenderers.

Sr. No.	Reference to Section No. of specification	Departures

Signature of tenderer _____

Date : _____



**SECTION 11 : SCEHDULE OF GUARANTEED TECHNICAL PARTICULARS OF
RMUs
(MUST BE FILLED IN BY THE TENDERER)**

Tenderer shall furnish the GTP format with all details against each clause. Bidder shall not change the format of GTP or clause description. Tenderer shall be to submit duly filled GTP in hard copy format with company seal and soft copy on CD or mail to deplm@bestundertaking.com.

Sr. No.	Description	Data to be filled by Manufacturer
1	11kv RMU (as per scope of supply, section-3)	Separate GTP to be filled for each type of RMU
2	Equipment make	
	Equipment type / brand name	
3	Conformance to design standards as per section-4	Yes/No
4	Conformance to specification as per section-6	Yes/No
5	If NO for pt 3 or pt 4 above, Submission of deviation sheet for each specification clause no –	Yes/No
6.1	Panel overall dimensions in mm -3 way	
	Width (measured from front)	
	Depth	
	height	
6.2	Panel overall dimensions in mm- 4 way	
	Width (measured from front)	
	Depth	
	height	
7.1	Panel weight in kg – 3 way	
7.2	Panel weight in kg – 4 way	
8.1	Panel extensible on both sides (3 way)– Yes / No	
8.2	Panel extensible on both sides (4 way)– Yes / No	
9	Panel enclosure protection offered	



10	Panel tested for internal arc (Cable & other compartments) –Yes / No	
11	Heat generated by the panel in Kw	
12	Insulation level for complete panel	
12.1	Impulse withstand (Kv peak) -70kvp min	
12.2	Power frequency withstand (Kv rms) – 28kv min	
13	Bus bar	
13.1	Material & grade	
13.2	Bus bar cross section area in sq mm	
13.3	Bus bar rated current in amp i) at designed 40 deg.C ambient ii) at 50 deg.C ambient	
13.4	Max temperature rise above reference ambient of 40 deg C	
13.5	Short time current withstand capacity for 3 seconds (in KA)	
13.6	Bus bar clearances in mm P-P / P-E	
13.7	Bus bar with insulation sleeve / barriers	
13.8	Bus bar support insulator type	
13.9	Bus bar support insulator voltage class	
13.10	Bus bar support insulator minimum creepage distance / mm	
13.11	Earth bus bar material	
13.12	Earth bus bar size	
14	Circuit breaker type – SF6 or VCB	
14.1	Rated voltage & frequency	
14.2	Rated current in amp	
14.3	Rated breaking current – KA rms symmetrical	
14.4	Short time withstand capacity in KA for 3 sec	
14.5	Rated making current - KA peak	
14.6	Breaker total opening time at rated breaking capacity (in milliseconds)	
14.7	Number of breaks per pole	
14.8	Total length of contact travel in mm	



14.9	No of circuit breaker operation cycles (close & open) guaranteed at rated current, Electrical endurance class	25% rated current -
		50% rated current -
		75% rated current -
		100% rated current -
14.10	No of breaker opening operations guaranteed at rated fault current, Electrical Endurance Class	
14.11	No of breaker mechanical operation cycles (close & open) guaranteed at zero current , Mechanical endurance class	
14.12	Contact material	
14.13	Operating mechanism – trip free	
	Manual Spring charge type	
14.14	Feeder circuit breaker (FCB) –VCB	
14.14.1	Spring charging motor rating - Watt	
14.14.2	Spring charging motor rated DC voltage	
14.14.3	Closing coil wattage & rated DC voltage	
14.14.4	Trip coil wattage & rated DC voltage	
14.15	Transformer CT class, ratio & Vk	
15	Load break switch type – SF6 or VCB	
15.1	Rated voltage & frequency	
15.2	Rated current in amp	
15.3	Load break switch total opening time at rated current (in milliseconds)	
15.4	Number of breaks per pole	
15.5	Total length of contact travel in mm	
15.6	No of LBS close & open operation cycles guaranteed at	25% rated current -
		50% rated current -
		75% rated current -
		100% rated current -
15.7	No of LBS making operations guaranteed at rated fault current, Electrical endurance class	



15.8	No of LBS close & open operations guaranteed at zero current, Mechanical endurance class	
15.9	Contact material	
15.10	Operating mechanism type	
15.11	Operating motor voltage with acceptable % variation	
15.12	Minimum permissible SF6 gas pressure (For SF6 type RMU only)	
15.13	Capacitor type cable voltage indication provided?	Yes / No
15.14	Operation counter provided	Yes/ No
16.1	Disconnect switch continuous rating (Amp)	
16.2	Disconnect switch Short time withstand rating - 20kA for 3 sec minimum	Yes / No
16.3	One LBS open operation possible in the event of loss of SF6 gas	Yes/No
16.4	DC charger rating in amps – min 12 Amp	Yes/No
a	MCB rating at 230v AC input of charger	Amp
b	MCB rating at 24v DC output of charger	Amp
c	Charger heat sink temperature rise (max 55 deg C above ambient 40 deg C)	
d	Charger with natural cooling (no cooling fans)	Yes/No
e	Charger tested for input supply voltage regulation	Yes/No
f	Charger temperature rise test certificate	Yes/No
16.5	DC battery rating in Ah – 12Ah standard	Yes/No
17.1	Cable termination –	mm
17.2	Torque required for tightening terminal lug	
18	Mimic diagram, labels & finish as per cl no 6.10	Yes / No
19	Submission of RMU / component catalogue	Yes/No
20	Unit price for Conversion kit offered	Yes / No
21	Earth Switch	
21.1	Minimum number of operations at no load-	
21.2	Making capacity endurance of earth switch – Electrical endurance class	



22	Self Powered Relay – Make / Model	
22.1	CT Input	
22.2	IDMT Setting Range 4 element – Over Current & Earth fault & steps	Overcurrent- Earth Fault- Instantaneous O/C-
22.3	Operating Time	Over Current – Curves
22.4	Pick up Current	
22.5	Resetting Current	
22.6	Relay Burden	
22.7	Time Accuracy	
22.8	Tripping Coil O/P – type & duration	
22.9	Fault Current Display	
22.10	No of Fault Current Latching with time stamping	
22.11	Display Facility / Type	
22.12	Operational Indicators	
22.13	Potential Free Output Contacts	
22.14	Thermal Withstand Capacity of Relay	
23	Fault Passage Indicator	
23.1	CBCT	
a	Type	
b	Mounting Arrangement	
c	CT to indicator connection	
d	ID of sensor	
23.2	Earth Fault Indicator	Make / Model
a	Sensing Current	
b	Sensing Time	
c	Indication	
d	Reset Time	
e	Resetting Facility	
f	Output Contact	
g	Contact Rating	
h	Aux Power Supply	
i	Degree of Protection	
j	Mounting Arrangement	
k	Ambient Temperature	



24	Current Transformer- Make	
24.1	Ratio	
24.2	Burden	
24.3	Accuracy Class	
25	Voltage Presence Indicator- Make / Model	

NOTE :

For our early scrutiny of offers for their suitability (or otherwise), tenderers are requested to submit soft copy of the above GTP data duly filled (only in MS-XL format at above) and also later email the same to Divisional Engineer, Planning (Materials) at his Email ID: deplm@bestundertaking.com.

Tenderer signature

Name of the bidder	
Address of bidder	
Name of contact person	
Telephone no & email id	
Name of the senior technical persons whom to be contacted incase of queries	
Telephone no & email id of Senior technical person.	

**ANNEXURE 'A'****THE BRIHAN-MUMBAI ELECTRIC SUPPLY & TRANSPORT UNDERTAKING****(Materials Management Department - Kussara)****PROFORMA FOR FURNISHING INFORMATION BY THE MANUFACTURING UNIT**

1.	Name of the Firm & Address of manufacturing Unit	
2.	Address for correspondence _____ _____ _____ Telephone No. : Office _____ Godown _____ Factory _____ Telephonic Address : _____ Telex No. : _____ Fax : _____	
3.	Constitution of the Firm Proprietary / Partnership / Private Ltd. / Public Limited.	
4.	Name & Office / Residential Address of Directors / Partners / Proprietor / Technical Head	
5.	Directorship / Partnership in other firms.	
6.	Name of Bankers & their Full address & Tel. No.	
7.	Details of registration with SSI, NSIC / Central & State Govt. Authorities / Semi-Govt. Authorities / State Transport Undertakings / Reputed Public Ltd. & Pvt. Companies / Distribution Utilities	Please attach xerox copies of the registration certificates.
8.	Details of registration with various tax / Govt. duties authorities such as : a) MST/CST Registration No. b) Excise Registration No.	Please attach xerox copies of the registration certificate
9.	Details as regard collaboration, if any.	
10.	Area of the a) Factory Premises	_____ Sq.mtr./Sq.ft.



	b) Godown/Store c) Office	_____ Sq.mtr./Sq.ft. _____ Sq.mtr./Sq.ft.
11.	The details of Machinery Equipment are installed in the factory.	Please furnish a separate list with all details indicating their sizes, capacity etc.
12.	a) Authorized capacity (Electric load) : b) Capacity Allowed (Electric load)	
13.	Whether generator facility is available, if yes, give details.	
14.	Persons on Roll a) Engineering/Science Graduates/Post Graduates b) Diploma holders a) ITI Qualified b) Skilled c) Semi-Skilled d) Unskilled e) Others.	Separate list may be attached
15.	No. of Shifts	
16.	Items manufactured / production range	Separate list may be attached
17.	Do you have any expansion / diversion plans, if yes, furnish details.	
18.	Please furnish a list source of raw materials/ sub-components and Quality assurance thereof.	Separate list may be attached indicating particulars of raw materials/components and source of purchase etc.
19.	Inspection of facilities / testing a) Equipments available b) Do you have your own laboratory for testing raw materials / finalized products.	List may be attached
20.	Any R & D facilities available? if yes, please furnish details.	
21.	Name of the reputed customers such as, O.E. manufacturers, Govt. / Semi Govt. / Organization State Transport Undertaking / Reputed Public & Private Companies / Corporations / Distribution Utilizes	List of orders executed alongwith Xerox copies of the same during last 3 years with details viz. Name & address of organization, material & quantity supplied & value of order must be attached.
22.	Whether the products have been tested at NABL accredited laboratory like CPRI / ERDA etc.	Certified copies of various latest test certificates shall be attached.
23.	In case of out-station firms, please furnish the name of the authorized distributors / agent available in Mumbai alongwith their address,	



	telephone no. and their terms/conditions etc.	
24.	<p>Other information –</p> <p>a) Approx. Annual turnover (Last 2 financial years)</p> <p>b) Delivery facilities available</p> <p>c) Please furnish latest Xerox copies of –</p> <p>i) Rent Receipt / Monthly compensation receipt</p> <p>ii) Electric Bill</p> <p>iii) Telephone Bill</p> <p>iv) Income Tax clearance certificate / Advance Tax paid receipt</p> <p>v) Balance sheet / Annual report for last 2 financial years.</p>	Certified copies of the same by Chartered Accountant must be attached.
25.	Any additional information not covered above.	

**Signature of the -
Director / Partner / Proprietor / Manager
(Seal of the Firm)**



BRIHAN-MUMBAI ELECTRIC SUPPLY & TRANSPORT UNDERTAKING
(of the BRIHAN MUMBAI MAHANAGARPALIKA)
MATERIALS MANAGEMENT DEPARTMENT

Tender No. AMM(SB)/9/_____/02-03/AAT.

Due on: _____

Tender Conditions

&

Specification No. For

11KV, 250MVA, INDOOR/OUTDOOR RMU IMPORTANT

1. Earnest Money Deposit
The tenderers must furnish EARNEST MONEY DEPOSIT as mentioned in clause of CONDITIONS OF TENDER, without which their offers will not be opened.
CHEQUES/BANK GUARANTEE WILL NOT BE ACCEPTED.
2. The offers alongwith Tender Form, Section 07: Schedule of Prices and Delivery, Section 11: Schedule of Guaranteed Performances & Section 10: Schedule of Departures from Specification shall be submitted **in duplicate**. The tenderers must, also, sign and return the Conditions of Tender and Conditions of Supply.
3. Tenderers whose offers are not as per the Undertaking's specifications and **who do not accept our commercial conditions in toto**, will not be considered for ranking. Further, no clarifications will be sent to such firms, once the tender is opened.
4. The Tenderers should indicate the correct rate of Excise Duty applicable to their product and confirm the same rate (even if it is concessional) will remain firm during the contractual period, irrespective of increase in their turn over, except in case of basic revision of Excise Duty structure by the Govt. They should also indicate the maximum rate of Excise Duty applicable to the item quoted for, failing which, their rates will be loaded with maximum Excise Duty applicable to the item, while evaluating their offers.
5. Any additional information or technical clarification asked for while evaluating tender quotations should be supplied **WITHIN A WEEK** and failure to do so would result in ignoring their tenders/offers.
6. Only those tenderers whose Minimum Annual Turnover is **Rs.25 Crores** and above per year, for previous Two financial years, should quote against the tender. Certified copies of assessment of Annual Turnover from Chartered Accountant should be attached by the tenderers. The offers of the tenderers not fulfilling above requirements, will not be considered.

PRICE OF TENDER: Rs. 2000/- (inclusive of all taxes).

**ANNEXURE 'X'****(To be submitted later by the tenderers in a separately sealed cover (envelope))**

We hereby volunteer & confirm that we are agreeable to accept order at the lowest acceptable gross rates received against the tender against following items of the tender. We also confirm that for these items, all other conditions & terms of our offer against above tender shall remain unchanged.

Item No.	Description

Date : _____

SEAL & SIGNATURE OF TENDERER

Tender No. _____ Due on _____

**ANNEXURE 'Y'**

Confirmation regarding fulfilling "Eligibility Criteria" specified in clause 20 of Chapter-I :
Instructions to Tenderer

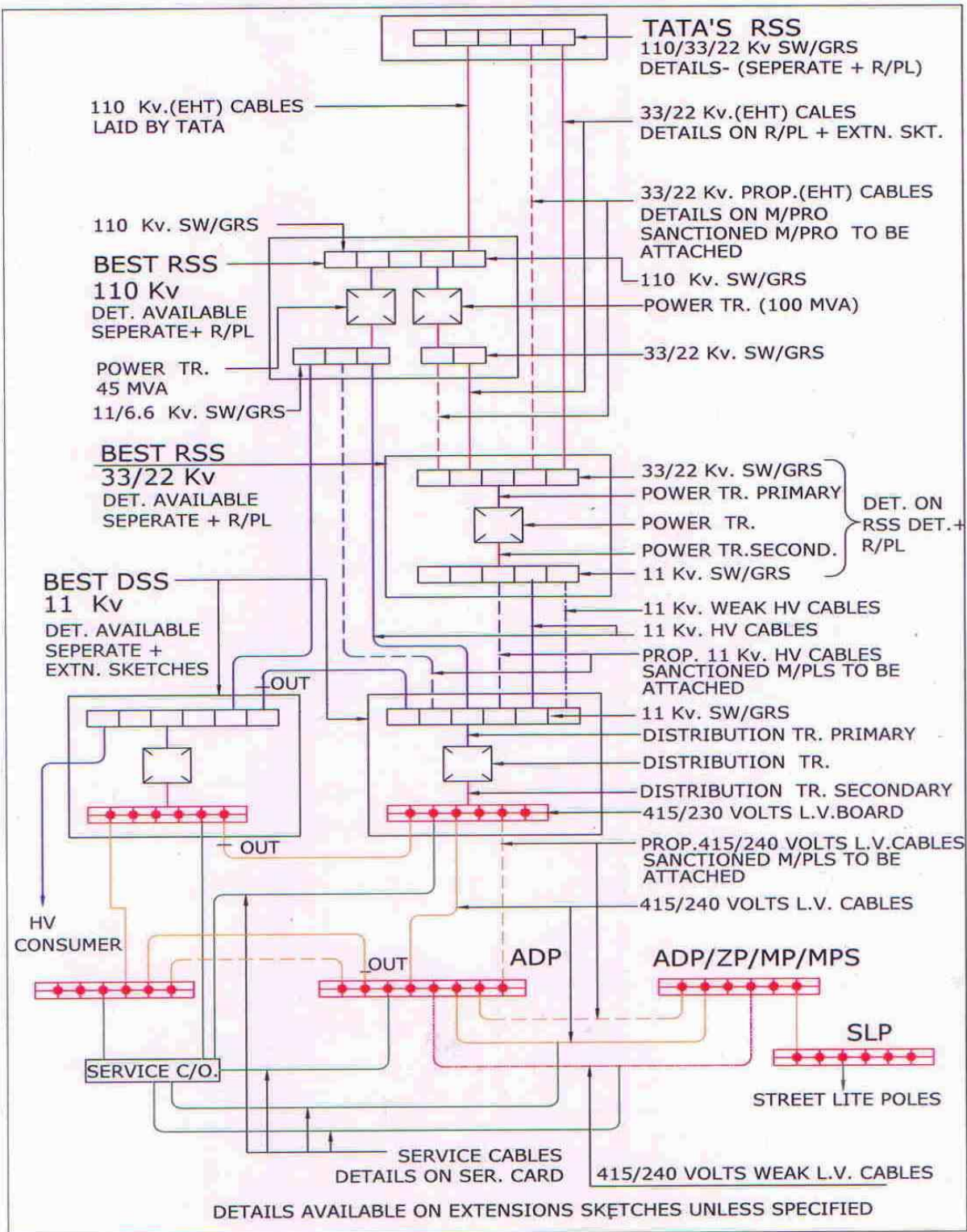
- 1) a) We confirm that our minimum Annual Turnover is above Rs. 25 Crores and above per year, for previous two financial years Yes / No
b) Necessary documentary evidence for above enclosed. Yes / No
- 2) We confirm that we have quoted for minimum 50% of the tender quantity. Yes / No

I/We confirm that I/We have understood the "Eligibility Criteria" given in clause 20 of Chapter I – Instructions to Tenderers and given the necessary confirmations required in the above table otherwise our Price-Bid [enclosed in Envelope-II(A)] will not be opened at 2.00 p.m. on _____.

Date : _____

Seal & Signature of Tenderer

Tender No. _____ Due on _____





Bus Bar Arrangement:-

