

**CORRIGENDUM-02**

**REPLY TO PRE- BID QUERIES**

**NAME OF WORK: CONVERSION OF EXISTING OVERHEAD POWER DISTRIBUTION NETWORK WITH UNDERGROUND POWER CABLE NETWORK UNDER 'KONKAN DISASTER MITIGATION PROJECT' ON TURNKEY BASIS IN ALIBAUG 1 SUB DIVISION, ALIBAUG 2 SUB DIVISION & PEN SUB DIVISION UNDER PEN CIRCLE AND AT URAN SUB DIVISION UNDER VASHI CIRCLE IN RAIGAD DISTRICT, MAHARASHTRA**

**RFB NO:HLL/DMRR/UGC-PKG-01/2023-24/08**

**Important Note:**

- 1. Corrigendum 02 (Reply to pre-bid queries) shall form part of the Tender Document and is to be submitted duly signed & stamped by the applicants along with their Application.**
- 2. All other terms & condition of Tender document remains unchanged.**
- 3. Prospective bidders are advised to regularly scan through <https://etenders.gov.in/eprocure/app> and HITES website tender page for corrigendum/amendments etc. and separate advertisement will not be made for this.**

**VP (ID), HITES South Operations  
HLL Lifecare Ltd**

**REPLY TO PRE-BID QUERIES**  
Pre-bid meeting held on 08/02/2024

**NAME OF WORK: CONVERSION OF EXISTING OVERHEAD POWER DISTRIBUTION NETWORK WITH UNDERGROUND POWER CABLE NETWORK UNDER 'KONKAN DISASTER MITIGATION PROJECT' ON TURNKEY BASIS IN ALIBAUG 1 SUB DIVISION, ALIBAUG 2 SUB DIVISION & PEN SUB DIVISION UNDER PEN CIRCLE AND AT URAN SUB DIVISION UNDER VASHI CIRCLE IN RAIGAD DISTRICT, MAHARASHTRA**

RFB No. HLL/DMRR/UGC-PKG-01/2023-24/08

The reply to pre-bid queries shall be treated as part of e-tender to be uploaded online duly signed and stamped along with e-tender:

S.No	Tender Document/ Section No.	Clause/ Sub Clause	Details ( as per Tender Documents)	Bidder's query	Reply by HLL
1	Part 1 bidding procedures and requirements,	Section – 2 : Eligibility and Qualification Requirements	<p>PART 1 BIDDING PROCEDURES AND REQUIREMENTS, 2. Qualification Requirements</p> <p>a. The Tenderer should meet the following minimum eligibility criteria:</p> <p>(ii) Experience of having successfully completed following works (under multiple work order or agreement) in EPC mode during the last seven years ending last day of the month previous to the one in which tenders are invited:</p> <p>Supply, Installation, Testing and Commissioning of medium voltage (22kV or higher voltage class) underground cable lines totalling to 100 km</p> <p>OR</p> <p>Supply, Installation, testing and commissioning of at least 02 nos 33/11 kV or above Hybrid GIS /GIS substations.</p> <p>OR</p> <p>Supply, Installation, testing &amp; commissioning of 11 kV or higher voltage class Ring Main Units (RMU) totalling 30 Nos.</p> <p>Minimum 2 (Two) works from (ii) above must be successfully operational at the time of tender submission, to be substantiated by a letter from Client.</p> <p>Note: In case of JV, the above requirement at (a)- (i)&amp; (ii) shall be met by any one of the partner or jointly by the partners.</p>	<p>PART 1 BIDDING PROCEDURES AND REQUIREMENTS, 2. Qualification Requirements</p> <p>a. The Tenderer should meet the following minimum eligibility criteria:</p> <p>(ii) Experience of having successfully completed following works (under multiple work order or agreement) in EPC mode during the last seven years ending last day of the month previous to the one in which tenders are invited:</p> <p>Supply, Installation, Testing and Commissioning of medium voltage (22kV or higher voltage class) underground cable lines totalling to 100 km</p> <p>OR</p> <p>Supply, Installation, testing and commissioning of at least 02 nos 33 kV or above Hybrid GIS /GIS / AIS substations.</p> <p>Since the scope of work is not involved any type of HGIS or GIS work, we request to you kindly consider experience of AIS substation also.</p> <p>OR</p> <p>Supply, Installation, testing &amp; commissioning of 11 kV or higher voltage class Ring Main Units (RMU) totalling 30 Nos.</p> <p>Minimum 1 (One) work from (ii) above must be successfully operational at the time of tender submission, to be substantiated by a letter from Client.</p> <p>Note: In case of JV, the above requirement at (a)- (i)&amp; (ii) shall be met by any one of the partner or jointly by the partners.</p>	No Change.Terms & conditions of e-tender prevail
2	Part 1 bidding procedures and requirements,	Section – 2 : Eligibility and Qualification Requirements	<p>v)</p> <p>Bidder shall submit Manufacturer Authorization Form (MAF) from any one approved Cables manufacturer as per list of approved makes in the tender. MAF to be on Rs.100/- stamp paper signed by authorized person as per format.</p> <p>Note: In case of JV, the MAF shall be issued in the name of JV partner</p>	<p>(v)</p> <p>Bidder shall submit Manufacturer Authorization Form (MAF) from any one approved Cables manufacturer as per list of approved makes in the tender. MAF to be on manufacturers letter head paper signed by authorized person as per format.</p> <p>Note: In case of JV, the MAF shall be issued in the name of JV partner/Lead Bidder.</p>	<p>The bidder shall visit the website of MSEDCL for list of approved makes. Please refer the following link: <a href="https://www.mahadiscom.in/supplier/en/approved-vendor-list-all-schemes/">https://www.mahadiscom.in/supplier/en/approved-vendor-list-all-schemes/</a></p> <p>Detailed Technical Specification to be followed for this work is attached as Annexure-B1.</p> <p>In addition check list mentioned in the Part 2 (Employers requirement) shall also be full filled.</p> <p>In case of any discrepancy the order of preference shall be given to MSEDCL tech spec over the check list.</p>

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S.No	Tender Document/ Section No.	Clause/ Sub Clause	Details ( as per Tender Documents)	Bidder's query	Reply by HLL
3	Part 1 bidding procedures and requirements,	2. Qualification Requirements (b)	b. The Bidder shall also furnish following documents/details with Technical Part of its bid: (iii) The bidder / Lead Partner of JV should meet the necessary license class requirements as applicable for the execution of works in this RFB. However in case the bidder does not hold the license for the given State, then the bidder should possess the equivalent license for any one State in India and post-award the bidder is required to acquire the necessary license for the given State within a period of two months.	We understand, bidders should have "Electrical Contractors License".	Yes. "Class-A" License for HV/EHV works is required as per tender conditions.
4	Part 1 bidding procedures and requirements,	ITB 11.3	ITB 11.3 The bidders shall submit the hard copies of technical bid to the office of: Vice President (ID) HITES South Operations HLL Lifecare Limited HLL Bhavan Golden Jubilee Block, 2nd Floor (HITES office) Poojappura. Trivandrum -695012  Note: Hard copies of the technical bid shall reach the above mentioned address before the last date & time of opening of bids.	We understand that original documents like POA, Integrity Pact, Joint Venture Agreement etc to be submitted in the event of LOA.	Please refer ITB 11.3 in BDS (Part I). The bidders shall submit complete set of Technical Bid in hard copy
5	Part 1 bidding procedures and requirements,	ITB 18.1	ITB 18.1 A Bid Security shall be required. All bidders shall submit EMD / Bid Security online for an amount of Rs.5,00,000/-	In case of unsuccessful in bidding , the EMD shall be return in how many days.	The Bid securities of unsuccessful Bidders shall be discharged/ returned after expiry of the final bid validity and latest on or before the 30th day after the award of contract. Bid securities of unsuccessful bidders during first stage , i.e, technical evaluation etc will be returned within 30 days of declaration of technical evaluation.
6	Part 1 bidding procedures and requirements,	ITB 13.5.2 (i)	ITB 13.5.2 (i) The bids shall be quoted excluding GST and evaluation will be on the basis of quoted amount.	We understand that, the estimated cost is exclusive of GST, pl confirm.	Estimated cost is exclusive of GST
7	Part 1 bidding procedures and requirements,	45. Source of Funds	45. Source of Funds Section - 1 : Request for Bids Notice/Notice Inviting Tender FORM-J The bidders shall submit along with the bid a declaration as per FORM-J of this document duly signed by nominated representative of HITES/Client after site visit.	We would like to have information about percentage of funding arrangement from Government of India and State fund from Government of Maharashtra. Kindly provide contact details of signing authority from representative of HITES/Client or Local representative available in the state of Maharashtra.	Details of Local representative is already available in Part 1 of RFB document. Other details w.r.t funding and agreement signing authority will be intimated to the L1 bidder after award of work.
8	Part 1 & Part 3	2.a (vi)	Bidding Capacity	Bidding capacity to be calculated with the formula mentioned in Part – 3: Conditions of Contract and Contract Forms or Part 1 - Bidding Procedures and Requirements.	Bidding capacity to be calculated with the formula mentioned in Part 1 - Bidding Procedures and Requirements.
9	Part 4	Price Bid	Price Bid	Please provide detailed activity breakup mentioned in Part 1 - Bidding Procedures and Requirements - BILL OF QUANTITIES./ Cost data.	Detailed Bill of quantities attached

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S.No	Tender Document/ Section No.	Clause/ Sub Clause	Details ( as per Tender Documents)	Bidder's query	Reply by HLL
10	Part – 3: Conditions of Contract and Contract Forms	Appendix-1: TERMS AND PROCEDURES OF PAYMENT	2.3. Third & Final Instalment (10%): a. The balance ten percent (10%) of payment against Supply contracts excluding Excise Duty, Taxes etc. shall be reimbursable on successful supply, erection, testing and commissioning of the works in the project and issuance of Completion Certificate by the Employer.	We understand that, Third & Final Instalment (10%) will be released after successful completion of individual activity mentioned in employer estimate. Pls confirm.	The final installment of balance ten percent (10%) of payment will be made upon successful commissioning of the entire works and completion of all the works duly certified by the employer's representatives and after issue of the last completion certificate and submission of a "unconditional No claim certificate" by the contractor.
11	Part – 3: Conditions of Contract and Contract Forms	Appendix-2 : PRICE ADJUSTMENT	Part – 3: Conditions of Contract and Contract Forms Appendix-2 : PRICE ADJUSTMENT	Kindly confirm price adjustment to be applicable for Ring Main Unit (SF6), Pls provide price adjustment formula for Ring Main Unit (SF6).	Price adjustment is applicable for the items listed in Appendix-2 : PRICE ADJUSTMENT in Part 3
12	General		General	Kindly provide Civil foundation drawing for Ring Main Unit.	Since this is a EPC contract, Bidder has to provide the foundation drawing according to the size of the RMU after design.
13	General		Railway/Road/National Highway Crossing	Kindly inform- required permission for Railway crossing /Road Crossing/ National Highway is in scope of bidder or not ? All statutory payment like supervision charges, approval fee etc. will be paid by the HLL Pls confirm.	Refer clause 3.3 Statutory Clearances (GCC 8.3 of Part-II Employer's requirement) in Part – 3: Conditions of Contract and Contract Forms
14	General		Way leave	Payment of compensation of land Payment of compensation towards utilization of the private land for Cable laying. Payment of compensation towards damage of crops etc. All statutory payment like supervision charges, approval fee etc. will be paid by the HLL Pl confirm.	Terms & conditions of e-tender prevail
15	General		General/Estimate	Hard rock excavation rates are not mentioned in BoQ. Pl confirm	The bidder has to assert the location where all the laying work is to be done. A preliminary survey has to be done by the successful bidder, and if any re-routing is required, it can be done and approved/documentated from concerned officials of HITES/MSEDCL. No extra cost is payable over and above the quoted rate.

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S.No	Tender Document/ Section No.	Clause/ Sub Clause	Details ( as per Tender Documents)	Bidder's query	Reply by HLL
16	Part – 3: Conditions of Contract and Contract Forms		PERFORMANCE SECURITY	The Performance Security amount is 3% of Contract Price - Kindly consider Performance Security as per Government of India Ministry of Finance Letter No. F1/2/2023-PPD dated 03.04.2023 Performance Security should be for an amount of 3% of the value of contract and Performance security may be furnished in the form of Insurance surety Bonds also.	No Change. Terms & conditions of e-tender prevail
17	Part 1 bidding procedures and requirements,		Hard copy Submission	Submission of Original Documents: The Bidders are also required to separately submit the hard copy of the documents, if any mentioned in BDS , at Employer's address specified in BDS, so as to reach the office before the opening of the Technical Part of the Bid, either by registered/speed post/courier or by hand, failing which the bids are liable to be declared non- responsive. - Kindly share the list of required documents to be submitted in hard copy.	The bidders shall submit the complete set of technical bid in hard copy.
18	Part 1 bidding procedures and requirements,	Pg 21, Cl no. VI, Eligibility of the bidder	Work experiences of the bidder as per above shall be considered only if the works have been executed under Govt./Semi-Govt./autonomous body of Central/State Govt. Electricity Power Utility/ Power Dept. in India only.	We request you to consider firm's experience in private sector also provided for private clients. Some PSU bodies such as MIDC, CIDCO accepts the similar experience in private sectors for the similar work qualification requirements.	No Change.Terms & conditions of e-tender prevail
19	Part – 3: Conditions of Contract and Contract Forms	Appendix-1: TERMS AND PROCEDURES OF PAYMENT	As per tender if advance not taken 60% against supply, 30% after erection and commissioned and 10% after completion of project.	we request to change payment terms as 80% against supply of material, 10% after erection and 10% after commissioning of particular line MSEDCL also accepting above.	No Change.Terms & conditions of e-tender prevail
20			2.1.3 For the purposes of satisfaction of Technical Requirement, similar works refers to : a) Projects(s) execution in one or more sectors below- 1) Electrical Transmission sector 2) Sub-transmission sector 3) Electrical distribution sector In above sectors, type of construction works undertaken should be of the nature of one or more of the following:- 1) HT underground cable lines 2) LT underground cable lines 3) 33 KV, 11 KV, Ring Main Units (RMU's) b) Notwithstanding the clause 2.1.3 (a) above, experience in only LT lines,would not be considered eligible.	As per experience of Transmission experience also acceptable but in detail MSEDCL asking experience for 33 kv only, in transmission line always voltage grade is 33 kV or above since maximum requirement of tender is 33 KV cable we requested please accept underground experience should be of 33 KV or above grade it should be satisfactorily working in past.	No change in qualification requirements. Terms & Conditions of e-tender prevail

## Detailed Project Estimate

"Shifting of Overhead Power Lines to Underground Power Cables(HT/LT)"

RFB no. HLL/DMRR/UGC-PKG-01/2023-24/08

### BILL OF QUANTITY (BOQ) and ESTIMATE

Name of District : Raigad

Name of Circle : Pen & Vashi

Name of Division : Alibag & Panvel

Name of Sub-Division : Alibag, Pen & Uran

#### Schedule 1: Grand Summary

SL No.	Proposed Bill Of Quantity	Unit	Alibag-1 Quantity	Alibag-2 Quantity	Pen Quantity	Uran Quantity	Total Quantity PKG-01	Unit Rate(Rs)	Amount(Rs)	Cost References
1	Conversion of 22 KV O/H Line by 3C, 22KV 300Sqmm XLPE U/G HT Cable	Km	40.03	54.57	23.73	45.3	163.63	22,73,715.00	37,20,47,985.45	Activity 5502
2	Conversion of 22 KV O/H Line by 3C, 22KV 95Sqmm XLPE U/G HT Cable	Km	3.98	21.79	0.00	5.1	30.87	14,23,859.00	4,39,58,371.75	Activity 5504
3	Augumentation of Pole mounted Distribution Transformer Sub-station 22/0.433 kv, 100 KVA to 22/0.433 kv, 200 KVA with MCCB	No	16.00	12.00	8.00	0.00	36.00	4,46,188.05	1,60,62,769.80	Activity 1102
4	22KV Ring Main Unit [SF6] SCADA Compacticable [2 Isolator + 2 Breaker]	No	49.00	52.00	0.00	19	120.00	6,69,292.10	8,03,15,052.34	Activity 6203 New
5	22KV Ring Main Unit [SF6] SCADA Compacticable	No	4.00	5.00	24.00	22	55.00	5,34,927.14	2,94,20,992.49	Activity 22KV2+1RMU

	[2 Isolator + 1 Breaker]										
6	22 kV Isolator with RSJ Pole 152 X 152, 9 mtr DP & allied fabrication ( Replacement of AB Switch by Isolator)	Km	0.00	80.00	0.00	0.00	80.00		1,12,066.56	89,65,324.80	Activity 6724 N
7	Coverion of Overhead LT Line to underground by 3.5 C, 300 sqmm XLPE cable	Km	0.00	0.00	0.00		16.30		10,23,685.95	1,66,86,080.99	Activity 5510
8	Coverion of Overhead LT Line to underground by 3.5 C, 185 sqmm XLPE cable	Km	0.00	0.00	0.00		16.35		7,06,435.95	1,15,50,227.78	Activity 5512
9	Supply, Erection, Testing & Commissioning of LT mini Feeder Pillars	Nos	0.00	0.00	0.00		311.00		16,382.61	50,94,990.47	Activity 2003
10	Foundation for RMU	No.s	53.00	57.00	24.00	41.00	175.00		22,200.00	38,85,000.00	Activity 6204 (Civil)
11	RI Charges LT Bitimin	Km					0.00			-	
12	RI Charges LT Concrete Road	Km					0.00			-	
13	RI Charges HT Bitimin	Km	4.00	32.05	5.61		41.66		16,94,000.00	7,05,65,992.42	
14	RI Charges HT Concrete Road	Km					0.00			-	
15	Dismantling of OH LT line	Km	0.00	0.00	0.00	0.00	0.00		12,400.00	-	
16	Dismantling of OH HT line	Km	44.01	77.36	23.73		145.10		12,400.00	17,99,240.00	
21	Quantity Variation Provision	LS	1	1	1	1.00	4.0		3,91,57,235.48	3,91,57,235.48	
<b>Grand Total (Material)</b>										<b>69,95,09,263.77</b>	

**Note:**

\* Exact Location & Quantity will be finalized during joint survey with Executing agency

**Note:**

1. Unit Rates considered are as per MSEDCL approved Cost Data ( FY 22-23)

2. Erection Charges are including digging and backfilling of Trench with Sand,Brick and Excavated Soil in proper manner

Item Code No. 5502					
Cost Data for conversion of 1 Km 22 KV Overhead line by 3 C, 300 Sqmm XLPE under ground Cable					
Sr.No.	Particulars	Unit	Qty.	RT/U Rs.	Amount
1	XLPE Cable 22 KV, 3 C / 300 mm sq.	Rmt	1000.00	1932.48	1932480.00
2	R.C.C. Pipe 150 mm 2 M	No	30.00	572.00	17160.00
3	Half round cement pipe ( 150mm X 1mtr)	No.	940.00	143.00	134420.00
4	22 kV Heat shrik Straight through joint (AI) kit for XLPE 3 C X 300 sqmm	No.	4.00	24600.00	98400.00
5	22 kV Heat shrik Outdoor termination joint (AI) kit for XLPE 3 C X 300 sqmm	No.	2.00	13715.00	27430.00
6	Sand	Cmt	250.00	255.30	63825.00
	<b>Cost of material</b>				<b>2273715.00</b>

Item Code No. 5504					
Cost Data for conversion of 1 Km 22 KV Overhead line by 3 C, 95 Sqmm XLPE under ground Cable					
Sr.No.	Particulars	Unit	Qty.	RT/U Rs.	Amount
1	XLPE Cable 22 KV, 3 C / 95 mm sq.	Rmt	1000.00	1142.10	1142100.00
2	R.C.C. Pipe 150 mm 2 M	No	30.00	572.00	17160.00
3	Half round cement pipe ( 150mm X 1mtr)	No.	940.00	143.00	134420.00
4	22 KV st. through joints for 3 C / 95 mm sq.	No.	4.00	12077.00	48308.00
5	22 kV Heat shrik Indoor termination joint (AI) kit for XLPE 3 C X 95 sqmm	No.	2.00	9023.00	18046.00
6	Sand	Cmt	250.00	255.30	63825.00
	<b>Cost of material</b>				<b>1423859.00</b>

Item Code No. 5510					
Conversion of Overhead LT Line to underground by 3.5 C, 300 sqmm XLPE cable					
Sr.No	Description of Material	Unit	Qty.	RT/U Rs.	Amount
1	L.T. XLPE cable 3.5 Core 300 mm2	RMT	1000	978.75	978750.00
2	R.C.C. Pipe 150 mm 2 M	No	30.00	572.00	17160.00
3	Misc. ( Bricks,sand,tremination kit and etc.)	LS	1	27775.95	27775.95
	<b>Cost of material</b>				<b>1023685.95</b>

Item Code No. 5512					
Conversion of Overhead LT Line to underground by 3.5 C, 185 sqmm XLPE cable					
Sr.No	Description of Material	Unit	Qty.	RT/U Rs.	Amount
1	L.T. XLPE Armoured 3.5 Core cable185 sq.mm.	RMT	1000	661.50	661500.00



2	R.C.C. Pipe 150 mm 2 M	No	30.00	572.00	17160.00
3	Misc. ( Bricks,sand,tremination kit and etc.)	LS	1	27775.95	27775.95
<b>Cost of material</b>					<b>706435.95</b>

**Item Code No. 5512**
**Coverision of Overhead LT Line to underground by 3.5 C, 185 sqmm XLPE cable**

Sr.No	Description of Material	Unit	Qty.	RT/U Rs.	Amount
1	22 kV SF6, Motorized, SCADA Compatible RMU 2 Iso + 1 Br	Set	1.00	464647.05	464647.05
2	Foundation Structure for RMU for Cable Entry Etc.	No	1.00	26047.59	26047.59
3	Earthing to equipment with Salt ,Coke, earthing strip Etc.	No	1.00	14950.00	14950.00
4	Sundries such as N/B, Washers, Welding etc.	kg	1.00	3162.50	3162.50
5	22 kV Silicon coated touchproof Indoor termination joint (Al) kit for XLPE 3 C X 300 sqmm	Set	4.00	16325.00	65300.00
<b>Cost of material</b>					<b>574107.14</b>

**Item Code No. 2003**
**Supply, Erection, Testing & Commissioning of LT mini Feeder Pillars**

Sr. No.	Particulars	Unit	Qty	Rate (Rs.)	Amount (Rs.)
1	L.T. Mini Feedar Pillar	No	1	10596.00	10596.00
2	Earthing with GI pipe	No	2	392.85	785.70
3	G.I.Strip (25 X 3 mm)	kG	2	90.15	180.31
4	Sundries		1	885.50	885.50
5	Concreting ration 1:3:6	L. S.	1	3935.10	3935.10
<b>Cost of material</b>					<b>16382.61</b>

**Item Code No. 1102**
**Cost Data for Augumentation of Pole mounted Distribution Transformer Sub-station  
22/0.433 kv, 100 KVA to 22/0.433 kv, 200 KVA with MCCB**

Sr.No	Description of Material	Unit	Qty.	RT/U.Rs.	Amount (Rs.)
1	Dist.transformer 200kva,22/0.4kv	No.	1.00	#####	398476.00
2	L.T.Dist.Boxes 200 KVA with MCCB	No.	1.000	27244.80	27244.80
3	L.T.XLPE Armoured 3.5 Core cable120 sq.mm.	Rmt	25.00	444.15	11103.75
4	L.T. XLPE cable 3.5 Core 240 mm2	Rmt	10.00	847.80	8478.00
5	Sundries	LS	1.00	885.50	885.50
<b>Cost of material</b>					<b>446188.05</b>

**Item Code No. 6203 New**
**Out door/ Indoor type Ring Main Unit (SF - 6) (2 Isolators + 2 Breaker)**

Sr.No	Description	Unit	Qty.	Rate/Unit Rs.	Total Cost Rs.
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1	22 kV SF6, Motorized, SCADA Compatible RMU 2 Iso + 2 Br	Set	1	614792.85	614792.85
2	Foundation Structure for RMU for Cable Entry Etc.	No	1	26047.59	26047.59
3	Earthing to equipment with Salt ,Coke, earthing strip Etc.	No	1	14950.00	14950.00
4	Sundries such as N/B, Washers, Welding etc.	kg	1	3162.50	3162.50
<b>Total Cost</b>					<b>658952.94</b>

Item Code No. 22KV2+1RMU					
Out door / Indoor type Ring Main Unit (SF - 6) (2 Isolators + 1 Breaker)					
Sr.No	Description	Unit	Qty.	Rate/Unit Rs.	Total Cost Rs.
1	22 kV SF6, Motorized, SCADA Compatible RMU 2 Iso + 1 Br	Set	1	464647.05	464647.05
2	Foundation Structure for RMU for Cable Entry Etc.	No	1	26047.59	26047.59
3	Earthing to equipment with Salt ,Coke, earthing strip Etc.	No	1	14950.00	14950.00
4	Sundries such as N/B, Washers, Welding etc.	kg	1	3162.50	3162.50
<b>Total Cost</b>					<b>508807.14</b>

22KV Ring Main Unit [SF6] SCADA Compactible [2 Isolator + 2 Breaker]

Activity No 22KV2+2RMU						
Sr no.	Div	Subdiv	Section	Feeder	Location	Qty
						No.
1	Alibag	Alibag-1	Nageon 2	Revdanda	Akshi Bridge David DTC	1
2	Alibag	Alibag-1	Nageon 2	Revdanda	Stambh DTC	1
3	Alibag	Alibag-1	Nageon 1	Revdanda	Kopar DTC to Vaidya Ali , Pradhan Ali	1
4	Alibag	Alibag-1	Nageon 1	Revdanda	Terkarwadi DTC	1
5	Alibag	Alibag-1	Nageon 1	Revdanda	Main Beach Nageon	1
6	Alibag	Alibag-1	Nageon 1	Revdanda	Samira DTC to Terkar Wadi DTC	1
7	Alibag	Alibag-1	Nageon 1	Revdanda	Petli Gali DTC	1
8	Alibag	Alibag-1	Nageon 1	Revdanda	Lamba DTC Bandar Road	1
9	Alibag	Alibag-1	Nageon 1	Revdanda	Chitsmani 2 DTC	1
10	Alibag	Alibag-1	Nageon 1	Revdanda	A to Z kirane DTC	1
11	Alibag	Alibag-1	Nageon 1	Revdanda	Badami Nageon	1
12	Alibag	Alibag-1	Nageon 1	Revdanda	Kothar Bhat 2 DTC	1
13	Alibag	Alibag-1	Chaul 1	Revdanda	Palav AB Switch	1
14	Alibag	Alibag-1	Chaul 1	Revdanda	Bagmala 1 DTC	1
15	Alibag	Alibag-1	Chaul 1	Revdanda	Mahalaxmi DTC to Bagmala 2 DTC	1
16	Alibag	Alibag-1	Chaul 1	Revdanda	Gondhal Gali DTC	1
17	Alibag	Alibag-1	Chaul 1	Revdanda	Piranchi Gali DTC	1
18	Alibag	Alibag-1	Chaul 1	Revdanda	Tulad Devi DTC	1
19	Alibag	Alibag-1	Chaul 1	Revdanda	Rameshwar 1 DTC	1
20	Alibag	Alibag-1	Chaul 1	Revdanda	Bandh DTC	1
21	Alibag	Alibag-1	Chaul 1	Revdanda	Rameshwar 2 DTC	1
22	Alibag	Alibag-1	Revdanda 2	Revdanda	Palav Fata DTC	1
23	Alibag	Alibag-1	Revdanda 2	Revdanda	Palav Gaon DTC	1
24	Alibag	Alibag-1	Revdanda 2	Revdanda	Palav Bhat DTC	1
25	Alibag	Alibag-1	Revdanda 2	Revdanda	Anglechiwadi 1 DTC	1
26	Alibag	Alibag-1	Revdanda 2	Revdanda	bazarpada 4 pole	1
27	Alibag	Alibag-1	Revdanda 2	Revdanda	Doryachiwadi DTC	1
28	Alibag	Alibag-1	Revdanda 2	Revdanda	Bazarpada DTC	1
29	Alibag	Alibag-1	Revdanda 2	Revdanda	Khanderao pada DTC	1
30	Alibag	Alibag-1	Revdanda 2	Revdanda	Hutatma Smarak DTC	1
31	Alibag	Alibag-1	Revdanda 1	Revdanda	Panzewadi DTC	1
32	Alibag	Alibag-1	Revdanda 1	Revdanda	tata Tower DTC	1
33	Alibag	Alibag-1	Revdanda 1	Revdanda	Bahiri Gali DTC	1
34	Alibag	Alibag-1	Revdanda 1	Revdanda	Vithoba Ali DTC	1
35	Alibag	Alibag-1	Revdanda 1	Revdanda	Khandoos Mandir DTC	1
36	Alibag	Alibag-1	Revdanda 1	Revdanda	Chunekoliwada AB	1
37	Alibag	Alibag-1	Revdanda 1	Revdanda	Koliwada DTC	1
38	Alibag	Alibag-1	Revdanda 1	Revdanda	Pager Mohalla DTC	1
39	Alibag	Alibag-1	Revdanda 1	Revdanda	Police station DTC	1
40	Alibag	Alibag-1	Revdanda 1	Revdanda	Bandar DTC	1
41	Alibag	Alibag-1	Revdanda 1	Revdanda	Agarkot DTC	1
42	Alibag	Alibag-1	Revdanda 1	Revdanda	Killa Link Line	1
43	Alibag	Alibag-1	Revdanda 1	Revdanda	Hareshwar DTC	1
44	Alibag	Alibag-1	Revdanda 1	Revdanda	Golastop area	1
45	Alibag	Alibag-1	Revdanda 1	Revdanda	Maruti Ali 2 DTC	1
46	Alibag	Alibag-1	Revdanda 1	Revdanda	Maruti ali 1 DTC	1
47	Alibag	Alibag-1	Revdanda 1	Revdanda	Angre Nagar 2 DTC	1
48	Alibag	Alibag-1	Revdanda 1	Revdanda	Center DTC	1
49	Alibag	Alibag-1	Revdanda 1	Revdanda	Narayan ali DTC	1
<b>Total</b>						<b>49</b>

22KV Ring Main Unit [SF6] SCADA Compactible [2 Isolator + 1 Breaker]

Activity No 22KV2+1RMU						
Sr no.	Div	Subdiv	Section	Feeder	Location	Distance
						Km
1	Alibag	Alibag 2	Thal	Thal	DTC 4138123	1
2	Alibag	Alibag 2	Thal	Thal	Kankeshwar	1
3	Alibag	Alibag 2	Thal	Thal	Charmala	1
4	Alibag	Alibag 2	Thal	Thal	Burudali	1
5	Alibag	Alibag 2	Thal	Thal	Boreshwar mandir	1
<b>Total</b>						<b>5</b>

22 kv Isolator with RSJ pole 152 X 152, 9 mtr DP with allied fabrications.

Activity No 6724 New						
Sr no.	Div	Subdiv	Section	Feeder	Location	Distance Km
1	Alibag	Alibag-2	Poynad1	22 kv Poynad	Pandwadevi	1
2	Alibag	Alibag-2	Poynad1	22 kv Poynad	Darbai Talav	1
3	Alibag	Alibag-2	Poynad1	22 kv Poynad	Parrallel Ab	1
4	Alibag	Alibag-2	Poynad1	22 kv Poynad	Navenagar tab	1
5	Alibag	Alibag-2	Saswane	Sasawane	Tulshiwadi	1
6	Alibag	Alibag-2	Saswane	Sasawane	Shildankar cut point	1
7	Alibag	Alibag-2	Saswane	Sasawane	Near RCF compound	1
8	Alibag	Alibag-2	Saswane	Sasawane	Navigation Fata	1
9	Alibag	Alibag-2	Saswane	Sasawane	Chondhi	1
10	Alibag	Alibag-2	Saswane	Sasawane	Awat Swt	1
11	Alibag	Alibag-3	Saswane	Sasawane	Darmila	1
12	Alibag	Alibag-4	Saswane	Sasawane	Navigation road	1
13	Alibag	Alibag-2	Kusumbale	22 KV Pezari Express	Thal	1
14	Alibag	Alibag-2	Kusumbale	22 KV Pezari Express	Bahirole	1
15	Alibag	Alibag-2	Kusumbale	22 KV Pezari Express	Jalpada	1
16	Alibag	Alibag-2	Kusumbale	22 KV Pezari Express	Kopar	1
17	Alibag	Alibag-2	Kusumbale	22 KV Pezari Express	Chari	1
18	Alibag	Alibag-2	Kusumbale	22 KV Kusumbale	Medhekhar	1
19	Alibag	Alibag-2	Kusumbale	22 KV Kusumbale	Kusumbale	1
20	Alibag	Alibag-2	Kusumbale	22 KV Kusumbale	Kurdus	1
21	Alibag	Alibag-2	Kusumbale	22 KV Kusumbale	Madhubag	1
22	Alibag	Alibag-2	Kusumbale	22 KV Kusumbale	Sutakwadi	1
23	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	WAGHODE TAP	1
24	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	DNYANWADI TAP	1
25	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	DALVI KHAROSHI TAP	1
26	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	TALASHET TAP	1
27	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	MHASOBA MANIDR TAP	1
28	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	BOPOLI TAP	1
29	Alibag	Alibag-2	Chondhi	CHARIPALI	OHANA TAPPING	1
30	Alibag	Alibag-2	Chondhi	CHARIPALI	CHANCHAL GUPTA	1
31	Alibag	Alibag-2	Chondhi	CHARIPALI	JAKHMATA MANDIR PARHUR	1
32	Alibag	Alibag-2	Chondhi	CHARIPALI	GUPTA TAP	1
33	Alibag	Alibag-2	Chondhi	CHARIPALI	PRAYAS HOSPITAL	1
34	Alibag	Alibag-2	Chondhi	CHARIPALI	JAMBHULPADA BUS STOP	1
35	Alibag	Alibag-2	Chondhi	RANJANPADA	SATIRJE SMASHAN BHUMI	1
36	Alibag	Alibag-2	Chondhi	RANJANPADA	MUNSHI TAPPING	1
37	Alibag	Alibag-2	Chondhi	RANJANPADA	4138234 NEELU KAPPOR TAP	1
38	Alibag	Alibag-2	Chondhi	REWAS	TROPICANA TAP	1
39	Alibag	Alibag-2	Chondhi	REWAS	DAVID SCHOOL CHONDHI POOL	1
40	Alibag	Alibag-2	Chondhi	REWAS	CHONDHI SMASHAN BHUMI	1
41	Alibag	Alibag-2	Chondhi	REWAS	SOGAON GROUND	1
42	Alibag	Alibag-2	Chondhi	REWAS	MAPGAON CORRY	1
43	Alibag	Alibag-2	Chondhi	REWAS	MUSHET ROAD MAPGAON	1
44	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	WAGHODE TAP	1

Activity No 6724 New						
Sr no.	Div	Subdiv	Section	Feeder	Location	Distance Km
45	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	DNYANWADI TAP	1
46	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	DALVI KHAROSHI TAP	1
47	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	TALASHET TAP	1
48	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	MHASOBA MANIDR TAP	1
49	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	BOPOLI TAP	1
50	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Shahabaj to pnp tap	1
51	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	kamalpada tap	1
52	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Poynad panobadevi	1
53	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	koghar anand patil	1
54	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Kolghar 4 pole	1
55	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Inamdar wadi tap	1
56	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Wagheshwar tap	1
57	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Pandwadevi	1
58	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Darbai talav	1
59	Alibag	Alibag-2	Poynad 1	22 kv Poynad	parellel Ab switch	1
60	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navenagar tap	1
61	Alibag	Alibag-2	Poynad 1	22 kv Poynad	tekadi	1
62	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Dandekar	1
63	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Hari-Om Soc.	1
64	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navin Bhom	1
65	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Sai-Vatika	1
66	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Bandhan naka	1
67	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navenagar	1
68	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Pezari Naka	1
69	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Jamna Nagar	1
70	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Rice Mill	1
71	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Desai Bag	1
72	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Suprabhat	1
73	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navin Subhashnagar	1
74	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navin Dehen	1
75	Alibag	Alibag-2	Rewas	22KV Mandwa	Navkhar Tapping	1
76	Alibag	Alibag-2	Rewas	22KV Mandwa	Mhatroli Tapping	1
77	Alibag	Alibag-2	Rewas	22KV Mandwa	Navkhar DTC 4138603	1
78	Alibag	Alibag-2	Rewas	22KV Mandwa	Seral DTC 4138603	1
79	Alibag	Alibag-2	Rewas	22KV Mandwa	Rewas DTC 4138607	1
80	Alibag	Alibag-2	Rewas	22KV Mandwa	Dattapada DTC 4138616	1
<b>Total</b>						<b>80</b>

Activity No 6724 New						
Sr no.	Div	Subdiv	Section	Feeder	Location	Distance Km
45	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	DNYANWADI TAP	1
46	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	DALVI KHAROSHI TAP	1
47	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	TALASHET TAP	1
48	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	MHASOBA MANIDR TAP	1
49	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	BOPOLI TAP	1
50	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Shehraj to pnp tap	1
51	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	kamalpada tap	1
52	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Poynad panbedevi	1
53	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	koghar anand petil	1
54	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Koghar 4 pole	1
55	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Inamdar wadi tap	1
56	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Wagheshwar tap	1
57	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Pandwadevi	1
58	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Darbei talav	1
59	Alibag	Alibag-2	Poynad 1	22 kv Poynad	parellel Ab switch	1
60	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navenagar tap	1
61	Alibag	Alibag-2	Poynad 1	22 kv Poynad	tekadi	1
62	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Dandekar	1
63	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Hari-Om Soc.	1
64	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navin Bhom	1
65	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Sai-Vatika	1
66	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Bandhan naka	1
67	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navenagar	1
68	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Pezari Naka	1
69	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Jamna Nagar	1
70	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Rice Mill	1
71	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Desai Bag	1
72	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Suprabhat	1
73	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navin Subhashnagar	1
74	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navin Dehen	1
75	Alibag	Alibag-2	Rewas	22KV Mandwa	Navkhar Tapping	1
76	Alibag	Alibag-2	Rewas	22KV Mandwa	Mhetrol Tapping	1
77	Alibag	Alibag-2	Rewas	22KV Mandwa	Navkhar DTC 4138603	1
78	Alibag	Alibag-2	Rewas	22KV Mandwa	Seral DTC 4138603	1
79	Alibag	Alibag-2	Rewas	22KV Mandwa	Rewas DTC 4130607	1
80	Alibag	Alibag-2	Rewas	22KV Mandwa	Dattapada DTC 4138616	1
<b>Total</b>						<b>80</b>

conversion of 1 Km 22 KV Overhead line by 3 C, 300 Sqmm XLPE under ground Cable

Activity No 5502						
Sr no.	Div	Subdiv	Section	Feeder	Location	Distance Km
1	Alibag	Pen	Wadkhal	Wadkhal Pen Express	Near goa gate to Jambhale House	5
2	Alibag	Pen	Urban1	Mhada Feeder	From Pen sw/sn to Node 15 of feeder	5.2
3	Alibag	Pen	Urban1	Chinchpada Feeder	From Pen sw/sn to HT consumer 1	3.7
4	Alibag	Pen	Jite	Jita Pen Express	From Jita Sub/sn to Govirle	5.63
5	Alibag	Pen	Jite	Jita Pen Express	From Pen sw/sn to Tarankhop	4.2
<b>Total</b>						<b>23.73</b>

Conversion of 22 KV O/H Line by 3C, 22KV 95Sqmm XLPE U/G HT Cable

Activity No 5508						
Sr no.	Div	Subdiv	Section	Feeder	Location	Distance Km
1	Alibag	Alibag-1	Chaul-1	Revdanda	From through line to Bagmala DTC 4137173	0.4
2	Alibag	Alibag-1	Chaul-1	Revdanda	Bagmala DTC 4137173 to Bagmala-2 DTC 4137132	0.8
3	Alibag	Alibag-1	Chaul-1	Revdanda	From through line to Gondhal Galli DTC 4137172	0.6
4	Alibag	Alibag-1	Chaul-1	Revdanda	From through lime to Piranchi Galli DTC 4137175	0.3
5	Alibag	Alibag-1	Chaul-1	Revdanda	From through lime to Tulad Devi DTC 4137162	0.3
6	Alibag	Alibag-1	Chaul-1	Revdanda	From through lime to Band DTC 41371656	0.28
7	Alibag	Alibag-1	Chaul-1	Revdanda	From through lime to Piranchi Galli DTC 4137175	1
8	Alibag	Alibag-1	Revdanda-2	Revdanda	Palav A/B switch to Palav fata DTC 4137267	0.042
11	Alibag	Alibag-1	Revdanda-2	Revdanda	From through line to Anglechiwadi DTC 4137289	0.26
					<b>Total</b>	<b>5.88</b>

Augumentation of Pole mounted Distribution Transformer Sub-station 22/0.433 kv, 100 KVA to 22/0.433 kv, 200 KVA with MCCB

Activity No 1102						
Sr no.	Div	Subdiv	Section	Feeder	Location	Units No.
29	Alibag	Pen	Pen Rural		Dhawta Gaon (4142044)	1
30	Alibag	Pen	Urban 1		Kavndal Talaw-II (4142072)	1
31	Alibag	Pen			Mehatar Colony (4142109)	1
32	Alibag	Pen			Datta Guru Society (4142088)	1
33	Alibag	Pen			Sai Mandir (4142049)	1
34	Alibag	Pen			Navnath Nagar (4142095)	1
35	Alibag	Pen			Ganesh Nagar (4142090)	1
36	Alibag	Pen			Godawari Nagar (4142042)	1
					<b>Total</b>	<b>8</b>

22KV Ring Main Unit (SF6) SCADA Compactible (2 Isolator + 2 Breaker)

Activity No 22KV2+2RMU						
Sr no.	Div	Subdiv	Section	Feeder	Location	Qty No.
1	Alibag	Alibag-1	Nageon 2	Revdanda	Akshi Bridge David DTC	1
2	Alibag	Alibag-1	Nageon 2	Revdanda	Stambh DTC	1
3	Alibag	Alibag-1	Nageon 1	Revdanda	Kopar DTC to Vaidya Ali , Pradhan Ali	1
4	Alibag	Alibag-1	Nageon 1	Revdanda	Tarkarwadi DTC	1
5	Alibag	Alibag-1	Nageon 1	Revdanda	Main Beach Nageon	1
6	Alibag	Alibag-1	Nageon 1	Revdanda	Samira DTC to Tarkar Wadi DTC	1
7	Alibag	Alibag-1	Nageon 1	Revdanda	Patil Galii DTC	1
8	Alibag	Alibag-1	Nageon 1	Revdanda	Lambe DTC Bandar Road	1
9	Alibag	Alibag-1	Nageon 1	Revdanda	Chitamani 2 DTC	1
10	Alibag	Alibag-1	Nageon 1	Revdanda	A to Z kirana DTC	1
11	Alibag	Alibag-1	Nageon 1	Revdanda	Badami Nageon	1
12	Alibag	Alibag-1	Nageon 1	Revdanda	Kothar Bhat 2 DTC	1
13	Alibag	Alibag-1	Chaul 1	Revdanda	Palav AB Switch	1
14	Alibag	Alibag-1	Chaul 1	Revdanda	Bagmale 1 DTC	1
15	Alibag	Alibag-1	Chaul 1	Revdanda	Mahalaxmi DTC to Bagmale 2 DTC	1
16	Alibag	Alibag-1	Chaul 1	Revdanda	Gondhal Galii DTC	1
17	Alibag	Alibag-1	Chaul 1	Revdanda	Piranchi Galii DTC	1
18	Alibag	Alibag-1	Chaul 1	Revdanda	Tuled Devi DTC	1
19	Alibag	Alibag-1	Chaul 1	Revdanda	Rameshwar 1 DTC	1
20	Alibag	Alibag-1	Chaul 1	Revdanda	Sandh DTC	1
21	Alibag	Alibag-1	Chaul 1	Revdanda	Rameshwar 2 DTC	1
22	Alibag	Alibag-1	Revdanda 2	Revdanda	Palav Fata DTC	1
23	Alibag	Alibag-1	Revdanda 2	Revdanda	Palav Gaon DTC	1
24	Alibag	Alibag-1	Revdanda 2	Revdanda	Palav Bhat DTC	1
25	Alibag	Alibag-1	Revdanda 2	Revdanda	Anglechiwadi 1 DTC	1
26	Alibag	Alibag-1	Revdanda 2	Revdanda	Bazarpada 4 pole	1
27	Alibag	Alibag-1	Revdanda 2	Revdanda	Doryachiwadi DTC	1
28	Alibag	Alibag-1	Revdanda 2	Revdanda	Bazarpada DTC	1
29	Alibag	Alibag-1	Revdanda 2	Revdanda	Khanderao pada DTC	1
30	Alibag	Alibag-1	Revdanda 2	Revdanda	Hutatma Smarak DTC	1
31	Alibag	Alibag-1	Revdanda 1	Revdanda	Pansewadi DTC	1
32	Alibag	Alibag-1	Revdanda 1	Revdanda	tata Tower DTC	1
33	Alibag	Alibag-1	Revdanda 1	Revdanda	Bahiri Galii DTC	1
34	Alibag	Alibag-1	Revdanda 1	Revdanda	Vithoba Ali DTC	1
35	Alibag	Alibag-1	Revdanda 1	Revdanda	Khandoba Mendir DTC	1
36	Alibag	Alibag-1	Revdanda 1	Revdanda	Chunekoivada AB	1
37	Alibag	Alibag-1	Revdanda 1	Revdanda	Koliwada DTC	1
38	Alibag	Alibag-1	Revdanda 1	Revdanda	Pagar Mohalla DTC	1
39	Alibag	Alibag-1	Revdanda 1	Revdanda	Police station DTC	1
40	Alibag	Alibag-1	Revdanda 1	Revdanda	Bandar DTC	1
41	Alibag	Alibag-1	Revdanda 1	Revdanda	Agarkot DTC	1
42	Alibag	Alibag-1	Revdanda 1	Revdanda	Killa Link Line	1
43	Alibag	Alibag-1	Revdanda 1	Revdanda	Hareshwar DTC	1
44	Alibag	Alibag-1	Revdanda 1	Revdanda	Golastop area	1
45	Alibag	Alibag-1	Revdanda 1	Revdanda	Maruti Ali 2 DTC	1

46	Alibag	Alibag-1	Revdanda 1	Revdanda	Maruti ali 1 DTC	1
47	Alibag	Alibag-1	Revdanda 1	Revdanda	Angre Nagar 2 DTC	1
48	Alibag	Alibag-1	Revdanda 1	Revdanda	Center DTC	1
49	Alibag	Alibag-1	Revdanda 1	Revdanda	Narayan ali DTC	1
50	Alibag	Alibag-2	Thal	Thal	ADM Gate	1
51	Alibag	Alibag-2	Thal	Thal	Vashet Naka	1
52	Alibag	Alibag-2	Thal	Thal	Hotel Darshan	1
53	Alibag	Alibag-2	Thal	Thal	Mani fata	1
54	Alibag	Alibag-2	Thal	Thal	Rajmala	1
55	Alibag	Alibag-2	Thal	Thal	Bhal	1
56	Alibag	Alibag-2	Thal	Thal	Bhal Naka	1
57	Alibag	Alibag-2	Sasawane	Sasawane	HT Mansion House	1
58	Alibag	Alibag-2	Sasawane	Sasawane	Singhanis	1
59	Alibag	Alibag-2	Sasawane	Sasawane	Mansion House	1
60	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138424	2
61	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138451	1
62	Alibag	Alibag-2	Sasawane	Sasawane	DTC4138405	2
63	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138434	1
64	Alibag	Alibag-2	Sasawane	Sasawane	HT Hansa Tirotkar	1
65	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138411	1
66	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138465	1
67	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138410	1
68	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138426	1
69	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138435	1
70	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138444	1
71	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138458	2
72	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138424	1
73	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138421	1
74	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138403	2
75	Alibag	Alibag-2	Kuzumbale	Pezari	Vaishet MIDC Pipeline	2
76	Alibag	Alibag-2	Kihim	Rajanpada	Chondhi AB Switch	1
77	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138308	1
78	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138343	1
79	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138309	1
80	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138323	1
81	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138379	1
82	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138331	1
83	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138314	1
84	Alibag	Alibag-3	Kihim	Rajanpada	DTC 4138318	1
85	Alibag	Alibag-4	Kihim	Rajanpada	DTC 4138346	1
86	Alibag	Alibag-5	Kihim	Rajanpada	DTC 4138384	1
87	Alibag	Alibag-6	Kihim	Rajanpada	DTC 4138328	1
88	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138330	1
89	Alibag	Alibag-2	Kihim	Rajanpada	Rajanpada AB	1
90	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138320	1
91	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138376	1
92	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138432	1
93	Alibag	Alibag-2	Chondhi	Rewas	4138220 to 4138233	4
<b>Total</b>						<b>101</b>

22KV Ring Main Unit [SF6] SCADA Compactible [2 Isolator + 1 Breaker]

Activity No 22KV2+1RMU						
Sr no.	Div	Subdiv	Section	Feeder	Location	Distance
						Km
1	Alibag	Pen	Hamrapur		Hamrapur Fata	1
2	Alibag	Pen			Manthan Hotel	1
3	Alibag	Pen	Wahi		Washi Naka/ R P Nagar	2
4	Alibag	Pen	Urban 1		Madha Colony	2
5	Alibag	Pen			Vasanti Steel	1
6	Alibag	Pen			Prabhu Ali	2
7	Alibag	Pen			Kumbhar Ali/Tare Ali	2
8	Alibag	Pen	Urban 1		Bus-stand	2
9	Alibag	Pen			Centuriyan Park/Tambadi Road	2
10	Alibag	Pen			Shankar Nagar/Borgaon Road	2
11	Alibag	Pen			Deo Nagari	2
12	Alibag	Pen			Khopoli Road Seassom Hall Corner	1
13	Alibag	Pen			Khopoli Road	1
14	Alibag	Pen			Private High School	1
15	Alibag	Pen			Chinchpada & Wadgaon	2
<b>Total</b>						<b>24</b>



Augumentation of Pole mounted Distribution Transformer Sub-station 22/0.433 kv, 100 KVA to 22/0.433 kv,  
200 KVA with MCCB

Activity No 1102						
Sr no.	Div	Subdiv	Section	Feeder	Location	Units No.
17	Alibag	Alibag 2	Poynad -1	Poynad	Chavarkar Ali (4138922)	1
18	Alibag	Alibag 2	Poynad -1	Poynad	Policestation(4138910)	1
19	Alibag	Alibag 2	Poynad -1	Poynad	Bandhan (4138908)	1
20	Alibag	Alibag 2	Poynad -2	Poynad	Kamlpada(4138956)	1
21	Alibag	Alibag 2	Poynad-2	Poynad	Ghaswad (4138986)	1
22	Alibag	Alibag-2	Chondhi	Rewas	1382018	1
23	Alibag	Alibag-2	Chondhi	Rewas	4138233	1
24	Alibag	Alibag-2	Chondhi	Rewas	4138215	1
25	Alibag	Alibag-2	Chondhi	Charipali	4138226	1
26	Alibag	Alibag-2	Chondhi	Charipali	4138224	1
27	Alibag	Alibag-2	Chondhi	Charipali	4138236	1
28	Alibag	Alibag-2	Chondhi	Charipali	4138223	1
					<b>Total</b>	<b>12</b>

Activity No 5504						
Sr no.	Div	Subdiv	Section	Feeder	Location	Distance Km
48	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138323	0.5
49	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138379	0.12
50	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138331	0.12
51	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138312	0.1
52	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138329	0.1
53	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138313	0.1
54	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138380	0.15
55	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138314	0.1
56	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138318	0.15
57	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138328	0.15
58	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138330	0.2
59	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138320	0.1
60	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138332	0.1
61	Alibag	Alibag-2	Kihim	Rajanpada	from through HT to DTC 4138376	0.1
62	Alibag	Alibag-2	Chondhi	Rewas	Chondhi Pull	0.32
63	Alibag	Alibag-2	Chondhi	Rewas	Katalpada	0.25

22KV Ring Main Unit (SF6) SCADA Compactible (2 Isolator + 2 Breaker)

Activity No 22KV2+2RMU						
Sr no.	Div	Subdiv	Section	Feeder	Location	Qty No.
1	Alibag	Alibag-2	Thal	Thal	ADM Gate	1
2	Alibag	Alibag-2	Thal	Thal	Vashet Naka	1
3	Alibag	Alibag-2	Thal	Thal	Hotel Darshan	1
4	Alibag	Alibag-2	Thal	Thal	Mani fete	1
5	Alibag	Alibag-2	Thal	Thal	Rajmala	1
6	Alibag	Alibag-2	Thal	Thal	Bhal	1
7	Alibag	Alibag-2	Thal	Thal	Bhal Naka	1
8	Alibag	Alibag-2	Sasawane	Sasawane	HT Mansion House	1
9	Alibag	Alibag-2	Sasawane	Sasawane	Singharis	1
10	Alibag	Alibag-2	Sasawane	Sasawane	Mansion House	1
11	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138424	2
12	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138451	1
13	Alibag	Alibag-2	Sasawane	Sasawane	DTC4138405	2
14	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138454	1
15	Alibag	Alibag-2	Sasawane	Sasawane	HT Hansa Tirodkar	1
16	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138411	1
17	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138465	1
18	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138410	1
19	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138426	1
20	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138435	1
21	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138444	1
22	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138458	2
23	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138424	1
24	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138421	1
25	Alibag	Alibag-2	Sasawane	Sasawane	DTC 4138403	2
26	Alibag	Alibag-2	Kusumbele	Pezari	Vaishet MIDC Pipeline	2
27	Alibag	Alibag-2	Kihim	Rajanpada	Chondhi AB Switch	1
28	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138308	1
29	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138343	1
30	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138309	1
31	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138323	1
32	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138379	1
33	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138331	1
34	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138314	1
35	Alibag	Alibag-3	Kihim	Rajanpada	DTC 4138318	1
36	Alibag	Alibag-4	Kihim	Rajanpada	DTC 4138346	1
37	Alibag	Alibag-5	Kihim	Rajanpada	DTC 4138384	1
38	Alibag	Alibag-6	Kihim	Rajanpada	DTC 4138328	1
39	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138330	1
40	Alibag	Alibag-2	Kihim	Rajanpada	Rajanpada AB	1
41	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138320	1
42	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138376	1
43	Alibag	Alibag-2	Kihim	Rajanpada	DTC 4138432	1
44	Alibag	Alibag-2	Chondhi	Rewas	4138220 to 4138233	4
<b>Total</b>						<b>52</b>

conversion of 1 Km 22 KV Overhead line by 3 C, 300 Sqmm XLPE under ground Cable

Activity No 5502						
Sr no.	Div	Subdiv	Section	Feeder	Location	Distance Km
1	Alibag	Alibag-2	Thal	Pezari Express	Waishet to Tudal MIDC pipeline road	3
2	Alibag	Alibag-2	Thal	Thal	Thal S/Sn to Kankeshwar DTC	10
3	Alibag	Alibag-2	Thal	Thal	Agar DTC to Charmala DTC	1
4	Alibag	Alibag-2	Thal	Thal	Peth DTC to Datar DTC	1.5
5	Alibag	Alibag-2	Thal	Thal	Navgaon to Bandar DTC	1.5
6	Alibag	Alibag-2	Thal	Thal	Navgaon School to Patilwadi DTC	1
7	Alibag	Alibag-2	Saswane	Saswane	Singhaniya DTC to Hansa DTC	15
8	Alibag	Alibag-2	Kihim	Ranjanpada	Chondhi AB S/w to 4138432 DTC	10
9	Alibag	Alibag-2	Kusumbale	22 Kv Pezari Express	Thal RCF TO TUDAL PUMP	11.57
<b>Total</b>						<b>54.57</b>

22 kv Isolator with RSJ pole 152 X 152, 9 mtr DP with allied fabrications.

Activity No 6724 New					
Sr no.	Div	Subdiv	Section	Location	
1	Alibag	Alibag-2	Poynad1	22 kv Poynad	Pandwadevi
2	Alibag	Alibag-2	Poynad1	22 kv Poynad	Darbai Talav
3	Alibag	Alibag-2	Poynad1	22 kv Poynad	Parrallel Ab
4	Alibag	Alibag-2	Poynad1	22 kv Poynad	Navenagar tab
5	Alibag	Alibag-2	Saswane	Saswane	Tulshiwadi
6	Alibag	Alibag-2	Saswane	Saswane	Shildankar cut point
7	Alibag	Alibag-2	Saswane	Saswane	Near RCF compound
8	Alibag	Alibag-2	Saswane	Saswane	Navgaoon Fata
9	Alibag	Alibag-2	Saswane	Saswane	Chondhi
10	Alibag	Alibag-2	Saswane	Saswane	Awass Swt
11	Alibag	Alibag-3	Saswane	Saswane	Darmila
12	Alibag	Alibag-4	Saswane	Saswane	Navgaoon road
13	Alibag	Alibag-2	Kusumbale	22 KV Pezari Express	Thal
14	Alibag	Alibag-2	Kusumbale	22 KV Pezari Express	Bahirole
15	Alibag	Alibag-2	Kusumbale	22 KV Pezari Express	Jalpada
16	Alibag	Alibag-2	Kusumbale	22 KV Pezari Express	Kopar
17	Alibag	Alibag-2	Kusumbale	22 KV Pezari Express	Chari
18	Alibag	Alibag-2	Kusumbale	22 KV Kusumbale	Medhekar
19	Alibag	Alibag-2	Kusumbale	22 KV Kusumbale	Kusumbale
20	Alibag	Alibag-2	Kusumbale	22 KV Kusumbale	Kurdus
21	Alibag	Alibag-2	Kusumbale	22 KV Kusumbale	Madhubag
22	Alibag	Alibag-2	Kusumbale	22 KV Kusumbale	Sutakwadi
23	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	WAGHODE TAP
24	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	DNYANWADI TAP
25	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	DALVI KHAROSHI TAP
26	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	TALASHET TAP
27	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	MHASOBA MANIDR TAP
28	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	BOPOLI TAP
29	Alibag	Alibag-2	Chondhi	CHARIPALI	OHANA TAPPING
30	Alibag	Alibag-2	Chondhi	CHARIPALI	CHANCHAL GUPTA
31	Alibag	Alibag-2	Chondhi	CHARIPALI	JAKHMATA MANDIR PARHUR
32	Alibag	Alibag-2	Chondhi	CHARIPALI	GUPTA TAP
33	Alibag	Alibag-2	Chondhi	CHARIPALI	PRAYAS HOSPITAL
34	Alibag	Alibag-2	Chondhi	CHARIPALI	JAMBHULPADA BUS STOP
35	Alibag	Alibag-2	Chondhi	RANJANPADA	SATIRJE SMASHAN BHUMI
36	Alibag	Alibag-2	Chondhi	RANJANPADA	MUNSHI TAPPING
37	Alibag	Alibag-2	Chondhi	RANJANPADA	4138234 NEELU KAPPOR TAP
38	Alibag	Alibag-2	Chondhi	REWAS	TROPICANA TAP
39	Alibag	Alibag-2	Chondhi	REWAS	DAVID SCHOOL CHONDHI POOL
40	Alibag	Alibag-2	Chondhi	REWAS	CHONDHI SMASHAN BHUMI
41	Alibag	Alibag-2	Chondhi	REWAS	SOGAON GROUND
42	Alibag	Alibag-2	Chondhi	REWAS	MAPGAON CORRY

43	Alibag	Alibag-2	Chondhi	REWAS	MUSHET ROAD MAPGAON
44	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	WAGHODE TAP
45	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	DNYANWADI TAP
46	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	DALVI KHAROSHI TAP
47	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	TALASHET TAP
48	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	MHASOBA MANIDR TAP
49	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	BOPOLI TAP
50	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Sheheoj to pnp tap
51	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	kamalpada tap
52	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Poynad panbadevi
53	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	koghar anand patil
54	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Koghar 4 pole
55	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Inamdar wadi tap
56	Alibag	Alibag-2	POYNAD 2	22 kv Poynad	Wagheshwar tap
57	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Pandwadevi
58	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Darbai talav
59	Alibag	Alibag-2	Poynad 1	22 kv Poynad	parallel Ab switch
60	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navenagar tap
61	Alibag	Alibag-2	Poynad 1	22 kv Poynad	tekadi
62	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Dandekar
63	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Hari-Om Soc.
64	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navin Bhom
65	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Sai-Vatika
66	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Bandhan naka
67	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navenagar
68	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Pezari Naka
69	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Jamna Nagar
70	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Rice Mill
71	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Desai Bag
72	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Suprabhat
73	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navin Subhashnagar
74	Alibag	Alibag-2	Poynad 1	22 kv Poynad	Navin Dehen
75	Alibag	Alibag-2	Rewas	22KV Mandwa	Navkhar Tapping
76	Alibag	Alibag-2	Rewas	22KV Mandwa	Mhetrol Tapping
77	Alibag	Alibag-2	Rewas	22KV Mandwa	Navkhar DTC 4138605
78	Alibag	Alibag-2	Rewas	22KV Mandwa	Saral DTC 4138603
79	Alibag	Alibag-2	Rewas	22KV Mandwa	Rewas DTC 4130607
80	Alibag	Alibag-2	Rewas	22KV Mandwa	Dettpada DTC 4138616

Locations for Activity No. 5502 (conversion of 22KV O.H. line by 3 C, 300 Sqmm XLPE U.G. Cable)

Sr No	Feeder Name	Locations	Quantity (in KM)	Name Of Sub Div.	Name Of Section	City/Village
1	2	3	4	9	10	
1	Kegaon	Kotnaka Substation to Mhatre hous	2	Uran	Karanja	kegaon
2	Kegaon	Mahesh Mhatre to Gospada	1	Uran	Karanja	kegaon
3	Kegaon	Charfata to Pirwadi	2	Uran	Karanja	nagaon
4	ONGC 2	Akshar RMU To Uran Bus depo	2	Uran	Karanja	chanje
5	ONGC 2	Mulekhand to Chanje fata	1	Uran	Karanja	chanje
6	Uran Inc	GTPS to Uran Switching	8.2	Uran	Uran City	Kala Dhonda
7	Court	Kotnaka s/s to Mohalla dtc	0.6	Uran	Uran City	uran
8	Court	Mohalla dtc to uran court dtc	0.65	Uran	Uran City	uran
9	Court	Govt hospital to sai prena DTC	0.6	Uran	Uran City	uran
10	Court	Sai prena DTC to shekhar mhtre dtc	0.6	Uran	Uran City	uran
11	Court	Shekhar mhtre dtc to pansare aali D	0.45	Uran	Uran City	uran
12	Balai	Machhi market 1 & 2 dtc to church	0.35	Uran	Uran City	uran
13	Balai	MSEB colony dtc to Khudhus	0.65	Uran	Uran City	uran
14	Balai	HP gas dtc to Lalmaidan 1 & 2 DTC	0.5	Uran	Uran City	uran
15	Balai	Lalmaidan 1 & 2 DTC to Balai DTC	0.5	Uran	Uran City	uran
16	Balai	Balai DTC to kamgarvasahat DTC	0.4	Uran	Uran City	uran
17	Balai	Lalmaidan 1 & 2 DTC to Anand naga	0.45	Uran	Uran City	uran
18	Balai	Anand nagar DTC to liberty park	0.4	Uran	Uran City	uran
19	Balai	kamgarvasahat DTC to Kamtha 1 &	0.45	Uran	Uran City	uran
20	Balai	Kamtha 1 & 2 DTC to Police line DTC	0.45	Uran	Uran City	uran
21	Mora	Kotnaka s/s to dhuliwada DTC	0.55	Uran	Uran City	mora
22	Mora	dhuliwada DTC to classic park	0.35	Uran	Uran City	uran
23	Mora	classic park to datta Mandir + 2	0.35	Uran	Uran City	uran
24	Mora	datta Mandir + 2 DTC TO sushilkur	0.1	Uran	Uran City	mora
25	ONGC 1	Sec-12 to Bhendkhal	2.2	Uran	Koprol	Bhendkhal
26	Dronagir	GTPS- CIDCO Office	3	Uran	Jaskhar	Bokadvira
27	Bokadvir	Sec 47- Sec 55	1.5	Uran	Jaskhar	dronagiri
28	Bokadvir	Akshar- New Sheva	2	Uran	Jaskhar	new sheva
29	Chirner	Kotnaka- CIDCO Office	6	Uran	Jasai	Bokadvira
30	Chirner	CIDCO Office to Township	3.5	Uran	Jasai	Funde
31	Chirner	Karal Bridge to SEZ	2.5	Uran	Jasai	Karal
		Total Qty	45.3			

Locations for Activity No. 5504 (conversion of 22KV O.H. line by 3 C, 95 Sqmm XLPE U.G. Cable)

Sr No	Feeder Name	Locations	Quantity (in	Name Of Sub Div.	Name Of Section	Village/City
1	2	3	4	9	10	11
1	Chirner	Dighoda G.O.D.-Vindhane Rice Mill	1	Uran	Jasai	Vindhane
2	Court	Mohalla 1 & 2	0.085	Uran	Uran City	uran
3	Court	padma manohar	0.025	Uran	Uran City	uran
4	Court	Sai prena	0.025	Uran	Uran City	uran
5	Court	shekhar mhatre	0.025	Uran	Uran City	uran
6	Court	patil aali	0.025	Uran	Uran City	uran
7	Balai	Machhi market 1 & 2	0.055	Uran	Uran City	uran
8	Balai	Minakshi & bakshi	0.055	Uran	Uran City	uran
9	Balai	Balai	0.025	Uran	Uran City	uran
10	Balai	Lalmaidan 1 & 2	0.085	Uran	Uran City	uran
11	Balai	Anand nagar	0.025	Uran	Uran City	uran
12	Balai	Kamtha 1 & 2	0.085	Uran	Uran City	uran
13	Balai	Bhairavnath	0.025	Uran	Uran City	uran
14	Balai	Kamgar vasahat and shriraj nagar	0.065	Uran	Uran City	uran
15	Balai	Liberty park 1 & 2	0.065	Uran	Uran City	uran
16	Mora	dhuliwada	0.025	Uran	Uran City	mora
17	Mora	classic park	0.025	Uran	Uran City	uran
18	Mora	datta Mandir & borinaka	0.085	Uran	Uran City	uran
19	ONGC 2	S T DEPO	0.08	Uran	Karanja	chanje
20	ONGC 2	MULEKHAND PADA	0.035	Uran	Karanja	chanje
21	ONGC 2	DAUR NAGAR	0.035	Uran	Karanja	chanje
22	ONGC 2	KARANJA MARATHI SCHOOL 1	0.035	Uran	Karanja	karanja
23	ONGC 2	KARANJA NAVAPADA I	0.095	Uran	Karanja	karanja
24	ONGC 2	KARANJA BAPDEVPADA	0.085	Uran	Karanja	karanja
25	ONGC 2	KARANJA KASAVALEPADA 1	0.025	Uran	Karanja	karanja
26	ONGC 2	CHANJE	0.025	Uran	Karanja	chanje
27	ONGC 2	MULEKHAND PADA	0.025	Uran	Karanja	chanje
28	ONGC 2	DOURNAGAR KATKARI WADI	0.025	Uran	Karanja	chanje
29	ONGC 2	ITI DAUR NAGAR	0.085	Uran	Karanja	chanje
30	ONGC 2	DAURNAGAR Z.P.SCHOOL	0.085	Uran	Karanja	chanje
31	ONGC 2	SHRIRAM SAMARTH	0.015	Uran	Karanja	chanje
32	ONGC 2	SHREE YOG	0.015	Uran	Karanja	chanje
33	ONGC 2	SHREE GANESH DEVELOPER	0.015	Uran	Karanja	chanje
34	ONGC 2	SHAKKAR PEER DARGA	0.085	Uran	Karanja	chanje
35	ONGC 2	SUDHIR GHARAT	0.025	Uran	Karanja	chanje
36	ONGC 1	Pale-Aware	2.5	Uran	Koprol	Aware
		Total Qty	5.095			

**Locations for Activity No. New11 (Erection of new RMU (SF6 Type) with 2 Isolator + 2 Breaker 22 KV)**

Sr No	Feeder Name	Locations	Quantity (in Nos)	Name Of Sub Div.	Name Of Section
1	Uran I/c	Sheva Bridge	1	Uran	Uran City
2	Uran I/c	Uran Railway Stn	1	Uran	Uran City
3	Court	Mohalla 1 & 2	1	Uran	Uran City
4	Balai	Kotnaka	1	Uran	Uran City
5	Balai	Machhi market 1 & 2	1	Uran	Uran City
6	Balai	Minakshi & bakshi	1	Uran	Uran City
7	Balai	Balai	1	Uran	Uran City
8	Balai	Lalmaidan 1 & 2	1	Uran	Uran City
9	Balai	Kamtha 1 & 2	1	Uran	Uran City
10	Balai	Bhairavnath	1	Uran	Uran City
11	Balai	Kamgar vasahat and shrira	1	Uran	Uran City
12	Balai	Liberty park 1 & 2	1	Uran	Uran City
13	Mora	dhuliwada	1	Uran	Uran City
14	ONGC 2	S T DEPO	1	Uran	Karanja
15	ONGC 2	SHAKKAR PEER DARGA	1	Uran	Karanja
16	Kegaon	GRINDWELL ONGC	1	Uran	Karanja
17	Kegaon	DENA BANK	1	Uran	Karanja
18	Chirner	CIDCO Bus Stop	1	Uran	Jasai
19	Chirner	Karal Bridge	1	Uran	Jasai
		<b>Total Qty</b>	<b>19</b>		
			<b>19</b>		

**Locations for Activity No. New12 (Erection of new RMU (SF6 Type) with 2 Isolator + 1 Breaker 22 KV)**

Sr No	Feeder Name	Locations	Quantity (in Nos)	Name Of Sub Div.	Name Of Section
1	Chirner	Gavhan Sub Stn	1	Uran	Jasai
2	Chirner	Kagle Ware House	1	Uran	Jasai
3	Chirner	Veshvi Mangal Karyalaya	1	Uran	Jasai
4	ONGC 1	CIDCO Sec12	1	Uran	Koproli
5	Bokadvira	Sheva bridge	1	Uran	Jaskhar
6	Bokadvira	Opp. Akshar Evorra	1	Uran	Jaskhar
7	Bokadvira	BPCL Gate No. 6	1	Uran	Jaskhar
8	Bokadvira	Sec. 52 ESS	1	Uran	Jaskhar
9	Bokadvira	Sec. 55 ESS	1	Uran	Jaskhar
10	Court	Sai prena	1	Uran	Uran City
11	Court	shekhar mhatre	1	Uran	Uran City
12	Court	patil aali	1	Uran	Uran City
13	Balai	Anandi	1	Uran	Uran City
14	Balai	MSEB colony	1	Uran	Uran City
15	Balai	Anand nagar	1	Uran	Uran City
16	ONGC 2	MULEKHAND PADA	1	Uran	Karanja
17	ONGC 2	TELIPADA I I	1	Uran	Karanja
18	ONGC 2	DAUR NAGAR	1	Uran	Karanja
19	Kegaon	GRINDWELL ONGC	1	Uran	Karanja
20	Kegaon	BAZARPUR	1	Uran	Karanja
21	Kegaon	VINAYAK	1	Uran	Karanja
22	Kegaon	Vanavati	1	Uran	Karanja
		<b>Total Qty</b>	<b>22</b>		

Locations for Activity No. 5510 (conversion of LT O.H. line by 3.5 C, 300 Sqmm XLPE U.G. Cable)

39	4126303	KARANJA ROAD AMBE NAGAR	0.1	Uran	Karanja
40	4126022	AMBIKA WADI	0.1	Uran	Karanja
41	4126045	GRINDWELL ONGC	0.1	Uran	Karanja
42	4126046	NAGAON AMBIKAWADI	0.1	Uran	Karanja
43	4126054	THAKURNAGAR	0.1	Uran	Karanja
44	4126164	Star Complex	0.1	Uran	Karanja
45	4126182	OM SAI RAM	0.1	Uran	Karanja
46	4126241	MANOJ GALAXY	0.15	Uran	Karanja
47	4126047	ANNA	0.1	Uran	Karanja
48	4126048	NAVE POPUD	0.1	Uran	Karanja
49	4126049	MANDAL ALI	0.1	Uran	Karanja
50	4126050	DENA BANK	0.1	Uran	Karanja
51	4126052	BAZARPUR	0.15	Uran	Karanja
52	4126053	VINAYAK	0.1	Uran	Karanja
53	4126165	Dwarkanagar	0.1	Uran	Karanja
54	4126166	Classic Park	0.1	Uran	Karanja
55	4126182	OM SAI RAM	0.1	Uran	Karanja
56	4126183	PHULE GALLI	0.1	Uran	Karanja
57	4126184	Warik Aali	0.1	Uran	Karanja
58	4126185	VINAYAK WATER TANK	0.1	Uran	Karanja
59	4126193	GANRAJ APPARTMENT	0.1	Uran	Karanja
		Total Qty	16.3		

Sr No	DTC Name	Locations	Quantity (in	Name Of Sub Div.	Name Of Section
1	2	3	4	9	10
1	4126012	Mohalla ,police station,market	1	Uran	Uran City
2	4126018	Wani aali	0.25	Uran	Uran City
3	4126259	deulwadi	0.25	Uran	Uran City
4	4126025	kotgaon	0.8	Uran	Uran City
5	4126024	Anandi hotel	0.8	Uran	Uran City
6	4126221	MSEB colony	0.8	Uran	Uran City
7	4126011 &4126054	machhi market 1& 2	1.2	Uran	Uran City
8	4126010	Minakshi	0.15	Uran	Uran City
9	4126006	balai	1.2	Uran	Uran City
10	4126009	Minakshi & bakshi	0.2	Uran	Uran City
11	4126003	Anand nagar	0.25	Uran	Uran City
12	4126199	Khudhus	0.25	Uran	Uran City
13	4126016 &4126017	Kamtha 1 & 2	0.25	Uran	Uran City
14	4126068 & 4126007	Kamgar vasahat and shriraj nagar	0.2	Uran	Uran City
15	4126021	shekhar mhatre	0.8	Uran	Uran City
16	4126218	Pansare aali	0.8	Uran	Uran City
17	4126034 & 4126146	datta Mandir & borinaka	1.5	Uran	Uran City
18	4126612	Marathi school	0.5	Uran	Uran City
19	4126167 & 4126029	mohan store 1 & 2	0.5	Uran	Uran City
20	4126031 & 4126198	Dhakka & Uran shipyard	0.5	Uran	Uran City
21	4126042	DAUR NAGAR	0.05	Uran	Karanja
22	4126035	KARANJA MARATHI SCHOOL 1	0.15	Uran	Karanja
23	4126036	KARANJA NAVAPADA I	0.15	Uran	Karanja
24	4126041	MULEKHAND PADA	0.1	Uran	Karanja
25	4126305	DOURNAGAR KATKARI WADI	0.1	Uran	Karanja
26	4126304	ITI DAUR NAGAR	0.1	Uran	Karanja
27	4126044	MULEKHAND PADA	0.1	Uran	Karanja
28	4126180	MULEKHAND FATA	0.05	Uran	Karanja
29	4126186	DAURNAGAR Z.P.SCHOOL	0.1	Uran	Karanja
30	4126187	KARANJA SAINAGAR	0.15	Uran	Karanja
31	4126242	SHRIRAM SAMARTH	0.1	Uran	Karanja
32	4126243	SHREE YOG	0.05	Uran	Karanja
33	4126244	SHREE GANESH DEVELOPER	0.1	Uran	Karanja
34	4126249	KARANJA KASAWALEPADA 2	0.1	Uran	Karanja
35	4126279	SHAKKAR PEER DARGA	0.1	Uran	Karanja
36	4126300	SUDHIR GHARAT	0.1	Uran	Karanja
37	4126301	CHRISCHEN CHANJE	0.15	Uran	Karanja
38	4126302	TANDEL NAGAR	0.15	Uran	Karanja

Locations for Activity No. 5512 (conversion of LT O.H. line by 3.5 C, 185 Sqmm XLPE U.G. Cable)

Sr No	DTC Name	Locations	Quantity (in	Name Of Sub Div.	Name Of Section
1	2	3	4	9	10
1	4126012	Mohalla ,police station,market	1	Uran	Uran City
2	4126018	Wani aali	0.25	Uran	Uran City
3	4126259	deulwadi	0.25	Uran	Uran City
4	4126025	kotgaon	0.25	Uran	Uran City
5	4126024	Anandi hotel	0.25	Uran	Uran City
6	4126221	MSEB colony	0.25	Uran	Uran City
7	4126011 &4126054	machhi market 1& 2	1	Uran	Uran City
8	4126010	Minakshi	0.25	Uran	Uran City
9	4126006	balai	0.25	Uran	Uran City
10	4126009	Minakshi & bakshi	0	Uran	Uran City
11	4126003	Anand nagar	0.25	Uran	Uran City
12	4126199	Khudhus	0	Uran	Uran City
13	4126016 &4126017	Kamtha 1 & 2	0.25	Uran	Uran City
14	4126068 & 4126007	Kamgar vasahat and shriraj nagar	0.25	Uran	Uran City
15	4126021	shekhar mhatre	0.25	Uran	Uran City
16	4126218	Pansare aali	0.25	Uran	Uran City
17	4126034 & 4126146	datta Mandir & borinaka	0.25	Uran	Uran City
18	4126167 & 4126029	mohan store 1 & 2	0.25	Uran	Uran City
19	4126031 & 4126198	Dhakka & Uran shipyard	0.25	Uran	Uran City
20	4126043	S T DEPO	0.25	Uran	Karanja
21	4126042	DAUR NAGAR	0.2	Uran	Karanja
22	4126035	KARANJA MARATHI SCHOOL 1	0.2	Uran	Karanja
23	4126036	KARANJA NAVAPADA I	0.3	Uran	Karanja
24	4126040	CHANJE	0.12	Uran	Karanja
25	4126041	MULEKHAND PADA	0.3	Uran	Karanja
26	4126305	DOURNAGAR KATKARI WADI	0.12	Uran	Karanja
27	4126304	ITI DAUR NAGAR	0.3	Uran	Karanja
28	4126044	MULEKHAND PADA	0.35	Uran	Karanja
29	4126179	KARANJA DRONAGIRI MANDIR	0.3	Uran	Karanja
30	4126180	MULEKHAND FATA	0.2	Uran	Karanja
31	4126186	DAURNAGAR Z.P.SCHOOL	0.2	Uran	Karanja
32	4126187	KARANJA SAINAGAR	0.2	Uran	Karanja
33	4126242	SHRIRAM SAMARTH	0.2	Uran	Karanja
34	4126243	SHREE YOG	0.2	Uran	Karanja
35	4126244	SHREE GANESH DEVELOPER	0.1	Uran	Karanja

36	4126279	SHAKKAR PEER DARGA	0.3	Uran	Karanja
37	4126300	SUDHIR GHARAT	0.1	Uran	Karanja
38	4126301	CHRISCHEN CHANJE	0.2	Uran	Karanja
39	4126302	TANDEL NAGAR	0.3	Uran	Karanja
40	4126303	KARANJA ROAD AMBE NAGAR	0.25	Uran	Karanja
41	4126306	KARANJA MARATHI SCHOOL 2	0.2	Uran	Karanja
42	4126022	AMBIKA WADI	0.3	Uran	Karanja
43	4126045	GRINDWELL ONGC	0.3	Uran	Karanja
44	4126046	NAGAON AMBIKAWADI	0.15	Uran	Karanja
45	4126054	THAKURNAGAR	0.3	Uran	Karanja
46	4126164	Star Complex	0.4	Uran	Karanja
47	4126182	OM SAI RAM	0.12	Uran	Karanja
48	4126241	MANOJ GALAXY	0.1	Uran	Karanja
49	4126047	ANNA	0.3	Uran	Karanja
50	4126048	NAVE POPUD	0.5	Uran	Karanja
51	4126049	MANDAL ALI	0.3	Uran	Karanja
52	4126050	DENA BANK	0.1	Uran	Karanja
53	4126053	VINAYAK	0.24	Uran	Karanja
54	4126165	Dwarkanagar	0.2	Uran	Karanja
55	4126166	Classic Park	0.3	Uran	Karanja
56	4126182	OM SAI RAM	0.15	Uran	Karanja
57	4126183	PHULE GALLI	0.3	Uran	Karanja
58	4126184	Warik Aali	0.5	Uran	Karanja
59	4126185	VINAYAK WATER TANK	0.43	Uran	Karanja
60	4126193	GANRAJ APPARTMENT	0.6	Uran	Karanja
61	4126307	KHARKHAND	0.12	Uran	Karanja
		Total Qty	16.35		



## Locations for Activity No. 2003 (Supply, Erection, Testing &amp; Commissioning of LT mini Feeder Pillars)

Sr No	DTC Name	Locations	Quantity (in	Name Of Sub Div.	Name Of Section
1	2	3	4	9	10
1	4126012	Mohalla ,police station,market	12	Uran	Uran City
2	4126018	Wani aali	6	Uran	Uran City
3	4126259	deulwadi	4	Uran	Uran City
4	4126025	kotgaon	8	Uran	Uran City
5	4126024	Anandi hotel	12	Uran	Uran City
6	4126221	MSEB colony	8	Uran	Uran City
7	4126011 &4126054	machhi market 1& 2	14	Uran	Uran City
8	4126010	Minakshi	4	Uran	Uran City
9	4126006	balai	14	Uran	Uran City
10	4126009	Minakshi & bakshi	4	Uran	Uran City
11	4126003	Anand nagar	4	Uran	Uran City
12	4126199	Khudhus	4	Uran	Uran City
13	4126016 &4126017	Kamtha 1 & 2	4	Uran	Uran City
14	4126068 & 4126007	Kamgar vasahat and shriraj nagar	4	Uran	Uran City
15	4126021	shekhar mhatre	12	Uran	Uran City
16	4126218	Pansare aali	12	Uran	Uran City
17	4126034 & 4126146	datta Mandir & borinaka	19	Uran	Uran City
18	4126612	Marathi school	6	Uran	Uran City
19	4126167 & 4126029	mohan store 1 & 2	6	Uran	Uran City
20	4126031 & 4126198	Dhakka & Uran shipyard	10	Uran	Uran City
21	4126043	S T DEPO	1	Uran	Karanja
22	4126044	MULEKHAND PADA	5	Uran	Karanja
23	4126042	DAUR NAGAR	8	Uran	Karanja
24	4126035	KARANJA MARATHI SCHOOL 1	5	Uran	Karanja
25	4126036	KARANJA NAVAPADA I	4	Uran	Karanja
26	4126040	CHANJE	3	Uran	Karanja
27	4126041	MULEKHAND PADA	2	Uran	Karanja
28	4126305	DOURNAGAR KATKARI WADI	1	Uran	Karanja
29	4126304	ITI DAUR NAGAR	2	Uran	Karanja
30	4126044	MULEKHAND PADA	2	Uran	Karanja
31	4126179	KARANJA DRONAGIRI MANDIR	4	Uran	Karanja
32	4126180	MULEKHAND FATA	5	Uran	Karanja
33	4126186	DAURNAGAR Z.P.SCHOOL	4	Uran	Karanja
34	4126242	SHRIRAM SAMARTH	2	Uran	Karanja
35	4126243	SHREE YOG	2	Uran	Karanja

36	4126244	SHREE GANESH DEVELOPER	2	Uran	Karanja
37	4126279	SHAKKAR PEER DARGA	6	Uran	Karanja
38	4126300	SUDHIR GHARAT	4	Uran	Karanja
39	4126301	CHRISCHEN CHANJE	3	Uran	Karanja
40	4126302	TANDEL NAGAR	4	Uran	Karanja
41	4126303	KARANJA ROAD AMBE NAGAR	4	Uran	Karanja
42	4126306	KARANJA MARATHI SCHOOL 2	2	Uran	Karanja
43	4126022	AMBIKA WADI	5	Uran	Karanja
44	4126045	GRINDWELL ONGC	2	Uran	Karanja
45	4126046	NAGAON AMBIKAWADI	5	Uran	Karanja
46	4126054	THAKURNAGAR	6	Uran	Karanja
47	4126164	Star Complex	2	Uran	Karanja
48	4126182	OM SAI RAM	1	Uran	Karanja
49	4126241	MANOJ GALAXY	4	Uran	Karanja
50	4126047	ANNA	3	Uran	Karanja
51	4126048	NAVE POPUD	1	Uran	Karanja
52	4126049	MANDAL ALI	1	Uran	Karanja
53	4126050	DENA BANK	2	Uran	Karanja
54	4126052	BAZARPUR	4	Uran	Karanja
55	4126053	VINAYAK	2	Uran	Karanja
56	4126165	Dwarkanagar	2	Uran	Karanja
57	4126166	Classic Park	4	Uran	Karanja
58	4126182	OM SAI RAM	1	Uran	Karanja
59	4126183	PHULE GALLI	4	Uran	Karanja
60	4126184	Warik Aali	4	Uran	Karanja
61	4126185	VINAYAK WATER TANK	5	Uran	Karanja
62	4126193	GANRAJ APPARTMENT	4	Uran	Karanja
63	4126307	KHARKHAND	3	Uran	Karanja
64	4126411	Kegaon Ganesh Nagar	4	Uran	Karanja
		Total Qty	311		

TECHNICAL SPECIFICATION

OF

11/22/33 KV XLPE POWER CABLES

FOR

DISTRIBUTION NETWORK IN  
MAHARASHTRA

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## 1.00 SCOPE

The specification covers design, manufacture, shop testing, stage inspection at works, testing before dispatch, supply and delivery of ISI marked 11, 22 & 33 kV, multi core, cross linked polyethylene insulated power cables to the designated Store Centers in the State of Maharashtra. These cables shall be suitable for the AC Three Phase 50 Hz system with the nominal voltage of 11 / 22 / 33 kV which may reach maximum of 12 / 24 / 36 kV respectively. These cables shall primarily be designed for effectively earthed neutral system.

The cable shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in the specification and / or the commercial order or not.

## 2.00 SERVICE CONDITIONS

Equipment to be supplied against the specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

2.01 Maximum ambient temperature	50 <sup>o</sup> C
2.02 Maximum temperature in shade	45 <sup>o</sup> C
2.03 Minimum temperature of Air in Shade	3.5 <sup>o</sup> C
2.04 Relative Humidity	10 to 100 %
2.05 Maximum annual rain fall	1450 mm
2.06 Maximum wind pressure	150 Kg/mm <sup>2</sup>
2.07 Maximum altitude above mean sea level	1,000 Metres
2.08 Isoceraunic level	50 days/year
2.09 Seismic level (Horizontal Acceleration)	0.3 g
2.10 Moderately hot and humid tropical climate	Conducive to rust and fungus growth

### 3.00 STANDARDS TO WHICH CABLE SHALL CONFORM

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the HT XLPE power cables shall conform to the latest revisions available at the time of placement of order of all the relevant standards as listed in, but not limited to following.

IS: 8130 / 2013 – Specification for Conductors for insulated electric cables and flexible cords.

IS: 7098 (Part 2) / 1985 - Specification for crosslinked polyethylene insulated PVC sheathed cables for working voltages from 3.3 kV upto and including 33 kV. IS: 5831 / 1984 - Specification for PVC insulation and sheath of electric cables.

IS: 3975 / 1988 – Low carbon galvanized steel wires, Formed wires and tapes for Armouring of cables – Specification

IS 3961 part (7) for Recommended Current Ratings for Crosslinked Polyethylene Insulated thermoplastic Sheathed Cables

IS: 10462 (Part I) / 1991 – Fictitious calculation method for determination of dimensions of protective coverings of cables.

### 4.00 GENERAL TECHNICAL REQUIREMENTS

4.01 6.35/11 kV, 12.7/22 kV, 19/33 kV earthed, multi core power cables shall normally be with stranded compacted H2/H4 grade aluminium conductor as per IS: 8130 /2013 provided with conductor screening (of extruded semi-conducting cross link material) and shall be insulated with Nitrogen Dry cure and Dry cool technology XLPE of natural colour. Identification of cores shall be by colour, as per provision of clause 13.1 of IS: 7098 (Part 2) / 1985. The insulation (XLPE) screening shall be provided consisting of extruded semi- conducting cross link material in combination with a metallic layer of copper tape. Three such screened cores shall be laid up together with fillers and/or binder tapes where necessary and provided with extruded inner sheathing of heat resistant PVC conforming to type ST2 of IS: 5831 / 1984. The maximum continuous operating temperature shall be 90°C under normal operation and 250°C under short circuit condition.

Armouring shall be provided consisting of galvanized round steel wires conforming to IS: 3975 / 1988 (amended upto date) and over the armouring a tough outer sheath of PVC compound shall be extruded.

The PVC compound for the outer sheath shall conform to type ST2 of IS: 5831 - 1984 (amended upto date). The colour of the outer sheath shall be black. The cable shall be manufactured strictly conforming to IS: 7098 (Part 2) - 1985 amended upto date and shall bear ISI mark

#### 4.02 SEQUENTIAL MARKING ON LENGTH ON CABLE

Non erasable Sequential Marking of length shall be provided by embossing on outer sheath of the cable for each meter length.

The quality of insulation shall be good and insulation shall not be deteriorated when exposed to the climatic conditions.

##### 4.02.1 DISCHARGE FREE CONSTRUCTION

Inner conductor shielding, XLPE insulation and outer core shielding shall be extruded in one operation by special process (viz. Triple Extrusion Process) to ensure that the insulation is free from contamination and voids and perfect bonding of inner and outer shielding with insulation is achieved. The bidders are requested to elaborate the manufacturing technique adopted by their manufacturers to achieve this motive.

The Company will order the verification of triple extrusion process at manufacturer's works as a pre-qualification, if it is technically accepting the bid. During verification if it is found that the firm is not manufacturing the cable with triple extrusion process the offer shall be rejected.

#### 4.03 CONTINUOUS AC CURRENT CAPACITY.

Continuous AC current capacity shall be as per Table given below.

11,22 & 33 KV Three CORE AL COND,XLPE INSULATED , ARMoured CABLE IS 3961 (part 7) Table 10 & 12						
Cross-sectional area (Sq MM)	Normal Current Rating in Amps					
	11kV Aluminums Conductor			22kV,33kV Aluminums Conductor		
	Ground	Duct	Air	Ground	Duct	Air
3X70	161	139	184	159	142	189
3X95	190	165	222	189	169	227
3X120	216	188	256	215	192	262
3X150	242	209	288	239	214	294
3X185	273	240	330	270	245	336
3X240	315	278	387	312	282	393
3X300	354	312	441	351	317	448
3X400	404	356	512	400	361	519
3X500	457	403	590	454	408	598

#### 4.04 SHORT CIRCUIT CURRENT

Short circuit current of 11, 22 & 33 kV XLPE cable shall be as per Table given below.

Duration of Short Circuit in sec	Area of Al. Conductor	Short circuit current in kA
t	A	$I=0.094 \times A/\text{sq.rt} (t)$
1	70 mm <sup>2</sup>	6.58
1	95 mm <sup>2</sup>	8.93
1	120 mm <sup>2</sup>	11.28
1	150 mm <sup>2</sup>	14.10
1	185 mm <sup>2</sup>	17.39
1	240 mm <sup>2</sup>	22.56
1	300 mm <sup>2</sup>	28.20
1	400 mm <sup>2</sup>	37.60
1	500 mm <sup>2</sup>	47.00
1	630 mm <sup>2</sup>	59.20

#### 5.00 TESTS

##### 5.01 TYPE TESTS:

The cable offered shall have successfully passed all type tests described in the IS: 7098 (Part- 2) / 1985 (amended upto date). The Type Test Certificate shall clearly indicate the constructional features of the type- tested cable. The Type Test Certificate of the cable shall be same as the cable offered. Separate Type Test Certificate for each offered size of cable shall be submitted.

All the Type Tests shall be carried out from **any** Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, ERDA, ERTL, etc. to prove that the cable meets the requirements of specification. Type Test conducted in manufacturers own laboratory and

TECHNICAL SPECIFICATION OF 11/22/33 KV XLPE POWER CABLE FOR DISTRIBUTION NETWORK  
Certified by testing institute shall not be acceptable.

The valid Type Test Certificate as per IS: 7098 (Part- 2) -1985, (amended upto date) shall be submitted along with the offer. The Type Test Certificate carried out during last five years shall be valid.

Further, purchaser reserves the right to pick up cable at random from the lots offered / supplied and get the cable tested for some or all the Type Tests in presence of purchasers' representative at third party NABL lab at the sole discretion of the purchaser. For this purpose, the tenderer shall quote unit rates for carrying out each Type Test. However, such unit rates will not be considered for evaluation of the offer. The supplier shall have no right to contest the test results of the third party lab for additional tests. In case the cable fails in any of the type tests, the complete supply shall be rejected. The supplier has to replace / take corrective action at the cost of the supplier.

It shall be the responsibility of the supplier to arrange such tests and purchaser shall be informed of the date and time of conduction of tests well in advance to enable him to witness such tests. Test charges of the testing authority, for such successful repeat type tests, shall be reimbursed at actual by the purchaser.

#### **5.02 ROUTINE TESTS:**

All the Routine tests as per IS: 7098 (Part 2) / 1985 amended upto date shall be carried out on each and every delivery length of cable. The results shall be given in test report. Partial discharge test must be carried out in a fully screened test cell. It is, therefore, absolutely

essential that the manufacturer shall have the appropriate type of facility to conduct this test which is routine test. The details of facility available in the manufacturer's works in this connection shall be given in the bid

#### **5.03 ACCEPTANCE TESTS:**

All Acceptance tests as per IS: 7098 (Part 2) / 1985 as modified upto date including the optional test as per clause no 18.4 and Flammability Test shall be carried out on sample taken from the delivery lot.

#### **5.04 SHORT CIRCUIT TEST:**

5.04.1 The bidder shall carry out short circuit type tests on each size & each voltage grade HT XLPE cables at the Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, ERDA, ERTL, etc. at the cost of the supplier and should submit along with the offer.

The short circuit tests carried out at the manufacturer own works/laboratory shall not be acceptable.



5.04.2 The short circuit test shall be preceded and followed by the following tests so as to ensure that the characteristics of the cable remain within the permissible limits even after it is subjected to the required short circuit rating.

- a) Partial Discharge Test.
- b) Conductor Resistance Test.
- c) High Voltage Test as a Routine Test.

5.04.3 The manufactured cable will be acceptable only after such a sample test is successfully carried out at NABL Labs as above or at suppliers works and approved by the Purchaser.

#### 6.00 TESTING FACILITIES:

The supplier / tenderer shall clearly state as to what testing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out type, routine and acceptance tests mentioned in specified IS. The facilities shall be provided by the bidder to purchaser's representative for witnessing the tests in the manufacturer's works. If any test cannot be carried out at manufacturer's works reason shall be clearly stated in the tender.

#### 7.00 PRE DESPATCH INSPECTIONS:

All the type tests in accordance with IS: 7098 (Part 2) / 1985 (amended upto date) and acceptance tests as per specification shall be performed on a sample of each size of cable ordered from the first lot of supply at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The sample for type tests of each size of cable ordered from the first lot of supply shall be drawn by purchaser representative.

The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification.

The MSEDCL's representative / Engineer attending the above testing will carry out testing in accordance with IS: 7098 (Part 2) / 1985 (amended upto date) and acceptance tests and additional acceptance test as per this specification and issue test certificate approval to the manufacturer and give clearance for dispatch.

#### 8.00 PERFORMANCE GUARANTEE:

The cable offered shall be guaranteed for satisfactory performance for a period of 30 months from the date of receipt of complete cable at site in good condition, or 24 months from the date of satisfactory commissioning, whichever is earlier. In case of failure within this period, the supplier shall make good the faulty cable at no extra cost to the purchaser.

#### 9.00 PACKING AND MARKING:

##### 9.01 IDENTIFICATION MARKS ON CABLE:

The following particulars shall be properly legible embossed on the cable sheath at the intervals of not exceeding one meter through out the length of the cable. The cables with poor and illegible embossing shall be liable for rejection.

- (a) Manufactures name and / or Trade name.
- (b) Voltage grade.
- (c) Year of manufacture.
- (d) M.S.E.D.C.L.
- (e) Successive Length.
- (f) Size of cable
- (g) ISI mark
- (h) Electric
- (i) IS & CML No

9.02 The cable shall be supplied in continuous standard length of 250 running meters with plus minus 5% tolerance wound on non-returnable wooden drum of good quality and non-standard lengths not less than 100 meters upto 5% of the ordered quantity shall be accepted. Alternately cable can be supplied wound on non-returnable steel drum without any extra cost to the purchaser. The ends of the cable shall be sealed by means of non-hygroscopic sealing material.

9.03 Packing and marking shall be as per clause No. 21 of IS: 7098 (Part 2) / 1985 amended up to date.

The following additional information shall be furnished on with the consignment.

- Name of the consignee, i.e. MSEDCL.
- Destination
- Company's Supply order no. and date

9.04 Supplier shall provide statistical data regarding cables of all sizes viz.-

- (a) Weight of one meter of finished product of cable of various sizes and ratings.
- (b) Weight of one meter of bare conductor used for cables of various sizes and ratings.

## 10.00 QUALITY CONTROL

10.1 The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of cable as per this specification.

10.2 The team shall be given all assistance and co-operation for inspection and testing at the bidder's works.

10.03 The cable supplied shall give service for a long period with out drifting from the original calibration & performance must be near to zero percent failure

## 11.00 Manufacturing Facility :

The HT cable manufacturer should have CCV (Catenary Continuous Vulcanizing) line for dry cure and dry cooling in Nitrogen gas medium. The bidder should submit certificate of CCV line facility installation, commissioning with offer. The purchaser has right to depute inspector to ensure manufacturing process for the offered HT cables at any time without prior intimation and if HT Cable not manufactured with the specified process i.e. through CCV line with nitrogen gas medium, the purchase order will be liable for cancellation and bidder's firm will be blacklisted as per MSEDCL blacklist policy.

## 12.00 QUALITY ASSURANCE PLAN

A detailed list of bought out items which got into the manufacture of cables shall be furnished indicating the name of the firms from whom these items are procured. The bidder shall enclose the quality assurance plan invariably along with offer followed by him in respect of the bought out items, items manufactured by him & raw materials in process as well as final inspection, packing & marking.

The Company may at its option order the verification of these plans at manufacturer's works as a pre qualification for technically accepting the bid. During verification if it is found that the firm is not meeting with the quality assurance plan submitted by the firm, the offer shall be liable for rejection.

<b>Guaranteed Technical Particular</b>			
<b>Sr.no</b>	<b>DESCRIPTION</b>	<b>Reference Documents</b>	<b>To be filled by Bidder</b>
1	Name of Manufacturer & Address		
2	Cable Type		
2.1	Description		
3	Applicable Standards (IS)		
4	No of cores (Nos)		
5	Cable Size (sq.mm)		
6	Voltage Grade (kV)		
7	Permissible Voltage & Frequency variations for satisfactory operation		
8	Maximum conductor temperature under normal operating conditions		
9	Maximum conductor temperature at the termination of short circuit		
10	Continuous Current carrying capacity in air (Amp) 40 Deg C		
11	Continuous Current carrying capacity in ground (Amp) 30 Deg C		
<b>12</b>	<b><u>Conductor</u></b>		
(i)	Material		
(ii)	Shape		
(iii)	Nominal Cross-sectional Area (Sq. mm )		
(iv)	No of Wire (mm)	IS:8130:2013-Table 2	
(v)	Dia of Individual wire (mm)		
(iv)	Nominal Conductor Diameter	mm	
<b>13</b>	<b><u>Conductor Screen</u></b>	IS 7098 (Part2)/2011	
(i)	Material		
(ii)	Nominal Thickness (mm)		
<b>14</b>	<b><u>Insulation</u></b>		
(i)	Material		
(ii)	Nominal Thickness ( mm)		
<b>15</b>	<b><u>Insulation Screening</u></b>		
(i)	Material	IS 7098 (Part2)/2011 as per Clause 6.1	
(ii)	Nominal Thickness ( mm)		

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16	<u>Core Identification</u>	IS 7098 (Part2)/2011 as per Clause 14.1	
17	Calculated Laid up dia (mm)		
<b>18</b>	<b><u>Inner Sheath</u></b>		
(i)	Material	IS 7098 (Part2)/2011 as per Clause 7.1	
(ii)	Extruded or wrapped		
(iii)	Min. Thickness (in mm)	IS 7098 (Part2)/2011 as per Table 5	
(iv)	Calculated Dia over I/Sh (mm)		
	<b>Filler material</b>		
<b>19</b>	<b><u>Armour</u></b>		
(i)	Material	IS 3975	
(ii)	<b><u>Types of Armouring</u></b>		
(iii)	Nominal size of wire (mm)	IS 7098 (Part2)/2011	
(iv)	Calculated Dia over Armour (mm)		
<b>20</b>	<b>OUTER SHEATH</b>		
(i)	Material	IS 7098 (Part2)/2011	
(ii)	Minimum Thickness ( mm)	IS 7098 (Part2)/2011	
(iii)	Colour		
<b>21</b>	Approximate Overall Diameter. (mm)		
<b>22</b>	Approximate Weight of cable. (Kg/Km.)		
<b>23</b>	Drum Material		
<b>24</b>	Standard Drum Length (mtr)		
<b>25</b>	Minimum Bending Radius		
<b>26</b>	Safe pulling Force	As IS 1255	
<b>27</b>	Short Current Rating Of Conductor - Duration of 1 Sec in (KA)	IEC:60949	
<b>28</b>	Maximum DC resistance of conductor at 20°C (Ohm/km)	As IS 8130:2013	
<b>29</b>	Approx. AC resistance 90°C (Ohm/km)		
<b>30</b>	Approx. Reactance of cable at 50 HZ (Ohm/km)		
<b>31</b>	Approx. capacitance (Micro F/Km)		
<b>32</b>	Marking Detail (by embossing)		
<b>33</b>	Sequential marking of length		
<b>34</b>	Technology use for insulation curing (CCV Line)	Dry cure Dry cooling (Nitrogen)	

TECHNICAL SPECIFICATION

OF

LT XLPE POWER CABLE

FOR

DISTRIBUTION NETWORK

I N D E X

- 1.00 SCOPE
  - 2.00 SERVICE CONDITIONS
  - 3.00 STANDARDS
  - 4.00 GENERAL TECHNICAL REQUIREMENT
  - 5.00 CONSTRUCTION
  - 6.00 TESTS
  - 7.00 PURCHASER'S AND MANUFACTURER'S IDENTIFICATION
  - 8.00 SIZE OF CABLE
  - 9.00 TESTING FACILITIES AND DETAILS OF EQUIPMENT
  - 10.00 PRE DESPATCH INSPECTIONS
  - 11.00 PACKING AND MARKING
  - 12.00 PERFORMANCE GUARANTEE
  - 13.00 QUALITY CONTROL
  - 14.00 QUALITY ASSURANCE PLAN
- Guaranteed Technical particular



## 1.00 SCOPE

This specification covers design, manufacture, testing, packing and delivery of 1100 Volts grade, Aluminium conductor, XLPE insulated multi core power cables by road/rail to the designated Stores in the State of Maharashtra.

The cable shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and / or the commercial order or not.

## 2.00 SERVICE CONDITIONS

The cable to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Maximum ambient temperature (Degree C)	50
Maximum temperature in shade (Degree C)	45
Minimum temperature of Air in Shade (Degree C)	3.5
Relative Humidity (Percent)	10 to 100
Maximum annual rain fall (mm)	1450
Maximum wind pressure (Kg/sq.mm.)	150
Maximum altitude above mean sea level (Metre)	1000
Isoceraunic level (days per year)	50
Seismic level (Horizontal Acceleration)	0.3 g
Climate: Moderately hot and humid tropical climate and fungus growth.	conducive to rust

### 3.00 STANDARDS

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the LT XLPE power cables shall conform to the latest revisions available at the time of placement of order of all the relevant standards as listed in, but not limited to standards as below.

IS: 7098 (Part 1) / 1988 (amended upto date) suitable for working voltages upto and including 1100 Volts.

IS: 5831 / 1984 modified upto date in all respects with regard to PVC insulation and sheath of electric cables

IS: 8130 / 2013 - PVC insulated for conductors for insulated electric cables and flexible cords.

IS: 3975 / 1988 for Mild Steel wires, formed wires and tapes for armouring of cables

IS 3961 part (6) for Recommended Current Ratings for Crosslinked Polyethylene Insulated PVC Sheathed Cables

IS: 10462 (Part I) / 1991 - Fictitious calculation method for determination of dimensions of protective covering of cables.

### 4.00 GENERAL TECHNICAL REQUIREMENT

System Voltage

The cable shall be suitable for operation on three phase, 440 Volts, 50 Hz, solidly earthed system.

For the above system, the cable shall be suitable for continuous 10% over-voltages.

The cable shall bear ISI mark.

### 5.00 CONSTRUCTION

#### 5.01 ARMOURED CABLES

1100 Volts Grade L.T. cable with stranded H2/H4 grade aluminium conductor, XLPE insulated, colour coded, laid up with fillers and / or binder tape wherever necessary provided with extruded PVC inner sheath (Type ST-2), with armouring as per Table No.6 of IS 7098 part -1 as follows

**i. Single Galvanized steel strip shall be used for multicore LT XLPE cables**

**ii. Aluminium armored shall be used for single core LT XLPE cables.**

**Note:- Round wire armoured shall be used for LT XLPE cables having calculated diameter under armored below 13 sq.mm**

**TECHNICAL SPECIFICATION OF LT XLPE POWER CABLES FOR DISTRIBUTION**

Further, shall be provided with extruded PVC outer sheath (Type ST-2). The cable shall conform to IS: 7098 (Part 1) / 1988 (amended upto date) and must bear ISI mark.

**5.02 INSULATION, INNER SHEATH AND OUTER SHEATH**

Insulation, inner sheath and outer sheath shall be applied by separate extrusion. Inner sheath shall be applied by extrusion only. Bedding of PVC tape for inner sheath is not acceptable. Colour of outer sheath shall be black. The quality of insulation shall be good and insulation shall not be deteriorated when exposed to the climatic conditions.

**5.03 SEQUENTIAL MARKING ON THE LENGTH OF CABLE**

Non erasable sequential marking of length shall be provided by embossing on outer sheath of the cable for each meter length as brought out elsewhere in this specification.

**5.04 CONTINUOUS AC CURRENT CAPACITY**

The continuous ac current capacity shall be as per Table given below.

1.1 KV SINGLE CORE AL/COPPER COND,XLPE INSULATED CABLES as per IS 3961 part (6) Table 2									
Cross-sectional area (Sq MM)	ARMOURED CABLE								
	Overall Diameter (mm)	Normal Current Rating in Amps						Short Circuit Current Rating for 1Sec.duration in KA	
		Aluminum Conductor			Copper Conductor			Aluminum	Copper
		Ground	Duct	Air	Ground	Duct	Air		
1eX4	10	37	34	33	47	43	41	0.376	0.572
1eX 6	11	47	43	43	58	53	52	0.56	0.858
1eX10	12	59	54	55	77	70	71	0.94	1.43
1eX16	13	76	69	72	98	89	94	1.50	2.29
1eX25	14	98	89	98	126	114	126	2.35	3.58
1eX 35	15	116	106	119	150	136	154	3.29	5.01
1eX50	17	137	124	145	177	160	187	4.70	7.15
1eX70	19	168	151	185	216	195	238	6.58	10.01
1eX 95	22	202	181	235	260	233	303	8.93	13.59
1eX120	24	230	206	276	295	264	354	11.28	17.16
1eX150	25	256	229	314	329	294	403	14.10	21.45
1eX185	28	290	258	366	371	330	468	17.39	26.46
1eX240	30	335	298	434	427	379	553	22.56	34.32
1eX300	33	376	333	500	477	422	634	28.20	42.90
1eX400	38	429	378	589	537	473	737	37.60	57.20

## TECHNICAL SPECIFICATION OF LT XLPE POWER CABLES FOR DISTRIBUTION

1.1 KV Two CORE AL/COPPER COND,XLPE INSULATED as per 3961 part 6 ( Table 3)										
Cross-sectional area (Sq MM)	ARMOURED CABLE								Short Circuit Current Rating for 1Sec.duration in KA	
	Overall Diameter (mm)	Normal Current Rating in Amps						Aluminum		
		Aluminum Conductor			Copper Conductor					
		Ground	Duct	Air	Ground	Duct	Air			
2cX4	15	42	36	38	54	45	48	0.376	0.572	
2cX 6	16	55	46	50	67	56	61	0.564	0.858	
2cX10	18	68	57	64	89	75	83	0.940	1.430	
2cX16	19	89	74	83	115	96	108	1.50	2.29	

1.1 KV Three & Half CORE AL/COPPER COND,XLPE INSULATED As per IS 3961 (Part-6) Table 4.										
Cross-sectional area (Sq MM)	ARMOURED CABLE								Short Circuit Current Rating for 1Sec.duration in KA	
	Overall Diameter (mm)	Normal Current Rating in Amps						Aluminum		
		Aluminum Conductor			Copper Conductor					
		Ground	Duct	Air	Ground	Duct	Air			
3.5X25	25	95	79	93	122	102	119	2.35	3.58	
3.5X35	27	114	94	114	146	122	147	3.29	5.01	
3.5X50	30	134	112	138	173	144	179	4.70	7.15	
3.5X70	35	164	137	115	212	177	226	6.58	10.01	
3.5X95	38	197	164	216	254	212	279	8.93	13.59	
3.5X120	42	223	187	244	287	240	320	11.28	17.16	
3.5X150	46	249	209	284	321	269	365	14.10	21.45	
3.5X185	51	282	238	329	362	304	422	17.39	26.46	
3.5X240	56	327	276	392	418	352	500	22.56	34.32	
3.5X300	60	369	312	452	469	396	514	28.20	42.90	
3.5X400	71	420	356	426	528	442	662	37.60	57.20	
3.5X500	79	478	412	612	593	511	760	47.00	71.50	
3.5X630	88	542	468	712	661	571	870	59.22	90.09	

1.1 KV Four CORE AL/COPPER COND,XLPE INSULATED CABLES As per IS 3961 (Part-6) Table 4										
Cross-sectional area (Sq MM)	ARMOURED CABLE								Short Circuit Current Rating for 1Sec.duration in KA	
	Overall Diameter (mm)	Normal Current Rating in Amps						Aluminum		
		Aluminum Conductor			Copper Conductor					
		Ground	Duct	Air	Ground	Duct	Air			
4cX4	18	35	30	32	45	38	41	0.376	0.572	
4cX 6	19	46	38	42	56	47	52	0.564	0.858	
4cX 10	21	57	48	54	74	62	70	0.940	1.430	
4cX16	22	74	61	69	95	79	89	1.50	2.29	

## 6.00 TESTS

### 6.01 TYPE TESTS

The cable offered shall have successfully passed all type tests described in the IS: 7098 (Part 1) / 1988 (amended upto date).

The Type Test Certificate shall clearly indicate the constructional features of the type-tested cable. The Type Test Certificate of the cable shall be same as the cable offered. Separate Type Test Certificate for each offered size of cable shall be submitted.

All the Type Tests shall be carried out from any Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, ERDA, ERTL, etc. to prove that the cable meets the requirements of specification.

Type Test conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The valid Type Test Certificate as per IS: 7098 (Part 1) / 1988 (amended upto date) shall be submitted along with the offer. The Type Test Certificate carried out during last ten years shall be valid.

Further purchaser reserves the right to pick up cable at random from the lots offered / supplied and get the cable tested for some or all the Type Tests in presence of purchasers' representative at third party NABL lab at the sole discretion of the purchaser. For this purpose, the tenderer shall quote unit rates for carrying out each Type Test. However, such unit rates will not be considered for evaluation of the offer. It shall be the responsibility of the supplier to arrange such tests and purchaser shall be informed of the date and time of conduction of tests well in advance to enable him to witness such tests. Test charges of the testing authority, for such successful repeat type tests, shall be reimbursed at actual by the Purchaser. The supplier shall have no right to contest the test results of the third party lab for additional tests. In case the cable fails in the type tests, the complete supply shall be rejected. The supplier has to replace / take corrective action at the cost of the supplier.

### 6.02 ROUTINE TESTS

All the Routine tests as per IS: 7098 (Part 1) - 1988 amended upto date shall be carried out on each and every delivery length of cable. The result shall be given in test report.

The details of facility available in the manufacturer's works in this connection shall be given in the bid.

### 6.03 ACCEPTANCE TESTS

All Acceptance tests as per IS: 7098 (Part-I) 1988 as amended upto date including the optional test as per clause no 15.4 and Flammability Test as per clause No. 16.3 shall be carried out on sample taken from the delivery lot.

### 6.04 ADDITIONAL ACCEPTANCE TESTS

The following additional acceptance test shall be carried out on PVC compounds used for outer sheath as per IS: 5831 / 1984 (amended upto date).

1. Hot Deformation Test.

### 7.00 PURCHASER'S AND MANUFACTURER'S IDENTIFICATION

The manufacturer and the Company shall be identified throughout the length of cable by embossing the manufacturer's name, the Company's name on the P.V.C. sheath. The manufacturer's name/ trade mark and M.S.E.D.C.Ltd. shall be embossed at least once on every meter length of cable, along with sequential marking for each meter length.

### 8.00 SIZE OF CABLE

The size of cables with voltages grade shall be as per schedule of requirement.

### 9.00 TESTING FACILITIES AND DETAILS OF EQUIPMENT

The supplier / tenderer shall clearly state as to what testing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out type, routine and acceptance tests mentioned in IS: 7098 (Part-1) / 1988 (amended upto date ) on the cable including test as per clause No. 6.04 of specification.

The facilities shall be provided by the bidder to purchaser's representative for witnessing the tests in the manufacturer's works.

If any test cannot be carried out at manufacturer's works reason shall be clearly stated in the tender.

## 10.00 PRE DESPATCH INSPECTIONS

All the type tests in accordance with IS: 7098 (Part-1) - 1988 (amended upto date) and additional acceptance test as per specification shall be performed on a sample of each size of cable ordered from the first lot of supply at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase.

The sample for type tests of each size of cable ordered from the first lot of supply shall be drawn by purchaser representative.

The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification.

The MSEDCL's representative / Engineer attending the above testing will carry out testing in accordance with IS: 7098 (Part 1) - 1988 (amended upto date) and additional acceptance test as per this specification and issue test certificate approval to the manufacturer and give clearance for dispatch.

### 11.00 PACKING AND MARKING

#### 11.01 UPTO 120 SQ. MM. SIZE

Cables shall be supplied in continuous standard length of 500 meters with plus minus 5% (five percent) tolerance wound on non returnable wooden drums of good quality or on non-returnable steel drums without any extra cost to the purchaser.

#### 11.02 ABOVE 120 SQ.MM. SIZE

Cables shall be supplied in continuous standard length of 250 meters with plus minus 5% (five percent) tolerance wound on non-returnable wooden drums of good quality or on non-returnable steel drums without any extra cost to the purchaser.

#### 11.03 NON STANDARD LENGTH

5% (five percent) of the ordered quantity of respective size shall be acceptable in non-standard length which shall not be less than 100 meters in length.

#### 11.04 In addition to the requirement as per IS, the following particulars shall be properly legibly embossed on the cable sheath at the intervals of not exceeding one meter throughout the length of the cable. The cables with

poor and illegible embossing shall be liable for rejection.

- (a) Electric
- (b) Manufactures name.
- (c) Voltage grade.
- (d) Year of manufacture.
- (e) Name of purchaser: M.S.E.D.C.L.
- (f) Successive Length.
- (g) Size of cable
- (h) ISI mark
- (i) CML no.
- (j) IS

11.05 Packing and marking shall be as per clause No. 18 of IS 7098 (Part I) / 1988 amended up to date.

11.06 Supplier shall provide statistical data regarding cables of all sizes viz.-

- (i) Weight of one meter of finished product of cable of various sizes and ratings.
- (j) Weight of one meter of bare conductor used for cables of various sizes and ratings.

#### 12.00 PERFORMANCE GUARANTEE:

The cable offered shall be guaranteed for satisfactory performance for a period of 30 months from the date of receipt of complete cable at site in good condition or 24 months from the date of satisfactory commissioning, whichever is earlier. In case of failure within this period, the supplier shall make good the faulty cable at no extra cost to the purchaser.

#### 13.00 QUALITY CONTROL

The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of cable as per this specification. The team shall be given all assistance and co-operation for inspection and testing at the bidder's works. The cable supplied shall give service for a long period without drifting from the original calibration & performance must be near to zero percent failure.



#### 14.00 QUALITY ASSURANCE PLAN

A detailed list of bought out items which got into the manufacture of cables shall be furnished indicating the name of the firms from whom these items are procured. The bidder shall enclose the quality assurance plan invariably along with offer followed by him in respect of the bought out items, items manufactured by him & raw materials in process as well as final inspection, packing & marking. The Company may at its option order the verification of these plans at manufacturer's works as a pre qualification for technically accepting the bid. During verification if it is found that the firm is not meeting with the quality assurance plan submitted by the firm, the offer shall be liable for rejection.

**TECHNICAL SPECIFICATION OF LT XLPE POWER CABLES FOR DISTRIBUTION**

<b>GUARANTEED TECHNICAL PARTICULARS ( Multi Core Cable )</b>		
	DESCRIPTION	
		..... (Size) sq. mm. Stranded shaped aluminium conductor (Class-2), Extruded cross linked polyethylene insulated cores laid-up, Extruded PVC (Type ST-2) Inner sheathed, Galvanised steel strips armoured and overall extruded PVC ( Type ST-2) Outer sheathed, 1.1 kv Grade LT XLPE Power Cable conforming to IS 7098 (Part-1) 1988 updated Code : “A2XFY”
1	<b>GENERAL</b>	
	Name of Manufacturer	
	Address	
	Brand	
	Applicable Standards	As per IS-7098 (P-1) 1988 Amended up to date
	Voltage Grade in ( KV)	
2	<b>CONDUCTOR (Phase)</b>	As per IS :8130:2013 - Amended up to date
	Material	
	grade	
	Shape	
	Cross sectional Area (SQ MM)	
	No. Of Cores	
	Minimum No of Strand (Nos)	
	Single strand Dia Before stranding (mm)	
	Max.D.C.resistance at 20 deg.c (ohm/km)	
3	<b>CONDUCTOR (Neutral)</b>	As per IS :8130:2013 - Amended up to date
	Material	
	grade	
	Shape	
	Cross sectional Area (SQ MM)	
	Minimum No of Strand (Nos)	
	Single strand Dia Before stranding (mm)	
	Max.D.C.resistance at 20 deg.cohm/km(Neutral) (ohm/km)	
4	<b>INSULATION (Phase)</b>	As per IS-7098 (P-1) 1988 Amended up to date
	Material	
	Nominal THICKNESS (MM)	
	Colour	
5	<b>INSULATION (Neutral)</b>	As per IS-7098 (P-1) 1988 Amended up to date
	Material	

**TECHNICAL SPECIFICATION OF LT XLPE POWER CABLES FOR DISTRIBUTION**

	Nominal THICKNES (MM)	
	Colour	
6	INNER SHEATH	As per IS : 5831 -1984 - Amended up to date
	Material	
	Minimum Thickness (MM)	
7	ARMOURING	As per IS -3975 - 88 Amended up to date
	Material	
	Types of Armouring	
	Nominal size of Armouring (MM)	
8	OUTER SHEATH	As per IS : 5831 -1984 - Amended up to date
	Material	
	Minimum Thickness (MM)	
	Colour	
9	Approximate Overall Diameter (MM)	
10	Approximate Net Weight of cable. (Kg/Km)	
11	Embossing/Printing on cable at regular interval along its length	ELECTRIC, Manufacture/ Trade Name, 1100V GRADE, IS:7098(Part-1)-1988, CM/L No-..... Size .....SQ.MM, A2XFY, MSEDCL, year of manufacturing, ISI Mark , Successive Length
12	Standard Drum Length (Mtr)	
13	Drums Type	IS: 10418 (Non-Returnable Wooden Drums)
14	Continous AC Current Carrying Capacity (Amp)	As per IS - 3961 (6) Amended up to date
	When laid in ground (30 Deg.C) (Amp)	
	When laid in air (40 deg.c) (Amp)	
15	Short Current Raiting Of Conductor KA For -Duaration of 1 Sec (KA)	
16	Minimum Bending Radius	

**TECHNICAL SPECIFICATION OF LT XLPE POWER CABLES FOR DISTRIBUTION**

GUARANTEED TECHNICAL PARTICULARS (Single core)		
	DESCRIPTION	
		..... sq.mm. aluminium stranded circular conductor (Class-2), Extruded cross linked polyethylene insulated, Aluminium Strips Armoured and overall Extruded PVC (Type-ST 2) outersheathed, 1.1 kv Grade LT LXPE Power Cable conforming to IS 7098 (Part-1) 1988 - updated.
1	<b>GENERAL</b>	
	Name of Manufacturer	
	Address	
	Brand	
	Applicable Standards	As per IS-7098 (P-1) 1988 Amended up to date
	Voltage Grade in (KV)	
2	<b>CONDUCTOR (Phase)</b>	As per IS :8130 - 2013 Amended up to date
	Material	
	grade	
	Shape	
	Cross sectional Area ( Sq.mm)	
	No. Of Cores	
	Minimum No of Strand (Nos)	
	Single strand Dia Before stranding (mm)	
	Max.D.C.resistance at 20 deg.c (Ohm/Km)	
3	<b>INSULATION (Phase)</b>	As per IS :7098 (part - 1) 1988 Amended up to date
	Material	
	Nominal THICKNES (MM)	
	Colour	
4	<b>ARMOURING</b>	As per IS : 3975 - 88 Amended up to date
	Material	
	Types of Armouring	
	Nominal size of Armouring (MM)	
5	<b>OUTER SHEATH</b>	As per IS : 5831 -1984 Amended up to date
	Material	
	Minimum Thickness (MM)	
	Colour	
6	Approximate Overall Diameter (MM)	
7	Approximate Net Weight of cable. (Kg/Km)	
8	Embossing/Printing on cable at regular interval along its length	ELECTRIC, Manufacture/ Trade Name, 1100V GRADE, IS:7098(Part-1)-1988, CM/L No-..... Size .....SQ.MM, A2XFY, MSEDCL, year of manufacturing, ISI Mark , Successive Length
9	Standard Drum Length( Mtr)	

TECHNICAL SPECIFICATION OF LT XLPE POWER CABLES FOR DISTRIBUTION

10	Drums Type	As per IS: 10418 (Non Returnable Wooden Drums)
11	Continuous AC Current Carrying Capacity (Amp)	As per IS - 3961 (6) Ammended up to date
	When laid in ground (30 Deg.C) (Amp)	
	When laid in air (40 deg.c) (Amp)	
12	Short Current Raiting Of Conductor KA For -Duaration of 1 Sec (KA)	
13	Minimum Bending Radius	

11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker



Maharashtra State Electricity Distribution Company Limited

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Specification No. T&QC: MSC-I/ 11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum  
Circuit Breaker /2019/12

Technical Specification

Of

11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum  
Circuit Breaker

For

Distribution System

In

MSEDCL

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

**I N D E X**

<b>Clause No.</b>	<b>Particulars</b>
1.0	Scope
2.0	System Particulars
3.0	Service Conditions
4.0	Objective of Work & Tolerances
5.0	Auxiliary Power Supply
6.0	Applicable Standards
7.0	General Requirement of Ring Main Unit
8.0	Principal Technical Parameters of Ring Main Unit and accessories
9.0	Principle Requirement of Ring Main Unit
10.0	Tests
11.0	Inspection
12.0	Qualifying Requirement
13.0	Prototype Samples
14.0	Manufacturing facility
15.0	Quality assurance plan
16.0	Drawing and Documentation
17.0	Name plate
18.0	Packing & forwarding
19.0	Training
20.0	Performance guarantee
21.0	Annexure
	Annexure 'A' -Principal Technical Parameters of Ring Main Units
22.0	Schedules
	Schedule 'A' -Guaranteed Technical Particulars of 11 kV Ring Main Units.
	Schedule 'B ' - List of Type Test Reports to be enclosed with the offer
	Schedule 'C ' - Schedule of Deviations from Specification
	Schedule 'D ' - Schedule of Bidder's Experience
	Schedule 'E ' - Schedule of Deviations from Specified Standards.
	Schedule 'F' - Deviations from specified Test requirements specified in Relevant Standards and Present Specification
	Schedule 'G ' - Proforma of Undertaking

## **MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.**

### **Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker**

#### **1.0 Scope:**

- i) This specification covers design, manufacture, assembly, Stage inspection, testing before supply, inspection, packing and delivery of SF6 gas filled 11 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker.
- ii) The Ring Main Unit shall be complete with all the accessories and auxiliary equipments required for their satisfactory operation in Distribution Network of MSEDCL in Maharashtra State, India.
- iii) The Ring Main Unit should have compatibility with Open Protocol Control and data Acquisition system. The Ring Main Units capable of being monitored and controlled by the Supervisory Control and data Acquisition (SCADA)/ Distribution Management System (DMS). The Ring Main Units should have the castell lock for avoiding dual supply and safety purpose.
- iv) The Ring Main Unit shall be complete with various combinations of Load Break Isolators & Circuit Breaker for Distribution transformers center and feeders.
- v) The Ring Main Units 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 Ring Main Unit shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.
- vi) It is not the intent to specify, completely here in all the details of design and construction of the Ring Main Unit. However, the Ring Main Unit shall conform, in all respects to high standards of engineering, design and workmanship as per recent Indian standards or International standards. It shall be capable of performing in continuous commercial operation up to the supplier's guaranteed life of Ring Main Unit in a manner acceptable to the purchaser who will interpret the meanings of drawings and specifications and shall have power to reject any work or material which, in his judgment, is not in accordance therewith. The Ring Main Unit 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 components shall be deemed to be within the scope of supplier's supply, irrespective of whether those are specifically brought out in this specification and/or in the commercial order or not.
- vii) Recommended spares: The bidder shall furnish in his offer a list of recommended spares with unit rates for each set of Ring Main Unit that may be necessary for satisfactory operation and maintenance of Ring Main Unit 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.

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker



- viii) Erection and maintenance tools: The bidder shall submit a list and unit rates of all the special tools, equipment and instruments required for erection, testing, commissioning and maintenance of the Ring Main Unit. 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.
- ix) The Bidder 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.

## 2.0 System Particulars:

2.1 Nominal System Voltage	:	11kV
2.2 Voltage variation on supply side	:	±10 %
2.3 Corresponding Highest System Voltage	:	12kV
2.4 Frequency	:	50 Hz with ± 3 % tolerance
2.5 Transient condition	:	-20 % or + 10 % combined variation of voltage and frequency.
2.6 Number of Phase	:	3 Phases
2.7 Neutral earthing	:	Solidly earthed.
2.8 Fault level (minimum) kA /Sec	:	16/3
2.9 Lightning Impulse Withstand Voltage (kVp)	:	75, 125, 170
2.10 One minute dry/wet power frequency withstand voltage primary (kV rms)	:	28 50 70
2.11 Rated Dynamic Withstand Current for 1 second duration (kAp)	:	40.0

## 3.0 Service Conditions :

- A) The SF6 gas filled 11 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

3.1	Maximum ambient temperature (Degree C)	50
3.2	Maximum temperature in shade (Degree C)	45
3.3	Minimum Temperature (Degree C)	3.5
3.4	Relative Humidity (percent)	10 to 95
3.5	Maximum Annual rain fall (mm)	1450
3.6	Maximum wind pressure (kg/sq.m)	150
3.7	Maximum altitude above mean sea level ( Meter)	1000
3.8	Isoceran level (days per year)	50

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

3.9 Seismic level (Horizontal Acceleration)

0.3 g

3.10 Climatic condition

Moderately hot and humid tropical climate conducive to rust and fungus growth

- B) The climatic conditions are prone to wide variations in ambient conditions and hence the SF6 gas filled 11 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker shall be of suitable design to work satisfactorily under these conditions.

#### 4.0 Objective of Work & Tolerances:

It is intended to have

- a) Enhanced safety and reliability.
- b) Maintenance free Ring Main Units.
- c) Reduction in space requirement
- d) Integrated remote control and monitoring-SCADA compatible

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

#### 5.0 Auxiliary Power Supply:

- a) A. C. supply shall be provided for Control & Protective devices, lighting fixtures, space heaters and motors.
- b) D.C. supply shall be provided for alarm, control and protective device.

The rating, quality and location of electrical supply system that will be made available by the supplier for operation of the Ring Main units are described below:

i.	A. C. Supply	230 volts with $\pm 10\%$ variation
ii	D.C. Supply	24 V DC to 30 V DC with +10% to - 15% variation
iii	Frequency	50 Hz with $\pm 3\%$ variation

#### 6.0 Applicable Standards:

- a) The design, manufacture and performance of the Ring Main Units shall comply with all currently applicable statutes, regulations and safety codes.

Nothing in this specification shall be construed to relieve the bidder off his responsibilities.

- b) Unless otherwise specified, the Ring Main Units offered shall conform to the latest applicable Indian, IEC, British, U.S.A. or International Standards and in particular, to the following:

11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

Sr. No.	Standards	Particulars
1.	IEC 62271- 200/ IEC 60 298/ IS 12729 : 1988	General requirement for Metal Enclosed Switchgear
2.	IEC 265	Medium Voltage Switches
3.	IEC 60129/ IEC 62271 – 102/ IS 9921	Alternating Current disconnectors (Load Break Isolators) and earthing switch
4.	IEC 62271-100/IEC 60056/ IS 13118 : 1991	Specification for alternating current breakers
5.	IEC 62271 – 1/ IEC 60694	Panel design, SF6/ Vacuum Circuit Breakers
6.	IEC 60044 –1/ IEC 60185/ IS 16227 (Part-1)/(Part-2) /2016	Current Transformers
7.	IEC 60265/IS 9920 : 1981	High voltage switches
8.	IEC 376	Filling of SF6 gas in RMU
9.	IEC 60273/ IS : 2099	Dimension of Indoor & Outdoor post insulators with voltage > 1000 V
10.	IEC 60273/ IS 13947 ( Part1)	Degree of protection provided by enclosures for low voltage Switchgear and control gear.
11.	IEC 60694	Common clauses for high voltage switchgear and control gear standards
12.	IEC 62271-103	High voltage switches for rated voltages above 1 KV and less than 52 KV.
13.	IEC 60137	Bushings for alternating voltages above 1000 V
14.	IEC 60233	Tests for hollow insulators for use in electrical equipment
15.	IEC 60376	New Sulphur hexafluoride (SF6)
16.	IEC 60480	Guidelines for checking and treatment of Sulphur hexafluoride (SF6)
17.	IEC 61243-5	Voltage detection systems
18.	IEC 60044-2	Potential transformers
19.	IEC 62271-209	Cable connections for gas insulated switch gears
20.	IS:2544/1973	Porcelain Post Insulators / Resin cast insulators
21.	IS 8828/1996	MCB
22.	IS 12063/1987	Degree of protection provided for enclosures for electrical equipment.
23.	IS 5/2005	Colors for ready mixed paints and enamels.
24.	IS 5578/1984	Marking of insulated conductor.
25.	11353/1985	Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals
26.	IS 1248/2003	Indicating instruments.
27.	IS 14697/1999 amended up to date & as per updated technical specifications of MSEDCL	HT Static tri vector TOD Energy meters
28.	IS 6875 amended up to date	Control switches.

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29.	IS 3231/1986	Electrical Relays for Power System Protection.
30.	IEC 60255 amended up	Numerical protection relays.
31.	IS 8686/1977	Static protective relays.
32.	IS 4794/68 & 86	Push button.
33.	IS 9431/1979	Indoor post insulator of organic material
34.	IEC 60529 / EN 60529	Protection against accidental contact, foreign Objects and water.
35.	IEC 60529	Classification of degrees of protection provided enclosures of electrical equipment
36.	IEC 60298	A.C metal-enclosed switchgear and control gear for rated voltages above 1KV and up to and including 52kV
37.	IEC 1330	High voltage/Low voltage prefabricated substations
38.	IEC 60801	Monitoring and control
39.	BS 159	Bus Bar
40.	CP 1013(British Code of Practice)	Earthing
41.	IEC 60255	Specification for Static Protective Relays
42.	BS 6231	Wires and wiring
43.	IEC 61000	Electromagnetic compatibility
44.	IEC 60129	Alternating current Disconnecter (isolators) and earthing switches
45.	IEC 60060-1, BS 923	High Voltage test technique
46.	IEC 60947-4-1	Control Gears

All Indian Electricity Rules/ Bills amended up to date applicable for clearances, safety and operation of the equipment.

The Ring Main Unit meeting with the requirements of any other standards, which ensures equal or better quality than the standard mentioned above shall also be acceptable. If the Ring Main Unit, offered by the bidder conforms 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.

#### 7.0 General Requirement of Ring Main Unit:

The Ring Main Unit shall be installed at 11 kV junction points such as 200kVA, 315kVA, 630kVA distribution transformers centers or feeder branches to isolate faulty section. The Ring Main Unit shall be both Non extensible/Extensible. Two Load break isolators for incoming & outgoing cables and one Circuit breaker for transformer or feeder protection shall be enclosed in the main tank using SF6 gas as insulating and vacuum as arc quenching medium.

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

**7.02** Both the load break switches and circuit breaker shall be suitable for motorization.

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

- 7.03** 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, Ring Main Unit & Switchboard housing shall be in accordance with IEC 298. The design of Ring Main Unit shall be in accordance with the Technical 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.

- 7.04** Circuit Breaker supplied with each Ring Main Unit shall be Vacuum Circuit Breaker. Insulating media for Bus Bar, Load Break Isolator, Earth Isolator and other associated equipment in Inner enclosure should be SF6 Gas.

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.

- 7.05** Each Ring Main Unit shall include its own power supply unit (including auxiliary transformer, batteries, and battery charger), which shall provide a stable power source for the Ring Main Unit. The auxiliary transformer of rating 500VA ,11kV/230 Volt shall be provide a stable power source which will supply **230V** AC for Remote Terminal unit (RTU).

The Ring Main Unit shall also provide the necessary space for housing the Remote Terminal unit (RTU). In addition, space must be provided for auxiliary power transformer, which shall serve as the AC power supply 230 V inputs, along with all other Ring Main Unit devices.

- 7.06** Within this context, the general requirements of the Ring Main Unit shall include, but shall not be limited to provision of the following monitoring and control features:

- i) Positions of local/remote switches as used to control local and remote access to circuit breakers and load break switches.
- ii) Power supply indications including battery failure and voltage alarms.
- iii) Open/Closed position of load break switches, circuit breakers, and earthing switches.
- iv) Enclosure door-open indications
- v) SF6 gas-pressure low alarm
- vi) Circuit breaker spring and load break switch charge (switch readiness) indications
- vii) Circuit breaker relay indications
- viii) Indications of fault current in the Ring Main Unit main feeder circuit as detected by the Fault Passage Indicator (FPI).
- ix) Measurement of 11 kV voltages, current, power, energy, and power factor values as per voltage level.
- x) Load break switch and circuit breaker open/close control
- xi) Fault Passage Indicator (FPI) reset control
- xii) Automatic Water Level Control
- xiii) Relay settings control

The acceptance of the RMUs shall not be complete until they have been demonstrated on a point-to-point basis to be fully interoperable with the Remote Terminal unit (RTU).

**7.07** The Ring Main Unit shall be provided with necessary take off terminal units for automations and all these units should be shielded in an outdoor metal-body enclosure for making them suitable for Outdoor / Indoor use. The insulation/dielectric media of Inner enclosure stainless steel tank should be SF6 gas.

**7.08** The Ring Main Units shall be extensible on both sides.

The Ring Main Units should be motorized and suitable to be connected to Field / Feeder Remote Terminal unit (F-RTU) so as to be monitored and controlled through Supervisory Control and data Acquisition (SCADA)/ Distribution Management System (DMS).

**7.09** A remote terminal unit (RTU) is a microprocessor-controlled electronic device that interfaces objects in the physical world to a distributed control system or SCADA (Supervisory Control and Data Acquisition) system by transmitting telemetry data to a master system, and by using messages from the master supervisory. The Supervisory Control and Data Acquisition (SCADA) system is the heart of Distribution Management System (DMS).

**7.10** The Ring Main Unit shall be equipped with main-line load break switches and a fault passage indicator (FPI). Furthermore, to protect each of its transformer / feeders, it shall be equipped with a corresponding set of circuit breakers and self-powered numerical relays. The Ring Main Unit shall include potential-free contacts and control contacts so as to connect to SCADA/DMS via FRTUs, so as to:

- i) Monitor and control the open/closed status of the Ring Main Unit circuit breakers and load break switches.
  - ii) Monitor the local/remote position of Ring Main Unit motorized (in case if failure of motor) manually-operated switches that can be used to enable and disable remote monitoring.
  - iii) Monitor the health of the power supply, which will include battery failure and low voltage indications.
  - iv) Monitor the open/closed status of Ring Main Unit earthing switches.
  - v) Monitor the open/closed status of RMU enclosure doors in case of Hinge doors.
- FRTU, Modem, Power and I/O cable interface between FRTU and Control panel of Ring Main Unit /sectionalizer are excluded in the scope of supply and these items will be provided by MSEDCL.

### 8.0 Principal Technical Parameters of Ring Main Unit and accessories:

The Ring Main Unit and accessories covered under this specification shall conform to specific parameters given below:

Sr. No.	Description	11 kV Ring Main Unit
<b>A) Ring Main Unit Assembly</b>		
1	Indoor / Out door	Indoor / Out door
2	Configurations(Type)	3 Way, M+LLV+
		4 Way, +LLLL+
		4 Way, M+LLL+
		4 Way, M+LLVV+
		5 Way, M+LLVVV+
		6 Way, +LLVVV+V+
		L= Isolator.
		V= VCB.
		M=Metering
3	Reference Standard	IEC-62271-100, 200, 103 and IEC-60694

11 kV, 630 Amps, Extensible / Non extensible type,  
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4	Rated Voltage in kV	11
5	Highest System Voltage in kV, Max.	12
6	Number of Phase	3
7	Frequency in HZ.	50 Hz
		± 3%
8	Short Circuit rating	
	a) Breaking Symmetrical for 3 Sec. in KA	16
	b) Breaking Asymmetrical for 3 Sec. in KA	16
	c) Short time for 3 Sec. in KA.	16
9	Insulation Level	
	a) Impulse withstand in KV peak.	75
	b) 1 Minute 50 Hz. Voltage withstand in KV rms	28
10	Internal arc rating for 1 sec. in kV	16
11	Construction: Material and Size	
	Inner Enclosure	Main Stainless Steel Tank with 2 mm Thickness
	Outer Enclosure	CRCA Sheet of 2 mm thickness or Galvanized Sheet of 1.6 mm thickness
12	Degree of protection	
	Inner Enclosure	IP 67
	Outer Enclosure	IP 54 (Main Door close) and IP 41 (Main Door open)
13	The Ring Main Unit and accessories completely wire and tested at factory	Yes
14	Paint	Polyurethane based powder paint
15	Color	Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007
16	Thickness of coat, Min.	150 microns for CRCA Sheet and 80 microns for galvanized Sheet
<b>B) Bus Bar</b>		
17	Reference Standard	IS: 1897, 2008
18	Grade and Material	Electrolytic Grade Copper
19	Cross sectional area in mm <sup>2</sup>	400
20	Size in mm or as per design	40 x 10
21	Current Density in Amps/mm <sup>2</sup> , Max.	1.6

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

22	Continuous Current in Amps	630
23	Maximum temperature rise over an ambient temperature 50°C.	55°C
24	Short time current rating for 3 Sec in kA rms	16
25	Clearance in mm from bare bus bar or as per design	
	Phase to Phase for Isolator or as per design	60
	Phase to Phase for VCB	60
	Phase to Earth for Isolator or as per design	60
	Phase to Earth for VCB or as per design	60
26	Bus Supports	
	Reference Standard	IEC 60243-1, ASTM D 648
	Voltage Class in kV	11 kV
	Creepage distance in mm or as per design	115 in SF6 gas
	Bus Bar support spacing in mm or as per design	120
27	Filling SF6 gas pressure (Filling pressure at 20°C), Min.	1.4 Bar
28	Operating SF6 gas pressure at 20°C, Min.	0.5 Bar
<b>C) Vacuum Circuit Breaker</b>		
29	Reference Standard	IEC 62271-100
30	Rated Voltage in kV	11
31	Highest System Voltage in kV, Max.	12
32	Type	Vacuum Type
33	Rated Frequency in Hz.	50 Hz
		± 3%
34	No. of Poles	3
35	Rated Current	630A
36	Maximum temperature rise over an ambient temperature 50°C.	55°C
37	Rated operating Duty	0-3min-CO-3min-CO
38	Rupturing capacity at rated voltage in MVA, Min.	As per design
39	Breaking Capacity at rated voltage & operating duty	
	Symmetrical in kA rms	16



11 kV, 630 Amps, Extensible / Non extensible type,  
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	Asymmetrical in kA rms	16
40	Rated making current in kA peak	40
41	Short time current for 3 sec in kA rms	16
42	Transient Recovery Voltage	
	Rate of rise in kV/ $\mu$ s	0.34 kV/ $\mu$ s as per IEC 62271-100
	Peak Voltage in kV	28
43	Insulation Level	
	Impulse Voltage with stand on 1.2/50 $\mu$ s full wave in kV	75
	1 minute power frequency voltage withstand in kV	28
44	Total breaking time for transient fault ( CB + Relay+ trip coil) in ms	45-50 ms
45	Opening time No load condition in ms	45-50 ms
46	Opening time under SF6 gas low or vacuum loss condition in ms	45-50 ms
47	Number of breaks per pole	Single
48	No of breaker operations permissible without requiring inspection replacement of contacts and other Main parts	
	At 100% rated current	2000
	At 100% rated breaking current, Min.	20
49	Type of contacts	
	Main	Butt Type
	Arcing	Butt Type
50	Material of contacts	
	Main	Copper
	Arching	Copper
	Chromium / Silver plated	Chromium / Silver plated
51	Mechanical Endurance Test for Circuit Breaker, Number of operations	2000
52	Spring charging mechanism	Motor Operated
53	Operating mechanism for closing of Circuit Breaker	
	Type	Spring operated Mechanism

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	No of breaker operations stored	One
	Trip free or fixed trip	Trip Free
	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material, Min.	Electrolytic grade Copper 25 x 3mm
54	Operating mechanism for tripping of Circuit Breaker	
	Type	Spring Operated Mechanism
	No of breaker operations stored	One
	Trip free or fixed trip (V)	Trip Free
	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material	Electrolytic grade Copper 25 x 3mm
55	Breaker Accessories	
	Mechanical safety Interlock	Provided
	Automatic safety Interlock	Provided
	Operational Interlock	Provided
	Emergency manual trip	Provided
	Operation counter	Provided
	Spring charge / discharge indicator	Provided
	Manual spring charging facility	Provided
<b>D) Isolators</b>		
56	Reference standard	IEC-62271-102 / IEC-62271-103
57	Nominal Voltage in KV	11
58	Highest System Voltage in kV, Max.	12
59	Rated Frequency in HZ	50 Hz
		$\pm 3\%$
60	No. Of poles	3
61	Rated Current in Amps	630
62	Maximum temperature rise over an ambient temperature 50°C.	60°C
63	Operation	Close-Open-Earth
64	Rupturing Capacity at rated voltage	630Amps at 11kV
65	Maximum over voltage factor when switching off Loaded feeder cable in kA	40

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66	No. of isolator operation permissible without requiring inspection,	
	replacement of contacts and other main parts	
	Mechanical Endurance in Number of operations	1000
	At 100% rated breaking current in Number of operations	100
67	Isolator provided with the following Mechanical safety	
	Mechanical ON and OFF Indication	Provided
	Cable Earth Indication	Provided
	Operational Counter	Provided
	Manual Spring Charging facility	Provided
<b>E) Current Transformer</b>		
68	Reference standard	IS:16227, I & II
69	Type	Ring Type, Resin Cast/Tape wound
70	Nominal Voltage in KV	11
71	Highest System Voltage in kV, Max.	12
72	Rated Frequency in HZ	50 Hz $\pm$ 3%
73	Current Transformer Ratio	200-100/1Amps
74	Short circuit withstand	
	i) Short time current for 1 sec. in kA rms	5
	Dynamic current in kA peak, Min.	7.5
75	Class of insulation	Class B
76	Basic insulation level in kV rms	3
77	Maximum temperature rise over an ambient temperature 50°C.	60°C
78	Class of Accuracy	
	Metering Core	0.5
	Protection Core	5P10
79	Rated Burden	2.5 VA
80	Over Current Rating in %	120
81	Continuous Over Load in %	120

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11 kV, 630 Amps, Extensible / Non extensible type,

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<b>F) Metering Voltage(Potential) Transformer</b>		
82	Reference standard	IS:16227, I & III
83	Type	Resin Cast/Tape wound
84	Nominal Voltage in KV	11
85	Highest System Voltage in kV, Max.	12
86	Rated Frequency in HZ	50 Hz $\pm$ 3%
87	Voltage Transformer Ratio	11 kV/ $\sqrt{3}$ /110V/ $\sqrt{3}$
88	Rated Primary Voltage in kV	11 kV/ $\sqrt{3}$
89	Rated Secondary Voltage in V	110V/ $\sqrt{3}$
90	Rated Burden in VA	50
91	Accuracy Class	0.5
92	Insulation Class	B
93	Voltage Factor	1.2 Continuous and 1.9 for 8 hrs.
94	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	28
	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	75
<b>G) Auxiliary Voltage(Potential) Transformer</b>		
95	Reference standard	IS:16227, I & III
96	Type	Resin Cast/Tape wound
97	Nominal Voltage in KV	11
98	Highest System Voltage in kV, Max.	12
99	Rated Frequency in HZ	50 Hz $\pm$ 3%
100	Voltage Transformer Ratio	11 kV / 230V
101	Rated Primary Voltage in kV	11 kV
102	Rated Secondary Voltage in V	230 V
103	Rated Burden in VA	500 VA
104	Voltage Regulation in %	5
105	Insulation Class	B
106	Voltage Factor	1.2
107	Application & Construction Type	Indoor, Single Phase/Two Pole
108	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	28

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	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	75
<b>H) Numerical Protection Relay</b>		
109	Reference Standard	IEC 60255
110	Type and Model	3 Over Current(O/C) and 1 Earth fault(E/F)
111	Current Transformer Secondary Input to Relay	1:00 AM
112	Operating Curve Type	Inverse Definite Minimum Time (IDMT)Relay
113	Auxiliary Supply	Self Powered relay for Protection
114	Rated Frequency in HZ	50 Hz $\pm$ 3%
115	Over Current Protection	
	Low set Over Current protection	20-200% of CT secondary rated current with increment/decrement by 1 %
	High set Over Current protection	100-2000% of CT secondary rated current with increment/decrement by 50%
116	Earth Fault Protection	
	Low set Earth Fault protection	5% to 80% of the CT rated current in steps of 1%
	High set Earth Fault protection	100-1000% of the CT rated current in steps of 50%
117	Mounting	Flush Mounted
118	Operational Indicator	LCD display and LED annunciation lamps
119	Contact Details	4 Binary Input(BI) and 6 Binary output(BO)
120	Self-diagnosis feature	Yes
121	Password protection	Yes
122	Communication Protocol	RS 232 or RS 485 Port for IEC 103, Communication Protocol
123	Event / fault record, Min.	10 Event and 5 Fault Records available
124	Setting groups	2 Groups available
125	Circuit Breaker control available	Yes, Only Trip
<b>I) Tripping Coil</b>		
<b>II)</b>		
126	DC Voltage in Volt	24
127	Maximum Tripping Current at rated voltage in Amps.	5
	Minimum Permissible voltage variation in %	85 to 110

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<b>J) HT three phase four wire CT / PT operated 1 Amps fully Static &amp; AMR compatible TOD Tri - vector Energy Meter</b>		
128	Reference Standard	IS: 14697, 1999
		IS: 15959, 2011
129	Make	Secure / L&T / other MSEDCL approved make
130	Auxiliary supply Voltage	110V/√3
131	Class of Accuracy	0.5S
132	Type of Display	Customized backlite liquid crystal display
133	Measuring Parameters as per MSEDCL Specification	
		Instantaneous parameters
		Block Load Profile parameters
		Billing Profile Parameters
		Name Plate details
		Programmable Parameters
		Event Conditions
		All logging parameters for each of the event condition for 3 Φ / 4W
<b>K) Fault Passage Indicator (FPI) on Short Circuit and Earth fault</b>		
134	Operating point/Current short circuit in Amp	Adjustable
		100/200/300
		/400/500
		/600/700
		/800/900/1000
		/1100/1200A (±15%)
135	Operating point/Current earth fault in Amp	Adjustable
		10/20/30/40
		/60/80/100A (±15%)
136	Response Time in ms	For Short Circuit Adjustable
		40/60/80/100/120
		/160/200/240 ms Sec(±100m Sec)
		For Earth Fault Adjustable
		40/60/80/160 ms (±100m Sec)
137	Auto Reset Time in Hrs	1/2/4/8 hrs (+ / - 1%) after fault
<b>L) Battery Charger</b>		
138	Input AC Voltage in V	230
139	Rated Frequency in Hz	50 Hz ± 3%
140	Output DC Voltage in V	24
141	Current Rating in Amps	10
142	Output DC Voltage for charger	
	Boost Mode in V	27 to 28
	Float Mode in V	27 to 28

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11 kV, 630 Amps, Extensible / Non extensible type,

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143	Operating Temperature in °C	-25 to 60
144.	Temperature Compensation	Junction temperature of SMPS crosses 142°C, thermal shutdown occurs.
145	Short Circuit and Overload Protection	Provided
146	High Voltage Isolation	2 kV for 1 minute
147	Efficiency	Above 85 %
<b>M) Battery</b>		
148	Type	Dry Type
149	Ah Efficiency	> 95%
150	Self-Discharge	Self-Discharge
151	Operating Temperature	Normal : +20°C to +30°C & Limits : -20°C to +50°C
152	Voltage (V)	24V (2 x 12V)
153	Ah Capacity	7Ah / 12 Ah / 26 Ah
<b>N) Manometer with Non Return Valve</b>		
154	Type	Analogue
155	Material	Stainless Steel
156	Accuracy of calibration pressure	+/-1% at 20°C
157	Pressure Element	Stainless Steel Welded
158	Dial	2"
159	Pointer	Dark
160	Window	Round
161	Gas pressure low signal	Indicated by Red Color Zone
162	Non Return Valve(NRV) Material	Stainless Steel
<b>O) Indoor cable terminations kits</b>		
163	Type	11 kV touch proof screened termination kit
164	Materials	Epoxy / EPDM / Silicon Rubber
165	Size	Up to 3 x 400 sq. mm 11 kV HT cables
166	Height of Bus bar / transformer / feeder Cable box from ground level	As per Manufacture design
167	Arrangement for mounting an extra cable at incoming and outgoing side box of Bus bar.	As per Manufacture design
168	Arrangement for mounting an extra cable at outgoing side box of transformer / feeder.	As per Manufacture design
<b>P) Automatic Water Level Controller</b>		
172	Position of Automatic Water Level Controller	200 mm below live contacts
173	Auxiliary contacts	4 NO + 4 NC

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174	Breaker Tripping and Load break Isolator opening due to water level increases signals to Control room	Yes
<b>Q) Name Plate</b>		
175	Material	Anodized Aluminum / Stainless Steel
176	Thickness	18 swg / 1.00 mm
177	Size	145 mm x 116 mm
<b>R) Painting</b>		
178	Inside	Powder Coated
179	Outside	Polyurethane based powder paint. Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.

## 9.0 Principle Requirement of Ring Main Unit:

### 9.1 Enclosure:

- i) The Ring Main Unit enclosure (Outer) shall be made up of CRCA Sheet of 2 mm thickness or galvanized Sheet of 1.6 mm thickness. The rating of enclosure shall be suitable for operation on three phases, three wire, 11 kV, 50 cycles, A.C. System with short-time current rating of 16 kA for 3 seconds for 11kV with Panels. The complete Ring Main Unit Outer enclosure shall be of degree of protection IP 54 (Main Door close) and IP 41 (Main Door open).
- ii) 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.
- iii) The Ring Main Unit Outer enclosure shall be painted with Polyurethane based powder paint. The color of Ring Main Unit Outer enclosure shall be Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.
- iv) Each switchboard shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics.
- v) The Ring Main Unit metal parts shall be made of high thickness high tensile steel which must be grit/short blasted, thermally sprayed with Zinc alloy ( not galvanized), 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 for CRCA Sheet and 80 microns for galvanized Sheet.

### 9.2 Inner enclosure (Main tank):

- i) The tank shall be robotically welded stainless steel sheet of minimum 2 mm thickness. The tank shall be sealed and no handling of gas is required throughout the 25 years of service life. However, the SF<sub>6</sub> 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 SF<sub>6</sub> gas will be lower than 0.1 % per year. An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF<sub>6</sub> gas to regenerate the SF<sub>6</sub>

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gas following arc interruption. The degree of protection of the inner enclosure shall be IP 67.

- ii) Oil or Air filled Switchgear will not be considered. The temperature rise test shall be carried out on complete Ring Main Unit and test reports shall be submitted with the offer.
- iii) The compact Ring Main 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.

### **9.3 Configurations recommended:**

The following configurations of Ring Main Units are recommended:

#### **i) Non Extensible:**

Non extensible Ring Main Unit with one number of 200A circuit breaker for transformer protection up to 630 kVA and two number of Load Break Isolators for network sectionalizing with earth isolator.

#### **ii) Extensible:**

Extensible Ring Main Unit 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 Ring Main Unit.

### **9.4 Bus bars:**

The three numbers of continuous Bus bars made up of EC grade tinned copper of rating current 630A shall be provided. The Short time rating current shall be 16 kA for 3 seconds for 11kV. The Bus bar connections shall Anti- oxide greased.

### **9.5 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 Ring Main Units under the stipulated service conditions. The SF6 gas shall be tested for purity, dew point air hydrolysable fluorides and water content as per IEC 376,376A and 376B and test certificate shall be furnished to the bidder indicating all the tests as per IEC 376 for each lot of SF6 Gas.

### **9.6 Load Break Switches (Load Break Isolators):**

- i) The Load Break Isolators for Incoming and Outgoing supply must be provided and the load break isolators are fully insulated by SF6 gas.
- ii) 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 fascia, which is allowed to move only if the main or earth switch is in the off position.

- iii) The load break isolators shall be remotely operated. Each load break switch shall be of the triple pole, simultaneously operated, automatic type with quick break contacts and with integral earthing arrangement.
- iv) 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 Amps maximum ambient temperature of 50 °C. The temperature rise of Isolator shall be 55°C maximum. The relevant type test report to prove the temperature rise below 55 °C shall be submitted by the bidder with the offer.

#### **9.7 Current Transformer:**

- i) The Current Transformers being prone to failure due to various reasons, the quality and reliability of the Current Transformers are of vital importance. Current Transformer's insulation used shall be of very high quality, details of which shall be furnished in the technical offer.
- ii) The Current Transformers shall be single wound double ratio, one Current Transformers for metering and one Current Transformers for protection.
- iii) The instrument security factor for metering Current Transformers shall be low enough but not greater than 5 at lower ratio. This shall be demonstrated on metering Current Transformers in accordance with the procedure specified in IS: 16227, I & II and relevant IEC.
- iv) The Current Transformers shall be ring type (Tape wound / resin cast). Contact tips of terminals shall be silver plated.
- v) Correct polarity shall be invariably marked on each terminal.
- vi) A panel shall be provided in each Ring Main Unit enclosure to mount a single wound double ratio, Current Transformers for metering and protection purposes. Current Transformers access for maintenance or any other purpose shall be from the back of these panels.
- vii) Secondary terminals of Current Transformers shall be brought out suitably to a terminal block, which will be easily accessible for testing and terminal connections.
- viii) Further characteristics and features of Current Transformers used for metering and protection are listed as follows:

##### Metering Current Transformers:

- a) Type: Ring Type
- b) Material:, Resin Cast
- c) Burden: 2.5VA
- d) Ratio: 200-100/1 Amps
- e) Accuracy Class for metering: 0.5

##### Protection Current Transformers:

- a) Type: Ring Type
- b) Material:, Resin Cast
- c) Burden: 2.5VA
- d) Ratio: 200-100/1 Amps
- e) Accuracy Class for protection: 5P10.

#### **9.8 Metering Voltage (Potential) Transformer:**

- i) The Potential Transformers shall be of Resin Cast and they shall conform to IS : 16227, I & III. Their design and construction, in particular, shall be sufficiently robust to withstand the thermal and dynamic stresses during short circuits.
- ii) A panel shall be provided in each Ring Main Unit enclosure to mount Potential Transformers. The primary and secondary contacts (moving & fixed type) shall have firm grip while in service. Service position locking mechanism shall be provided and indicated by bidder in relevant drawing. Rigidity of primary stud point with earth bus in service position shall be confirmed.
- iii) Contact tips of primary/secondary contacts shall be silver plated. Correct polarity shall be distinctly marked on primary and secondary terminal.
- iv) Secondary terminal studs shall be provided with at least three nuts, two plain and two spring washers for fixing leads. The stud nut and washer shall be of brass, duly nickel plated. The minimum outside diameter of the studs shall be 6 mm. The length of at least 15 mm shall be available on the studs for inserting the leads. The space clearance between nuts on adjacent studs when fitted shall be at least 10 mm.
- v) Each secondary core will be protected by suitable MCB.
- vi) HRC fuses shall be provided on the HV side.
- vii) Further characteristics and features of Potential Transformers used for metering are listed as follows:
  - a) Type: Ring Type
  - b) Material:, Resin Cast
  - c) Burden: 50 VA
  - d) Ratio:  $11 \text{ kV}/\sqrt{3} / 110\text{V}/\sqrt{3}$  For 11 kV
  - e) Accuracy Class for metering: 0.5

### **9.9 Auxiliary Voltage (Potential) Transformer:**

- i) The Auxiliary Potential Transformers shall be of Resin Cast and they shall conform to IS:16227, I & III. Their design and construction, in particular, shall be sufficiently robust to withstand the thermal and dynamic stresses during short circuits.
- ii) A panel shall be provided in each Ring Main Unit enclosure to mount Auxiliary Potential Transformers. The primary and secondary contacts (moving & fixed type) shall have firm grip while in service. Service position locking mechanism shall be provided and indicated by bidder in relevant drawing. Rigidity of primary stud point with earth bus in service position shall be confirmed.
- iii) Contact tips of primary/secondary contacts shall be silver plated. Correct polarity shall be distinctly marked on primary and secondary terminal.
- iv) Further characteristics and features of Potential Transformers used for metering are listed as follows:
  - a) Type: Ring Type
  - b) Material:, Resin Cast
  - c) Burden: 500 VA
  - d) Ratio:  $11 \text{ kV}/\sqrt{3} / 230\text{V}$  For 11 kV
  - e) Voltage Regulation: 5 %

**Note:** Instrument transformers shall be suitable for continuous operation at the ambient temperature prevailing inside the Ring Main Unit enclosure, when the Ring Main Unit is

operating at its rated load and the outside ambient temperature is 50°C. The class of insulation shall be E or better.

All instrument transformers shall withstand the power frequency and impulse test voltage specified for the Ring Main Unit assembly. The current transformer shall further have the dynamic and short time ratings at least equal to those specified for the associated Ring Main Unit and shall safely withstand the thermal and mechanical stress produced by maximum fault currents specified when mounted inside the Ring Main Unit enclosure.

The parameters of instrument transformers specified in this specification are indicative and shall be finalized by the Employer during detailed engineering, considering the actual burden of various relays and other devices finally selected. In case the Bidder finds that the specified ratings are not adequate for the relays and other devices offered by him, he shall offer instrument transformer of adequate ratings without any cost implication.

All instrument transformers shall have clear indelible polarity markings. All secondary terminals shall be wired to separate terminals on an accessible terminal block.

#### **9.10 Earthing of Bus bars ( Earth Switch):**

- i) 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.
- ii) 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.

#### **9.11 Circuit Breaker (Vacuum media for arc quenching):**

- i) The 3 pole circuit breaker for the protection of Distribution transformers or feeder 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 16 kA for 3 second.

Rated making current shall be 40 kA for 3 second.

- ii) The manual operation of the circuit breaker shall not have an effect on the spring charging mechanism.
- iii) 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.
- iv) 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.

### **9.12 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 front / rear side of the Ring Main Unit.

### **9.13 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 up to date.

The internal arc fault test on cable box shall be carried out for 11 kV systems for 16 kA/ 1 second.

The clearance between phase to phase and phase to earth shall be as per IEC 61243 - 5 amended up to date. The cable termination and gland arrangements shall be appropriate for the type and style of cables used at the time.

The cable boxes for an isolator in its standard design should have sufficient space for connecting two cables per phase. Necessary Right angle Boot should be supplied to the cable terminations. The type of the Right angle Boot should be cold applied insulating Boot.

### **9.14 Voltage Indicator Lamps and Phase Comparators:**

The Ring Main Unit 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 Ring Main Unit 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.

### **9.15 Extensible:**

Each combination of Ring Main Unit shall have the provision for extension by load break isolators / breakers in future, with suitable trenching chamber, accessories and necessary Bus bars. 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. 16 KA for 3 second for 11kV system. The Breaker should have a rated current carrying capacity of 200 A for Distribution Transformers and Feeders.

### **9.16 Wiring and Terminals:**

- a) 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 automation, DC, Control wiring), Spare terminals shall be provided by the bidder. 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.
- b) The wiring shall be carried out using single core multi-strand copper conductor super flexible PVC insulated and shall be flame retardant low smoke type wires of 1.1 KV

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Grade for AC Power, DC Control and CT circuits. Suitable colored 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.

- c) 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.
- d) 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.
- e) All wires directly connected to trip circuits of breaker or devices shall be distinguished by addition of a red color unlettered ferrule.
- f) 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. Color code for wiring is preferable in the following colors:

Voltage supply: Red, Yellow, Blue for phases, Black for Neutral

CT circuits: Red, Yellow, Blue for phases, Black for Neutral

230V 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.

### **9.17 Earthings:**

The Ring Main Unit outdoor metal clad, Switch Gear, Earth contact of Load break isolators, Neutral and body of Distribution Transformer, M.S. Channels / M.S. Angles etc, shall be equipped with an earth bus securely fixed along the base of the Ring Main Unit.

When several units of the Ring Main Unit (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 bus bar of tinned copper flat shall be as per IEC/IS standards and shall be fixed with the Ring Main Unit. Provision shall be made on end of Ring Main Unit 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.

### **9.18 Motorization :**

All the functions within the Ring Main Unit i.e Isolators / Breakers should be fitted with motor mechanism and closing coil making it suitable to make it ON from remote. Control Supply and Auxiliaries following has to be considered:

- (i) Shunt trip coil – 24VDC for Isolators and Breakers
- (ii) Closing Coil – 24VDC
- (iii) Motor Mechanism – 24VDC
- (iv) 6NO+6NC – Potential free auxiliary contacts for breakers / isolator
- (v) Auxiliary supply should be – 24VDC
- (vi) Battery/ Battery charger with battery backup of at least 1hours
- (vii) Local / Remote switch for breaker and Isolators.

### **9.19 Metering:**

The Ring Main Unit should be provided with separate Metering Module Consisting of Bus connected Potential Transformer and metering cum protection Current Transformer to be provided for VCB function i.e. for Distribution Transformer / Feeder along with provision of installing Tri-vector Meter (TVM). The Potential Transformer with PT Fuse and Ring Core type Current Transformer provided shall be made up of Epoxy Cast Resin. The CT ratio shall as per transformer rating.

### **9.20 Take OFF Terminal Units for Automation:**

The Ring Main Unit should be provided with necessary take off terminal units for automations. Remote operation of the Ring Main Units 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 Ring Main Unit fully energized 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 bidder may wish to advice of options and cost for remote supervisory control units of the Ring Main Unit 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.

**Control and Interlocks:**

The circuit breaker shall normally be controlled remotely from SCADA system closing through Motor and tripping through spring.

The isolators and earth isolator shall normally be controlled remotely from SCADA system closing and opening through Motor.

However, it shall also be designed to control locally from Ring Main Unit panel. Suitable mimic on Panel shall be provided.

Facilities shall be provided for mechanical tripping of the breaker in an emergency. Facility shall also be provided for manual charging of the stored energy mechanism for a complete duty cycle.

Necessary mechanical & Electrical interlocks shall be provided between CB, Isolator & Earth switches for safe operation.

Each CB, Isolator & earth switch shall have 8 NO + 6 NC Auxiliary spare of good quality (corrosion free and easy for making connection) for future use by owner. It should be located at accessible position in panel.

All the binary inputs/outputs shall be wired to the terminals & kept ready for SCADA connectivity.

#### **9.21 Fault Passage Indicators (FPI) on Short Circuit and Earth fault:**

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 Fault Passage Indicators (FPI) shall be integral part of Ring Main Unit.

The Fault Passage Indicators (FPI) shall facilitate for detection of short circuit fault and earth fault through Current Transformer inbuilt in Fault Passage Indicators.

#### **9.22 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.

#### **9.23 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'.

#### **9.24 Automatic Water Level Controller Using Mercury Float Switch:**

The float switch shall be provided in Ring Main Unit at 200 mm below live contacts to avoid flash over due to water.

The float switch is a device used to detect the level of water within the Ring Main Unit. The float switch shall be used in the Ring Main Unit as an indicator, an alarm (at Control Room), tripping of Vacuum Circuit Breaker and opening of Load Break switch.

A mercury switch is a switch whose purpose is to allow the flow of electric current in an electrical circuit in a manner that is dependent on the switch's physical position.

Mercury switches shall have 4 NO + 4 NC Auxiliary contacts in a sealed glass envelope which contains a bead of mercury. The envelope may also contain air, an inert gas, or a vacuum. Gravity is constantly pulling the drop of mercury to the lowest point in the envelope. When the switch is tilted in the appropriate direction, the mercury touches a set of contacts, thus completing the electrical circuit through those contacts. 'Normally Open' contact becomes 'Normally Close' contact, hence signals to breaker and motor for tripping of Vacuum Circuit Breaker and opening of Load Break switch. These signals shall be goes to Sub Station Control Room / SCADA Control Room via RTU with opening reason for further action.



### 9.25 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 Ring Main Unit shall not be increased due to the use of the operating handle. The operating handle should have two workable positions 180° apart.

### 9.26 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.

### 9.27 Danger Board:

The danger Board plate as per relevant IS: 2551, 1982 shall be riveted on the front plate of the Ring Main Unit.

### 9.28 Internal arc rating:

The Ring Main Unit shall have a design such that in the event of an internal arc fault, the operator shall be safe. This should be in accordance with IEC 298 and relevant Test certificates shall be submitted with the Tender.

The Ring Main Unit shall be tested for an internal arc rating of 21 kA for 1 Sec for 11 kV. Suitable temperature rise test on the Ring Main Unit shall be carried out & test reports shall be submitted with tender for technical bid evaluation.

### 9.29 Specific Requirement for Automation:

The Ring Main Units should be provided with provision of following minimum signals available at separate SCADA terminal box.

Minimum signals for SCADA/DMS - to be wired to separate TBs

Sr. No.	Particulars	Contacts
1.	CB Close / Open	Potential free contacts
2.	LBS Close / Open	Potential free contacts
3.	LBS & CB Earth Switch Close / Open	Potential free contacts
4.	CB Test/Service Position	Potential free contacts
5.	Spring charge Status indication	Potential free contacts
6.	SF6 gas pressure low	Potential free contacts
7.	O/C Operated	Potential free contacts

8.	E/F Operated	Potential free contacts
9.	Local/Remote	Potential free contacts
10.	Common Power Supply Healthy	Potential free contacts
11.	Motor MCB Healthy Status	Potential free contacts
12.	Battery charger Fail	Potential free contacts
13.	RMU Door Open	Potential free contacts
14.	CB Trip Coil Healthy	Potential free contacts
15.	Current Transformer Status	Potential free contacts
16.	Potential Transformer Status	Potential free contacts
17.	FPI Control	Potential free contacts
18.	CB control	Potential free contacts
19.	LBS Control	Potential free contacts
20.	Water Level Alarm	Potential free contacts
21.	CB Open	Potential free contacts
22.	LBS Open	Potential free contacts

## A) Specific requirement for SCADA Connectivity:

- i) Fault Passage Indicator shall be provided per isolator
- ii) DC control supply system should be 24V DC.
- iii) Battery charger to cater load of minimum 10 motorized operation cycles (Close-Open) in absence of battery.
- iv) Battery to cater load of minimum 10 motorized operation cycles (Close-Open) in absence of battery charger. The battery backup should be minimum of 6 Hrs.
- v) Miniature Circuit Breakers (MCB) shall be provided for battery charger supply, RMU Motor supply & FRTU supply (Minimum 2 Amp circuit for future use of FRTU).
- vi) Individual control circuit of Isolator/Circuit Breaker to have point of isolation/protection.
- vii) Individual motor circuit of Isolator/Circuit Breaker to have point of isolation/protection.
- viii) The Ring Main Unit shall have minimum protection of IP54 for Outer Enclosure with gland plate & knock outs. Provision for control cable entry should preferably be from Right/ Left top through LV cable box & shall be independent of HV Isolator/Circuit Breaker status. It should be vermin proof.
- ix) Control cable gland plate shall be independent of power cable gland plate.
- x) A point of earthing for control cables shall be electrically isolated from power cable earthing.

- xi) Ambient temperature of 50°C max. Allowable temperature rise of battery & battery charger above ambient 40°C.
  - xii) Local / Remote switch shall be provided on all the isolator & breaker panels for selection of controls.
  - xiii) Current Transformer & Potential Transformer terminals for all the circuit breakers for Distribution Transformers / Feeders only.
- B) Following is the list of I/O requirements for Ring Main Unit modules. Please note that all DI & DO should be potential free contacts.
- i) List of potential free contacts for Isolator (Terminals shall be provided):
    - a) Digital Indications:
      - 1. Isolator ON --02 No. & 2 NC
      - 2. Isolator OFF --02 No. & 2 NC
      - 3. Isolator Earth switch Status (ON/OFF)
      - 4. FPI Operated
      - 5. LOCAL/REMOTE switch position
    - b) List of commands:
      - 1. Isolator Close
      - 2. Isolator Open
      - 3. FPI reset
  - ii) List of potential free Contacts for Circuit Breakers (Terminals shall be provided):
    - a) Digital Indications:
      - 1. Circuit Breaker ON
      - 2. Circuit Breaker OFF
      - 3. Auto Trip
      - 4. LOCAL/REMOTE switch position
    - b) List of commands:
      - 1. Circuit Breaker Close
      - 2. Circuit Breaker Open
  - iii) Requirement of Tri-Vector Meter (TVM):
    - a) The terminals shall be provided for CT and PT Connections
    - b) Space shall be provided for Tri-Vector Meter (TVM) mounting on Outer Enclosure panel

### **9.30 Distribution Automation System Interface:**

The Ring Main Unit shall be equipped so that it can be monitored and controlled via the SCADA. In this respect, it shall interoperate with the RTU that will be housed in the Ring Main Unit Control Cabinet. The RTU in turn will interoperate with the SCADA via the remote communications system.

The Ring Main Unit shall have provisions for opening and closing its switches / breakers using output from the RTU. The Ring Main Unit shall also supply analog and status signals to the RTU for monitoring the condition of the Ring Main Unit's distribution network circuits as well as the components of the Ring Main Unit.

## **10.0 Tests:**

### **a. Type tests:**

The Ring Main Unit and accessories 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. The bidder must provide the original copies of type test reports for verification purpose or produce authentic documents to confirm the type tests are authentic in case of tests carried out at equivalent International Laboratories

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.

Type tests:

- i) Short time current withstand test and peak current withstand test.
- ii) Lightning Impulse voltage with-stand test
- iii) Temperature rise test.
- iv) Short Circuit current making and breaking tests.
  - v) Power frequency voltage withstand test (dry).
  - vi) Capacitive current switching test confirming to IEC.
  - vii) Mechanical operation test.
- viii) Measurement of the resistance of the main circuit.
- ix) Degree of protection of Inner enclosure and outer enclosure
- x) Switch, circuit breaker, earthing switch making capacity.
- xi) Switch, circuit breaker breaking capacity.
- xii) Internal arc withstand Test for Inner Enclosure and Cable Chamber.
- xiii) 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.

In addition to that, Test report of Vacuum Interrupter along with Catalogues &

Literatures to be submitted along with the Offer.

**b. Acceptance and 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 dispatch.

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

After finalization of the program of 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) , MMC, MSEDCL.

All the Ring Main Units must be routine tested for the following:

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 / SF6 gas leak test.
6. Dielectric testing and main circuit resistance measurement.
7. Power frequency voltage
8. Resistance test for the circuit
9. Mechanical operation tests.
10. Micro-ohm test for the assembly inside the tank.
11. Circuit breaker analyzer test so as to ensure the simultaneous closing of all poles for VCB.
12. Partial Discharge test on the complete gas tank so as to be assure of the proper insulation level and high product life.
13. High voltage withstands.
14. Secondary test to ensure the proper functioning of the live line indicators, fault passage indicators and relays.

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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.

### **11.0 Inspection:**

The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder 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 program 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 program.

### **12.0 Qualifying Requirement:**

- a) The Bidder should have proven experience of not less than 10 years in design, manufacture, supply and testing at work for Ring Main Units and accessories offered for equal or higher voltage class. The Ring Main Units and accessories offered by bidder should be in the successful operation, at least for five years as on the date of submission of the tender.
- b) The bidder should have adequate in house testing facilities for conducting acceptance / routine tests in accordance with relevant IS.
- c) Bidder 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, MM Cell is requested to verify this point.
- d) The bidder should furnish all the relevant documentary evidence to establish the fulfillment of the above requirement.
- e) The bidders not meeting the requirement at clause No. 12,(a) 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 Ring Main Units and accessories of same 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.

### **13.0 Prototype Sample:**

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

### **14.0 Manufacturing Facilities:**

As Ring Main Units 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.
6. Computerized SF6 filling and testing facility.
7. Partial Discharge Lab for conducting the partial discharge test.

### **15.0 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 bidder's representative, copies of test certificates.

- 2) Information and copies of test certificates as in (1) 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 Ring Main Unit 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.

1. List of raw materials as well bought out accessories and the names of sub-suppliers selected from those furnished along with offer.
2. Necessary test certificates of the raw material and bought out accessories.
3. 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.

## 16.0 Drawings and Documentations:

All drawings shall conform to relevant IEC Standards Specification. All drawings shall be in clear and visible.

The Bidder shall submit following drawings for approval:

- i) General Arrangement Drawing.
- ii) General Arrangement Drawing with Door Open.
- iii) Name Plate Drawing.
- iv) Foundation Drawing.
- v) Single Line Diagram Drawing.
- vi) MIMIC Diagram Drawing.
- vii) Control Schematic Wiring Diagram of Load Break Switch.
- viii) Control Schematic Wiring Diagram of Circuit Breaker.
- ix) Control Schematic Wiring Diagram of Earth Switch.
- x) Control Schematic Wiring Diagram of Automatic Water Level Controller.
- xi) Control Schematic Wiring Diagram of Voltage Indicator Lamps.
- xii) Control Schematic Wiring Diagram of Fault Passage Indicators (FPI).
- xiii) Terminal Block Drawing.
- xiv) Mechanical Interlock Drawing.
- xv) Electrical Interlock Drawing.
- xvi) SF6 Monitoring Pressure Switch and Indication Schematic Drawing.
- xvii) Schematic Wiring Diagram of Metering Unit.
- xviii) Vacuum Interrupter Drawing.
- xix) Danger Plate Drawing.
- xx) Two Cable Arrangement Drawing.
- xxi) Technical Detail Sheet Drawing.
- xxii) Bill of Material.
- xxiii) Packing List.

1. After issue of letter of acceptance, the successful bidders shall submit 3 identical sets of complete drawings along with detailed bill of materials for approval, to the Chief Engineer (Testing), 5th 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.
2. The manufacturing of the Ring Main Units shall be strictly in accordance with the approved drawings and no deviation will be permitted without the written approval of MSEDCL. All manufacturing and fabrication work in connection with the Ring Main Units prior to the approval of the drawings shall be at the supplier's risk and cost.
3. Approval of drawings by the purchaser shall not relieve the supplier of any of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the latest revisions of applicable standards, rules and codes of practices.
4. After approval of the drawings detailed packing lists and bills of materials, the suppliers 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.
5. Before dispatch of Ring Main Units 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 (MMD), 1st floor, Prakashgad, Bandra(E), Mumbai positively before the dispatch of Ring Main Units. 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 Ring Main Units consignment and shall be listed out in the packing list, when submitted for approval.

6. In case the supplier fails to furnish contractual drawings and manuals even at the time of supply of Ring Main Units, the date of furnishing of drawings/manuals will be considered as the date of supply of Ring Main Units for the purpose of computing penalties for late delivery.
  7. The successful bidder shall furnish in the form of nicely bound volumes, the manuals covering erection, commissioning, operation and maintenance instructions and all relevant information and drawings pertaining to the Ring Main Unit as well as auxiliary devices. Marked erection drawings shall identify the component parts of the Ring Main Unit as shipped to enable Engineer/Purchaser to carry out erection with his own personnel. Each manual shall also contain one set of all the approved drawings type test reports as well as acceptance test reports to corresponding consignment dispatched. The total quantity of the operating manuals/approved drawings sets to be supplied by the supplier shall be equal to the number of Ring Main Units ordered.
- b.** The Bidder shall submit along with his tender illustrative and descriptive literature in triplicate for various items in the Ring Main Units, which are all essentially required for automation.

The Bidder shall submit following documents along with the tender:

- i) Instruction manuals.
- ii) Catalogues of spares recommended with drawing to indicate each items of spares.
- iii) List of spares and special tools recommended by the supplier.
- iv) Copies of Type Test Certificates as per latest IS/IEC.
- v) Dimensional drawings of each material used for item.
- vi) Actual single line diagram of Ring Main Unit with or without extra combinations shall be made displayed on the front portion of the Ring Main Unit so as to carry out the operations easily.

Operation, Maintenance and erection instruction manual in English language shall be also supplied along with each Ring Main Unit to the respective consignee as per the dispatch instructions given from Material Management Cell under CE (MMD), Corporate Office, Mumbai. The successful bidder shall submit the drawings, bill of materials, packing lists, etc. in time and get these approved from the office of Chief Engineer (Testing), 5th floor, Prakashgad, MSEDCL, Mumbai.

#### **17.0 Name Plate:**

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

- b. Name of manufacturer.
- c. Type.
- d. Serial number.
- e. Voltage.
- f. Current.
- g. Frequency.
- h. Symmetrical breaking capacity.

- i. Making capacity.
- j. Short time current and its duration.
- k. Purchase Order number and date.
- l. Month and Year of supply.
- m. Rated lighting impulse withstands voltage.

### **18.0 Packing and 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:

- a. Name of the consignee.
- b. Details of consignment
- c. Destination.
- d. Total weight of consignment.
- e. Sign showing upper/lower side of the crate.
- f. Handling and unpacking instructions.
- g. Bill of material indicating contents of each package.

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

The bidder 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 bidder to submit the drawings, bill of materials, packing lists, etc. in time and get these approved from the office of Chief Engineer (Quality Control and Testing), 5th 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.

### **19.0 Training:**

All successful bidders for Ring Main Units 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 finalized 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.

## **20.0 Performance Guarantee:**

All Ring Main Units and accessories supplied against this specification shall be guaranteed for a period of 66 months from the date of receipt at the consignee's Stores Center 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.

## **21.0 Annexure:**

The bidder shall fill in the following Annexure 'A' which forms part of the Tender Specification and offer. If the Annexure 'A' is not submitted duly filled in with the offer, the offer shall be liable for rejection.

Annexure 'A' - Principal Technical Parameters of Ring Main Units.

## **22.0 Schedules:**

The bidder shall fill in the following Schedule which forms part 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 Technical Particulars of 11 kV Ring Main Units.

Schedule - 'B' - List of Type Test Reports to be enclosed with the offer

Schedule - 'C' - Schedule of Deviations from Specification

Schedule - 'D' - Schedule of Bidder's Experience

Schedule - 'E' - Schedule of Deviations from Specified Standards

Schedule - 'F' - Deviations from specified Test requirements specified in Relevant Standards and Present Specification

Schedule - 'G' - Proforma of Undertaking

The Bidder shall submit the list of orders for supply of Ring Main Units executed or under execution during last three years, with full details, in the schedule of Bidders experience (Schedule 'D') to enable the purchaser to evaluate the tender.

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

## **23.0 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.

### Annexure 'A'

#### Principal Technical Parameters of Ring Main Unit and accessories:.

Sr. No.	Description	11 kV Ring Main Unit
<b>A)Ring Main Unit Assembly</b>		
1	Indoor / Out door	Indoor / Out door
2	Configurations(Type)	3 Way, M+LLV+
		4 Way, +LLLL+
		4 Way, M+LLL+
		4 Way, M+LLVV+
		5 Way, M+LLVVV+
		6 Way, +LLVVV+V+
		L= Isolator.
		V= VCB.
		M=Metering
3	Reference Standard	IEC-62271-100, 200, 103 and IEC-60694
4	Rated Voltage in kV	11
5	Highest System Voltage in kV, Max.	12
6	Number of Phase	3
7	Frequency in HZ.	50 Hz
		$\pm 3\%$
8	Short Circuit rating	
	a) Breaking Symmetrical for 3 Sec. in KA	16
	b) Breaking Asymmetrical for 3 Sec. in KA	16
	c) Short time for 3 Sec. in KA.	16
9	Insulation Level	
	a) Impulse withstand in KV peak.	75
	b) 1 Minute 50 Hz. Voltage withstand in KV rms	28
10	Internal arc rating for 1 sec. in kV	16
11	Construction: Material and Size	
	Inner Enclosure	Main Stainless Steel Tank with 2 mm Thickness

11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

	Outer Enclosure	CRCA Sheet of 2 mm thickness or Galvanized Sheet of 1.6 mm thickness
12	Degree of protection	
	Inner Enclosure	IP 67
	Outer Enclosure	IP 54 (Main Door close) and IP 41 (Main Door open)
13	The Ring Main Unit and accessories completely wire and tested at factory	Yes
14	Paint	Polyurethane based powder paint
15	Color	Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007
16	Thickness of coat, Min.	150 microns for CRCA Sheet and 80 microns for galvanized Sheet
<b>B) Bus Bar</b>		
17	Reference Standard	IS: 1897, 2008
18	Grade and Material	Electrolytic Grade Copper
19	Cross sectional area in mm <sup>2</sup>	400
20	Size in mm or as per design	40 x 10
21	Current Density in Amps/mm <sup>2</sup> , Max.	1.6
22	Continuous Current in Amps	630
23	Maximum temperature rise over an ambient temperature 50°C.	55°C
24	Short time current rating for 3 Sec in kA rms	16
25	Clearance in mm from bare bus bar or as per design	
	Phase to Phase for Isolator or as per design	60
	Phase to Phase for VCB	60
	Phase to Earth for Isolator or as per design	60
	Phase to Earth for VCB or as per design	60
26	Bus Supports	
	Reference Standard	IEC 60243-1, ASTM D 648

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

	Voltage Class in kV	11 kV
	Creepage distance in mm or as per design	115 in SF6 gas
	Bus Bar support spacing in mm or as per design	120
27	Filling SF6 gas pressure (Filling pressure at 20°C), Min.	1.4 Bar
28	Operating SF6 gas pressure at 20°C, Min.	0.5 Bar
<b>C)Vacuum Circuit Breaker</b>		
29	Reference Standard	IEC 62271-100
30	Rated Voltage in kV	11
31	Highest System Voltage in kV, Max.	12
32	Type	Vacuum Type
33	Rated Frequency in Hz.	50 Hz
		± 3%
34	No. of Poles	3
35	Rated Current	630A
36	Maximum temperature rise over an ambient temperature 50°C.	55°C
37	Rated operating Duty	O-3min-CO-3min-CO
38	Rupturing capacity at rated voltage in MVA, Min.	As per design
39	Breaking Capacity at rated voltage & operating duty	
	Symmetrical in kA rms	16
	Asymmetrical in kA rms	16
40	Rated making current in kA peak	40
41	Short time current for 3 sec in kA rms	16
42	Transient Recovery Voltage	
	Rate of rise in kV/μs	0.34 kV/μs as per IEC 62271-100
	Peak Voltage in kV	28
43	Insulation Level	
	Impulse Voltage with stand on 1.2/50 μs full wave in kV	75

11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

	1 minute power frequency voltage withstand in kV	28
44	Total breaking time for transient fault ( CB + Relay+ trip coil) in ms	45-50 ms
45	Opening time No load condition in ms	45-50 ms
46	Opening time under SF6 gas low or vacuum loss condition in ms	45-50 ms
47	Number of breaks per pole	Single
	No of breaker operations permissible without requiring inspection replacement of contacts and other Main parts	
48		
	At 100% rated current	2000
	At 100% rated breaking current, Min.	20
	Type of contacts	
49		
	Main	Butt Type
	Arcing	Butt Type
50	Material of contacts	
	Main	Copper
	Arching	Copper
	Chromium / Silver plated	Chromium / Silver plated
51	Mechanical Endurance Test for Circuit Breaker, Number of operations	
		2000
52	Spring charging mechanism	Motor Operated
53	Operating mechanism for closing of Circuit Breaker	
	Type	Spring operated Mechanism
	No of breaker operations stored	One
	Trip free or fixed trip	Trip Free

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material, Min.	Electrolytic grade Copper 25 x 3mm
54	Operating mechanism for tripping of Circuit Breaker	
	Type	Spring Operated Mechanism
	No of breaker operations stored	One
	Trip free or fixed trip (V)	Trip Free
	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material	Electrolytic grade Copper 25 x 3mm
55	Breaker Accessories	
	Mechanical safety Interlock	Provided
	Automatic safety Interlock	Provided
	Operational Interlock	Provided
	Emergency manual trip	Provided
	Operation counter	Provided
	Spring charge / discharge indicator	Provided
	Manual spring charging facility	Provided
<b>D) Isolators</b>		
56	Reference standard	IEC-62271-102 / IEC-62271-103
57	Nominal Voltage in KV	11
58	Highest System Voltage in kV, Max.	12
59	Rated Frequency in HZ	50 Hz
		± 3%
60	No. Of poles	3
61	Rated Current in Amps	630
62	Maximum temperature rise over an ambient temperature 50°C.	60°C
63	Operation	Close-Open-Earth
64	Rupturing Capacity at rated voltage	630Amps at 11kV
65	Maximum over voltage factor when switching off Loaded feeder	40

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker



	cable in kA	
66	No. of isolator operation permissible without requiring inspection,	
	replacement of contacts and other main parts	
	Mechanical Endurance in Number of operations	1000
	At 100% rated making current in Number of operations	
		100
	At 100% rated breaking current in Number of operations	100
67	Isolator provided with the following Mechanical safety	
	Mechanical ON and OFF Indication	Provided
	Cable Earth Indication	Provided
	Operational Counter	Provided
	Manual Spring Charging facility	Provided
<b>E) Current Transformer</b>		
68	Reference standard	IS:16227, I & II
69	Type	Ring Type, Resin Cast/Tape wound
70	Nominal Voltage in KV	11
71	Highest System Voltage in kV, Max.	12
72	Rated Frequency in HZ	50 Hz
		± 3%
73	Current Transformer Ratio	200-100/1Amps
74	Short circuit withstand	
	i) Short time current for 1 sec. in kA rms	5
	Dynamic current in kA peak, Min.	7.5
75	Class of insulation	Class B
76	Basic insulation level in kV rms	3

77	Maximum temperature rise over an ambient temperature 50°C.	60°C
78	Class of Accuracy	
	Metering Core	0.5
	Protection Core	5P10
79	Rated Burden	2.5 VA
80	Over Current Rating in %	120
81	Continuous Over Load in %	120
<b>F) Metering Voltage(Potential) Transformer</b>		
82	Reference standard	IS:16227, I & III
83	Type	Resin Cast/Tape wound
84	Nominal Voltage in KV	11
85	Highest System Voltage in kV, Max.	12
86	Rated Frequency in HZ	50 Hz
		± 3%
87	Voltage Transformer Ratio	11 kV/√3 /110V/√3
88	Rated Primary Voltage in kV	11 kV/√3
89	Rated Secondary Voltage in V	110V/√3
90	Rated Burden in VA	50
91	Accuracy Class	0.5
92	Insulation Class	B
93	Voltage Factor	1.2 Continuous and 1.9 for 8 hrs.
94	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	28
	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	75
<b>G) Auxiliary Voltage(Potential) Transformer</b>		
95	Reference standard	IS:16227, I & III
96	Type	Resin Cast/Tape wound
97	Nominal Voltage in KV	11
98	Highest System Voltage in kV, Max.	12
99	Rated Frequency in HZ	50 Hz

11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

		$\pm 3\%$
100	Voltage Transformer Ratio	11 kV / 230V
101	Rated Primary Voltage in kV	11 kV
102	Rated Secondary Voltage in V	230 V
103	Rated Burden in VA	500 VA
104	Voltage Regulation in %	5
105	Insulation Class	B
106	Voltage Factor	1.2
107	Application & Construction Type	Indoor, Single Phase/Two Pole
108	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	28
	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	75
<b>H) Numerical Protection Relay</b>		
109	Reference Standard	IEC 60255
110	Type and Model	3 Over Current(O/C) and 1 Earth fault(E/F)
111	Current Transformer Secondary Input to Relay	1:00 AM
112	Operating Curve Type	Inverse Definite Minimum Time (IDMT)Relay
113	Auxiliary Supply	Self Powered relay for Protection
114	Rated Frequency in HZ	50 Hz
		$\pm 3\%$
115	Over Current Protection	
	Low set Over Current protection	20-200% of CT secondary rated current with increment/decrement by 1 %
	High set Over Current protection	100-2000% of CT secondary rated current with increment/decrement by 50%
116	Earth Fault Protection	
	Low set Earth Fault protection	5% to 80% of the CT rated current in steps of 1%
	High set Earth Fault protection	100-1000% of the CT rated current in steps of 50%
117	Mounting	Flush Mounted

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

118	Operational Indicator	LCD display and LED annunciation lamps
119	Contact Details	4 Binary Input(BI) and 6 Binary output(BO)
120	Self-diagnosis feature	Yes
121	Password protection	Yes
122	Communication Protocol	RS 232 or RS 485 Port for IEC 103, Communication Protocol
123	Event / fault record, Min.	10 Event and 5 Fault Records available
124	Setting groups	2 Groups available
125	Circuit Breaker control available	Yes, Only Trip
<b>I) Tripping Coil</b>		
126	DC Voltage in Volt	24
127	Maximum Tripping Current at rated voltage in Amps.	5
	Minimum Permissible voltage variation in %	85 to 110
<b>J) HT three phase four wire CT / PT operated 1 Amps fully Static &amp; AMR compatible TOD Tri - vector Energy Meter</b>		
128	Reference Standard	IS: 14697, 1999
		IS: 15959, 2011
129	Make	Secure / L&T / other MSEDCL approved make
130	Auxiliary supply Voltage	110V/ $\sqrt{3}$
131	Class of Accuracy	0.5S
132	Type of Display	Customized backlite liquid crystal display
133	Measuring Parameters as per MSEDCL Specification	
		Instantaneous parameters
		Block Load Profile parameters
		Billing Profile Parameters
		Name Plate details
		Programmable Parameters
		Event Conditions
		All logging parameters for each of the event condition for 3 $\Phi$ / 4W
<b>K) Fault Passage Indicator (FPI) on Short Circuit and Earth fault</b>		
134	Operating point/Current short circuit in Amp	Adjustable
		100/200/300

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

		/400/500
		/600/700
		/800/900/1000
		/1100/1200A ( $\pm 15\%$ )
135	Operating point/Current earth fault in Amp	Adjustable
		10/20/30/40
		/60/80/100A ( $\pm 15\%$ )
136	Response Time in ms	For Short Circuit Adjustable
		40/60/80/100/120
		/160/200/240 ms Sec( $\pm 100$ m Sec)
		For Earth Fault Adjustable
		40/60/80/160 ms ( $\pm 100$ m Sec)
137	Auto Reset Time in Hrs	1/2/4/8 hrs (+ / - 1%) after fault
<b>L) Battery Charger</b>		
138	Input AC Voltage in V	230
139	Rated Frequency in Hz	50 Hz
		$\pm 3\%$
140	Output DC Voltage in V	24
141	Current Rating in Amps	10
142	Output DC Voltage for charger	
	Boost Mode in V	27 to 28
	Float Mode in V	27 to 28
143	Operating Temperature in $^{\circ}\text{C}$	-25 to 60
144.	Temperature Compensation	Junction temperature of SMPS crosses $142^{\circ}\text{C}$ , thermal shutdown occurs.
145	Short Circuit and Overload Protection	Provided
146	High Voltage Isolation	2 kV for 1 minute
147	Efficiency	Above 85 %
<b>M) Battery</b>		
148	Type	Dry Type
149	Ah Efficiency	> 95%
150	Self-Discharge	Self-Discharge
151	Operating Temperature	Normal : $+20^{\circ}\text{C}$ to $+30^{\circ}\text{C}$ &
		Limits : $-20^{\circ}\text{C}$ to $+50^{\circ}\text{C}$
152	Voltage (V)	24V (2 x 12V)
153	Ah Capacity	7Ah / 12 Ah / 26 Ah
<b>N) Manometer with Non Return Valve</b>		
154	Type	Analogue
155	Material	Stainless Steel

11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

156	Accuracy of calibration pressure	+/-1% at 20°C
157	Pressure Element	Stainless Steel Welded
158	Dial	2"
159	Pointer	Dark
160	Window	Round
161	Gas pressure low signal	Indicated by Red Color Zone
162	Non Return Valve(NRV) Material	Stainless Steel
<b>O) Indoor cable terminations kits</b>		
163	Type	11 kV touch proof screened termination kit
164	Materials	Epoxy / EPDM / Silicon Rubber
165	Size	Up to 3 x 400 sq. mm 11 kV HT cables
166	Height of Bus bar / transformer / feeder Cable box from ground level	As per Manufacture design
167	Arrangement for mounting an extra cable at incoming and outgoing side box of Bus bar.	As per Manufacture design
168	Arrangement for mounting an extra cable at outgoing side box of transformer / feeder.	As per Manufacture design
<b>P) Automatic Water Level Controller</b>		
172	Position of Automatic Water Level Controller	200 mm below live contacts
173	Auxiliary contacts	4 NO + 4 NC
174	Breaker Tripping and Load break Isolator opening due to water level increases signals to Control room	Yes
<b>Q) Name Plate</b>		
175	Material	Anodized Aluminum / Stainless Steel
176	Thickness	18 swg / 1.00 mm
177	Size	145 mm x 116 mm
<b>R) Painting</b>		
178	Inside	Powder Coated
179	Outside	Polyurethane based powder paint. Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.

11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

**Schedule 'A'**

**Guaranteed Technical Parameters of 11 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker**

Sr. No.	Description	11 kV Ring Main Unit	Parameters to be filled by Bidder
<b>A) Ring Main Unit Assembly</b>			
1.	Indoor / Out door	Indoor / Out door	
2.	Manufacturer's Name & address		
3.	Manufacturer's Type Designation		
4.	Model		
5.	Configurations(Type)	L= Isolator. V= VCB. M=Metering	
	i) Configurations	3 Way, M+LLV+	
	ii) Configurations	4 Way, +LLLL+	
	iii) Configurations	4 Way, M+LLLV+	
	iv) Configurations	4 Way, M+LLVV+	
	v) Configurations	5 Way, M+LLVVV+	
	vi) Configurations	6 Way, +LLVVV+V+	
6.	Reference Standard	IEC-62271-100, 200, 103 and IEC-60694	
7.	Rated Voltage in kV	11	
8.	Highest System Voltage in kV, Max.	12	
9.	Number of Phase	3	
10.	Frequency in HZ.	50 Hz $\pm$ 3%	
11.	Short Circuit rating		
	a) Breaking Symmetrical for 3 Sec. in KA	16	
	b) Breaking Asymmetrical for 3 Sec. in KA	16	
	c) Short time for 3 Sec. in KA.	16	
12.	Insulation Level		
	a) Impulse withstand in KV peak.	75	
	b) 1 Minute 50 Hz. Voltage withstand in KV rms	28	
13.	Internal arc rating for 1 sec. in kV	21	
14.	Construction: Material and Size		
	a) Inner Enclosure	Main Stainless Steel Tank with 2 mm Thickness	
	b) Outer Enclosure	CRCA Sheet of 2 mm thickness or Galvanized Sheet of 1.6 mm thickness	
15.	Degree of protection		
	a) Inner Enclosure	IP 67	
	b) Outer Enclosure	IP 54 (Main Door close)	

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

		and IP 41 (Main Door open)	
16.	The Ring Main Unit and accessories completely wire and tested at factory	Yes	
17.	Paint	Polyurethane based powder paint	
18.	Color	Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007	
19.	Thickness of coat, Min.	150 microns for CRCA Sheet and 80 microns for	
<b>Overall Dimensions and Weight</b>			
20.	Tolerance to Overall Dimensions	+ 5 %	
	1.Extensible 3 Way RMU(3 Way, M+LLV+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
	2. Extensible 4 Way RMU(4 Way, +LLLL+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
	3. Extensible 4 Way RMU(4 Way, M+LLL+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
	4. Extensible 4 Way RMU(4 Way, M+LLVV+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
	5. Extensible 5 Way RMU(5 Way, M+LLVVV+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
	6. Extensible 6 Way RMU(6 Way, +LLVVV+V+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
<b>B) Bus Bar</b>			
21.	Make	As per Manufacture Design	
22.	Reference Standard	IS: 1897, 2008	
23.	Grade and Material	Electrolytic Grade Copper	
24.	Cross sectional area in mm <sup>2</sup>	400	
25.	Size in mm	40 x 10 or as per Manufacture design	

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker



11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

26.	Current Density in Amps/mm <sup>2</sup> , Max.	1.6	
27.	Continuous Current in Amps	630	
28.	Maximum temperature rise over an ambient temperature 50°C.	55°C	
29.	Short time current rating for 3 Sec in kA rms	16	
30.	Clearance in mm from bare bus bar		
	a) Phase to Phase for Isolator or as per design	60	
	b)Phase to Phase for VCB or as per design	60	
	c)Phase to Earth for Isolator or as per design	60	
	d)Phase to Earth for VCB or as per design	60	
31.	Bus Supports		
	i)Make	As per Manufacture Design	
	ii)Type	As per Manufacture Design	
	iii)Reference Standard	IEC 60243-1, ASTM D 648	
	iv)Voltage Class in kV	11 kV	
	v) Creepage distance in mm or as per design	115 in SF <sub>6</sub> gas	
	vi)Bus Bar support spacing in mm or as per design	120	
32.	Filling SF <sub>6</sub> gas pressure (Filling pressure at 20°C), Min.	1.4 Bar	
33.	Operating SF <sub>6</sub> gas pressure at 20°C, Min.	0.5 Bar	
<b>C)Vacuum Circuit Breaker</b>			
34.	Make	As per Manufacture Design	
35.	Type	As per Manufacture Design	
36.	Reference Standard	IEC 62271-100	
37.	Rated Voltage in kV	11	
38.	Highest System Voltage in kV, Max.	12	
39.	Type	Vacuum Type	
40.	Rated Frequency in Hz.	50 Hz ± 3%	
41.	No. of Poles	3	
42.	Rated Current	630A	
43.	Maximum temperature rise over an ambient temperature 50°C.	55°C	
44.	Rated operating Duty	O-3min-CO-3min-CO	
45.	Rupturing capacity at rated voltage in MVA, Min.	400	
46.	Breaking Capacity at rated voltage & operating duty		
	i)Symmetrical in kA rms	16	
	ii)Asymmetrical in kA rms	16	
	iii)Rated making current in kA peak	40	

11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

47.	Short time current for 3 sec in kA rms	16	
48.	Transient Recovery Voltage		
	i)Rate of rise in kV/ $\mu$ s	0.34 kV/ $\mu$ s as per IEC 62271-100	
	ii)Peak Voltage in kV	28	
49.	Insulation Level		
	a)Impulse Voltage with stand on 1.2/50 $\mu$ s full wave in kV	75	
	b)1 minute power frequency voltage withstand in kV	28	
50.	Vacuum Bottle		
	i)Make	As per Manufacture Design	
	ii)Type	As per Manufacture Design	
	iii)Rated Voltage in kV	As per Manufacture Design	
	iv)Rated Current in Amps.	As per Manufacture Design	
51.	Total breaking time for transient fault ( CB + Relay+ trip coil) in ms	45-50 ms	
52.	Opening time No load condition in ms	45-50 ms	
53.	Opening time under SF6 gas low or vacuum loss condition in ms	45-50 ms	
	i)At 100% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	
	ii)At 60% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	
	iii)At 30% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	
	iv)At 10% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	

		Design	
54.	Number of breaks per pole	Single	
55.	No of breaker operations permissible without requiring inspection replacement of contacts and other Main parts		
	a)At 100% rated current	2000	
	b)At 100% rated breaking current, Min.	20	
56.	Type of contacts		
	i)Main	Butt Type	
	ii)Arcing	Butt Type	
57.	Material of contacts		
	i)Main	Copper	
	ii)Arching	Copper	
	iii)Chromium / Silver plated	Chromium / Silver plated	
58.	Mechanical Endurance Test for Circuit Breaker, Number of operations	2000	
59.	Spring charging mechanism	Motor Operated	
60.	Operating mechanism for closing of Circuit Breaker		
	i)Type	Spring operated Mechanism	
	ii)No of breaker operations stored	One	
	iii)Trip free or fixed trip	Trip Free	
	iv)Earthing for operating mechanism and metal parts	Solidly Earthed	
	v)Earth terminal size and material, Min.	Electrolytic grade Copper 25 x 3mm	
61.	Operating mechanism for tripping of Circuit Breaker		
	i)Type	Spring Operated Mechanism	
	ii)No of breaker operations stored	One	
	iii)Trip free or fixed trip (V)	Trip Free	
	iv)Earthing for operating mechanism and metal parts	Solidly Earthed	
	v)Earth terminal size and material	Electrolytic grade Copper 25 x 3mm	
	vi)Spring charging mechanism		
	a)Make	As per Manufacture Design	
	b)Type	As per Manufacture Design	
	c)Motor, Voltage and Watts	As per Manufacture Design	
62.	Breaker Accessories		
	i)Mechanical safety Interlock	To be Provided	
	ii)Automatic safety Interlock	To be Provided	
	iii)Operational Interlock	To be Provided	
	iv)Emergency manual trip	To be Provided	
	v)Operation counter	To be Provided	

11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

	vi)Spring charge / discharge indicator	To be Provided	
	vii)Manual spring charging facility	To be Provided	
63.	Impact load on foundation design (to include dead load plus impact value on Closing at maximum interrupting rating)in kg		
	i)Extensible 3 Way RMU(3 Way, M+LLV+)	As per Manufacture Design	
	ii)Extensible 4 Way RMU(4 Way, +LLLL+)	As per Manufacture Design	
	iii)Extensible 4 Way RMU(4 Way, M+LLLLV+)	As per Manufacture Design	
	iv)Extensible 4 Way RMU(4 Way, M+LLVV+)	As per Manufacture Design	
	v)Extensible 5 Way RMU(5 Way, M+LLVVV+)	As per Manufacture Design	
	vi)Extensible 6 Way RMU(6 Way, +LLVVV+V+)	As per Manufacture Design	
<b>D)Isolators</b>			
64.	Make	As per Manufacture Design	
65.	Type	As per Manufacture Design	
66.	Reference standard	IEC-62271-102 / IEC-62271-103	
67.	Nominal Voltage in KV	11	
68.	Highest System Voltage in kV, Max.	12	
69.	Rated Frequency in HZ	50 Hz $\pm$ 3%	
70.	No. Of poles	3	
71.	Rated Current in Amps	630	
72.	Maximum temperature rise over an ambient temperature 50°C.	60°C	
73.	Operation	Close-Open-Earth	
74.	Rupturing Capacity at rated voltage	630Amps at 11kV	
75.	Maximum over voltage factor when switching off Loaded feeder cable in kA	40	
76.	No. of isolator operation permissible without requiring inspection, replacement of contacts and other main parts		
	i)Mechanical Endurance in Number of operations	1000	
	ii)At 100% rated making current in Number of operations	100	
	iii)At 100% rated breaking current in Number of operations	100	
77.	Isolator provided with the following Mechanical safety		
	a)Mechanical ON and OFF Indication	To be Provided	
	b)Cable Earth Indication	To be Provided	
	c)Operational Counter	To be Provided	
	d)Manual Spring Charging facility	To be Provided	

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

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<b>E) Current Transformer</b>			
78.	Make	As per Manufacture Design	
79.	Reference standard	IS:16227, I & II	
80.	Type	Ring Type, Resin Cast/Tape wound	
81.	Nominal Voltage in KV	11	
82.	Highest System Voltage in kV, Max.	12	
83.	Rated Frequency in HZ	50 Hz $\pm$ 3%	
84.	Current Transformer Ratio	200-100/1Amps	
85.	Short circuit withstand		
	i) Short time current for 3 sec. in kA rms	5	
	ii) Dynamic current in kA peak, Min.	7.5	
86.	Class of insulation	Class B	
87.	Basic insulation level in kV	3	
88.	Maximum temperature rise over an ambient temperature 50°C.	60°C	
89.	Class of Accuracy		
90.	Metering Core	0.5	
91.	Protection Core	5P10	
92.	Rated Burden	2.5 VA	
93.	Over Current Rating in %	120	
94.	Continuous Over Load in %	120	
<b>F) Metering Voltage(Potential) Transformer</b>			
95.	Make	As per Manufacture Design	
96.	Reference standard	IS:16227, I & III	
97.	Type	Resin Cast/Tape wound	
98.	Nominal Voltage in KV	11	
99.	Highest System Voltage in kV, Max.	12	
100.	Rated Frequency in HZ	50 Hz $\pm$ 3%	
101.	Voltage Transformer Ratio	11 kV/ $\sqrt{3}$ /110V/ $\sqrt{3}$	
102.	Rated Primary Voltage in kV	11 kV/ $\sqrt{3}$	
103.	Rated Secondary Voltage in V	110V/ $\sqrt{3}$	
104.	Rated Burden in VA	50	
105.	Accuracy Class	0.5	
106.	Insulation Class	B	
107.	Voltage Factor	1.2 Continuous and 1.9 for 8 hrs.	
108.	One Minute Power Frequency Dry Withstand Voltage Rating		
	a) Primary Winding Induced Test in kV rms	28	
	b) Secondary Winding in kV rms	3	
	c) Rated Impulse Voltage in kV peak	75	
<b>G) Auxiliary Voltage(Potential) Transformer</b>			
109.	Make	As per Manufacture Design	
110.	Reference standard	IS:16227, I & III	
111.	Type	Resin Cast/Tape wound	
112.	Nominal Voltage in KV	11	
113.	Highest System Voltage in kV, Max.	12	
114.	Rated Frequency in HZ	50 Hz $\pm$ 3%	

11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

115.	Voltage Transformer Ratio	11 kV/ $\sqrt{3}$ / 230V	
116.	Rated Primary Voltage in kV	11 kV/ $\sqrt{3}$	
117.	Rated Secondary Voltage in V	230 V	
118.	Rated Burden in VA	500 VA	
119.	Voltage Regulation in %	5	
120.	Insulation Class	B	
121.	Voltage Factor	1.2	
122.	Application & Construction Type	Indoor, Single Phase/Two Pole	
123.	One Minute Power Frequency Dry Withstand Voltage Rating		
	a)Primary Winding Induced Test in kV rms	28	
	b)Secondary Winding in kV rms	3	
	c)Rated Impulse Voltage in kV peak	75	
<b>H) Numerical Protection Relay</b>			
124.	Make	As per Manufacture Design	
125.	Type and Model	As per Manufacture Design	
126.	Reference Standard	IEC 60255	
127.	Type and Model	3 Over Current(O/C) and 1 Earth fault(E/F)	
128.	Current Transformer Secondary Input to Relay	1 A	
129.	Operating Curve Type	Inverse Definite Minimum Time (IDMT)Relay	
130.	Auxiliary Supply	Self Powered relay for Protection	
131.	Rated Frequency in HZ	50 Hz $\pm$ 3%	
132.	Over Current Protection		
	a)Low set Over Current protection	20-200% of CT secondary rated current with increment/decrement by 1 %	
	b)High set Over Current protection	100-2000% of CT secondary rated current with increment/decrement by 50%	
133.	Earth Fault Protection		
	a)Low set Earth Fault protection	5% to 80% of the CT rated current in steps of 1%	
	b)High set Earth Fault protection	100-1000% of the CT rated current in steps of 50%	
134.	a)Mounting	Flush Mounted	
	b)Mounting Dimensions, W X L x H in mm	As per Manufacture Design	
135.	Operational Indicator	LCD display and LED annunciation lamps	
136.	Contact Details	4 Binary Input(BI) and 6 Binary output(BO)	
137.	Self-diagnosis feature	To be Provided	

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

138.	Password protection	To be Provided	
139.	Communication Protocol	RS 232 or RS 485 Port for IEC 103 Communication Protocol	
140.	Event / fault record, Min.	10 Event and 5 Fault Records available	
141.	Setting groups	2 Groups available	
142.	Circuit Breaker control available	Yes, Only Trip	
<b>I) Tripping Coil</b>			
143.	Make	As per Manufacture Design	
144.	Type	As per Manufacture Design	
145.	DC Voltage in Volt	24, Pulse operated	
146.	Maximum Tripping Current at rated voltage in Amps.	5	
147.	Minimum Permissible voltage variation in %	85 to 110	
148.	Power at Voltage in Watts	As per Manufacture Design	
<b>J) HT three phase four wire CT / PT operated 1 Amps fully Static &amp; AMR compatible TOD Tri - vector Energy Meter</b>			
149.	Reference Standard	IS: 14697, 1999 IS: 15959, 2011	
150.	Make	Secure / L&T / other MSEDCL approved make	
151.	Auxiliary supply Voltage	110V/ $\sqrt{3}$	
152.	Class of Accuracy	0.5S	
153.	Type of Display	Customized backlite liquid crystal display	
154.	Measuring Parameters as per MSEDCL Specification		
	i) Instantaneous parameters	To be Provided	
	ii) Block Load Profile parameters	To be Provided	
	iii) Billing Profile Parameters	To be Provided	
	iv) Name Plate details Programmable Parameters	To be Provided	
	v) Event Conditions	To be Provided	
	vi) All logging parameters for each of the event condition for 3 $\Phi$ / 4W	To be Provided	
<b>K) Fault Passage Indicator (FPI) on Short Circuit and Earth fault</b>			
155.	Make	As per Manufacture Design	
156.	Type and Model	As per Manufacture Design	
157.	Operating point/Current short circuit in Amp	Adjustable 100/200/300 /400/500 /600/700 /800/900/1000 /1100/1200A ( $\pm 15\%$ )	
158.	Operating point/Current earth fault in Amp	Adjustable 10/20/30/40	

11 kV, 630 Amps, Extensible / Non extensible type,  
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		/60/80/100A (±15%)	
159.	Response Time in ms	For Short Circuit Adjustable 40/60/80/100/120 /160/200/240 ms Sec(±100m Sec) For Earth Fault Adjustable 40/60/80/160 ms (±100m Sec)	
160.	Auto Reset Time in Hrs	1/2/4/8 hrs (+ / - 1%) after fault	
<b>L) Battery Charger</b>			
161.	Make	As per Manufacture Design	
162.	Type and Model	As per Manufacture Design	
163.	Input AC Voltage in V	230	
164.	Rated Frequency in Hz	50 Hz ± 3%	
165.	Output DC Voltage in V	24	
166.	Current Rating in Amps	10	
167.	Output DC Voltage for charger		
	i)Boost Mode in V	27 to 28	
	ii)Float Mode in V	27 to 28	
168.	Operating Temperature in °C	-25 to 60	
169.	Temperature Compensation	Junction temperature of SMPS crosses 142°C, thermal shutdown occurs.	
170.	Short Circuit and Overload Protection	To be Provided	
171.	High Voltage Isolation	2 kV for 1 minute	
172.	Efficiency	Above 85 %	
173.	Mounting Arrangement	As per Manufacture Design	
174.	Dimensions, W x D x H in mm	As per Manufacture Design	
<b>N) Battery</b>			
175.	Make	As per Manufacture Design	
176.	Type	Dry Type	
177.	Ah Efficiency	> 95%	
178.	Self-Discharge	Self-Discharge	
179.	Operating Temperature	Normal : +20°C to +30°C & Limits : -20°C to +50°C	
180.	Voltage (V)	24V (2 x 12V)	
181.	Ah Capacity	7Ah / 12 Ah / 26 Ah	
<b>O) Manometer with Non Return Valve</b>			
182.	Make	As per Manufacture Design	
183.	Type and Model	Analogue, ---	



11 kV, 630 Amps, Extensible / Non extensible type,

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184.	Material	Stainless Steel	
185.	Accuracy of calibration pressure	+/-1% at 20°C	
186.	Pressure Element	Stainless Steel Welded	
187.	Dial	2"	
188.	Pointer	Dark	
189.	Window	Round	
190.	Gas pressure low signal	Indicated by Red Color Zone	
191.	Non Return Valve(NRV) Material	Stainless Steel	
<b>P) Indoor cable terminations kits</b>			
192.	Make	As per Manufacture Design	
193.	Type	11 kV touch proof screened termination kit	
194.	Materials	Epoxy / EPDM / Silicon Rubber	
195.	Cable Size	Up to 3 x 400 sq. mm 11 kV HT cables	
196.	Height of each Cable box from ground level	As per Manufacture Design	
197.	Arrangement for mounting an extra cable at incoming and outgoing side box of Bus bar.	As per Manufacture Design	
198.	Arrangement for mounting an extra cable at outgoing side box of transformer / feeder.	As per Manufacture Design	
<b>Q) Automatic Water Level Controller</b>			
199.	Make	As per Manufacture Design	
200.	Type and Model	As per Manufacture Design	
201.	Position of Automatic Water Level Controller	200 mm below live contacts	
202.	Auxiliary contacts	4 NO + 4 NC	
203.	Breaker Tripping and Load break Isolator opening due to water level increases; signals to Control room	To be Provided	
<b>R) Name Plate</b>			
204.	Material	Anodized Aluminum / Stainless Steel	
205.	Thickness	18 swg / 1.00 mm	
206.	Size	145 mm x 116 mm	
<b>S) Painting</b>			
207.	Inside	Powder Coated	
208.	Outside	Polyurethane based powder paint. Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.	

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

<b>T) Danger Board</b>			
209.	Reference Standard	IS: 2551, 1982	
210.	Material	Mild Steel	
211.	Thickness in mm, Min.	1.6	
212.	Size H x L in mm	200 x 250	
<b>U) Type Test</b>			
213.	Following Type Test carried out within 5 years at NABL laboratories in India or equivalent International Laboratories, Yes / No		
214.	Short time Current withstand test and peak current withstand test.	Yes	
215.	Lightening Impulse voltage with-stand test	Yes	
216.	Temperature rise test.	Yes	
217.	Short Circuit current making and breaking tests.	Yes	
218.	Power frequency voltage withstand test (dry).	Yes	
219.	Capacitive current switching test confirming to IEC.	Yes	
220..	Mechanical operation test.	Yes	
221.	Measurement of the resistance of the main circuit.	Yes	
222.	Degree of protection of Inner enclosure and outer enclosure	Yes	
223.	Switch, circuit breaker, earthing switch making capacity.	Yes	
224.	Switch, circuit breaker breaking capacity.	Yes	
225.	Internal arc withstand Test for Inner Enclosure and Cable Chamber.	Yes	
226.	Checking of partial discharge on complete unit.	Yes	
227.	Guarantee of Ring Main Units and accessories supplied against this specification	66 months from the date of receipt at the consignee's Stores Center or 60 months from the date of commissioning	

**Schedule 'B'**  
**List of Type Test Reports to be enclosed with the offer**

Sr. No.	Description of Type Test	Type & Make of Ring Main Unit & its rating	IS/IEC Clause No.	Testing Lab. & Date of Testing	Type test report No., dt & pages	Whether certificate of compliance with IS/IEC is enclosed with T.R.
1.						
2.						
3.						
4.						

Name of the firm \_\_\_\_\_  
Signature of the bidder \_\_\_\_\_  
Designation \_\_\_\_\_  
Date \_\_\_\_\_

**Schedule 'C'**  
**Schedule of Deviations from Specification**

Sr. No.	Clause No.	Details of Deviations
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

Name of the firm \_\_\_\_\_  
Signature of the bidder \_\_\_\_\_  
Designation \_\_\_\_\_

Date \_\_\_\_\_

**Schedule 'D'**  
**Schedule of Bidder's Experience**

Bidder 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 along with size & qty	Period of supply and commissioning	Name & Address to whom reference may be made
1.				
2.				
3.				
4.				
5.				
6.				
7.				

Name of the firm \_\_\_\_\_  
Signature of the bidder \_\_\_\_\_  
Designation \_\_\_\_\_  
Date \_\_\_\_\_

**Schedule 'F'**

**Deviations from specified Test requirements specified in Relevant Standards  
and Present Specification**

Sr. No.	Name of Test	Standard No. & Clause No.	Requirement of standards	Proposed deviation	Reasons for deviation.
1.	Type Test				
2	Additional Test				
3	Acceptance Test				

Name of the firm\_\_\_\_\_

Signature of the bidder\_\_\_\_\_

Designation\_\_\_\_\_

Date\_\_\_\_\_

11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

**Schedule 'G'**  
**Proforma Of Undertaking**

We hereby confirm that ---Rating Ring Main Units offered by us against this tender are of the same design and type as have been supplied to M.S.E.D.C.L. against earlier order No. \_\_\_\_\_ dtd. \_\_\_\_\_ and all the Type Test Reports thereof were approved by C.E. (Quality Control and Testing) vide letter No. \_\_\_\_\_ dtd. \_\_\_\_\_ (copy enclosed.)

We further confirm that the said Type Test have been carried out at \_\_\_\_\_ within five years prior to the date of opening of present tender.

Seal and signature of Bidder

Technical Specification for 11 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

33 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker



Maharashtra State Electricity Distribution Company Limited

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Specification No. T&QC: MSC-I/ 33 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum  
Circuit Breaker /2020/001

Technical Specification

Of

33 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum  
Circuit Breaker

For

Distribution System

In

MSEDCL

Technical Specification for 33 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker



**I N D E X**

<b>Clause No.</b>	<b>Particulars</b>
1.0	Scope
2.0	System Particulars
3.0	Service Conditions
4.0	Objective of Work & Tolerances
5.0	Auxiliary Power Supply
6.0	Applicable Standards
7.0	General Requirement of Ring Main Unit
8.0	Principal Technical Parameters of Ring Main Unit and accessories
9.0	Principle Requirement of Ring Main Unit
10.0	Tests
11.0	Inspection
12.0	Qualifying Requirement
13.0	Prototype Samples
14.0	Manufacturing facility
15.0	Quality assurance plan
16.0	Drawing and Documentation
17.0	Name plate
18.0	Packing & forwarding
19.0	Training
20.0	Performance guarantee
21.0	Annexure
	Annexure 'A' -Principal Technical Parameters of Ring Main Units
22.0	Schedules
	Schedule 'A-' - Guaranteed Technical Particulars of 33 kV Ring Main Units.
	Schedule 'B ' - List of Type Test Reports to be enclosed with the offer
	Schedule 'C ' - Schedule of Deviations from Specification
	Schedule 'D ' - Schedule of Bidder's Experience
	Schedule 'E ' - Schedule of Deviations from Specified Standards.
	Schedule 'F' - Deviations from specified Test requirements specified in Relevant Standards and Present Specification
	Schedule 'G ' - Proforma of Undertaking

## **MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.**

### **Technical Specification for 33 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker**

#### **1.0 Scope:**

- i) This specification covers design, manufacture, assembly, Stage inspection, testing before supply, inspection, packing and delivery of SF6 gas filled 33 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker.
- ii) The Ring Main Unit shall be complete with all the accessories and auxiliary equipments required for their satisfactory operation in Distribution Network of MSEDCL in Maharashtra State, India.
- iii) The Ring Main Unit should have compatibility with Open Protocol Control and data Acquisition system. The Ring Main Units capable of being monitored and controlled by the Supervisory Control and data Acquisition (SCADA)/ Distribution Management System (DMS). The Ring Main Units should have the castell lock for avoiding dual supply and safety purpose.
- iv) The Ring Main Unit shall be complete with various combinations of Load Break Isolators & Circuit Breaker for Distribution transformers center and feeders.
- v) The Ring Main Units 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 Ring Main Unit shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.
- vi) It is not the intent to specify, completely here in all the details of design and construction of the Ring Main Unit. However, the Ring Main Unit shall conform, in all respects to high standards of engineering, design and workmanship as per recent Indian standards or International standards. It shall be capable of performing in continuous commercial operation up to the supplier's guaranteed life of Ring Main Unit in a manner acceptable to the purchaser who will interpret the meanings of drawings and specifications and shall have power to reject any work or material which, in his judgment, is not in accordance therewith. The Ring Main Unit 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 components shall be deemed to be within the scope of supplier's supply, irrespective of whether those are specifically brought out in this specification and/or in the commercial order or not.
- vii) Recommended spares: The bidder shall furnish in his offer a list of recommended spares with unit rates for each set of Ring Main Unit that may be necessary for satisfactory operation and maintenance of Ring Main Unit 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.

- viii) Erection and maintenance tools: The bidder shall submit a list and unit rates of all the special tools, equipment and instruments required for erection, testing, commissioning and maintenance of the Ring Main Unit. 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.
- ix) The Bidder 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.

## 2.0 System Particulars:

Nominal System Voltage	:	33kV
Voltage variation on supply side	:	±10 %
Corresponding Highest System Voltage:		36kV
Frequency	:	50 Hz with ± 3 % tolerance
Transient condition	:	-20 % or + 10 % combined variation of Voltage and frequency.
Number of Phase	:	3 Phases
Neutral earthing	:	Solidly earthed.
Fault level (minimum) kA /Sec	:	25/3
Lightning Impulse Withstand Voltage (kVp)	:	170
One minute dry/wet power frequency withstand voltage primary (kV rms)	:	70
Rated Dynamic Withstand Current for 1 second duration (kAp)	:	62.5

## 3.0 Service Conditions :

- A) The SF6 gas filled 33 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

3.1	Maximum ambient temperature (Degree C)	50
3.2	Maximum temperature in shade (Degree C)	45
3.3	Minimum Temperature (Degree C)	3.5
3.4	Relative Humidity (percent)	10 to 95
3.5	Maximum Annual rain fall (mm)	1450
3.6	Maximum wind pressure (kg/sq.m)	150

3.7	Maximum altitude above mean sea level ( Meter)	1000
3.8	Isoceranic level (days per year)	50
3.9	Seismic level (Horizontal Acceleration)	0.3 g
3.10	Climatic condition humid	Moderately hot and tropical climate conducive to rust and fungus growth

B) The climatic conditions are prone to wide variations in ambient conditions and hence the SF6 gas filled 33 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker shall be of suitable design to work satisfactorily under these conditions.

**4.0 Objective of Work & Tolerances:**

It is intended to have

- a) Enhanced safety and reliability.
- b) Maintenance free Ring Main Units.
- c) Reduction in space requirement
- d) Integrated remote control and monitoring-SCADA compatible

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

**5.0 Auxiliary Power Supply:**

- a) A. C. supply shall be provided for Control & Protective devices, lighting fixtures, space heaters and motors.
- b) D.C. supply shall be provided for alarm, control and protective device.

The rating, quality and location of electrical supply system that will be made available by the supplier for operation of the Ring Main units are described below:

i.	A. C. Supply	230 volts with ± 10% variation
ii	D.C. Supply	24 V DC to 30 V DC with +10% to – 15% variation
iii	Frequency	50 Hz with ± 3% variation

**6.0 Applicable Standards:**

- a) The design, manufacture and performance of the Ring Main Units shall comply with all currently applicable statutes, regulations and safety codes.  
Nothing in this specification shall be construed to relieve the bidder off his responsibilities.
- b) Unless otherwise specified, the Ring Main Units offered shall conform to the latest applicable Indian, IEC, British, U.S.A. or International Standards and in particular, to the following:

Sr. No.	Standards	Particulars
1.	IEC 62271-200/ IEC 60 298/ IS 12729 : 1988	General requirement for Metal Enclosed Switchgear
2.	IEC 265	Medium Voltage Switches
3.	IEC 60129/ IEC 62271 - 102/ IS 9921	Alternating Current disconnectors (Load Break Isolators) and earthing switch
4.	IEC 62271-100/IEC 60056/ IS 13118 : 1991	Specification for alternating current breakers
5.	IEC 62271 - 1/ IEC 60694	Panel design, SF6/ Vacuum Circuit Breakers
6.	IEC 60044 -1/ IEC 60185/ IS 16227 (Part-1)/(Part-2) /2016	Current Transformers
7.	IEC 60265/IS 9920 : 1981	High voltage switches
8.	IEC 376	Filling of SF6 gas in RMU
9.	IEC 60273/ IS : 2099	Dimension of Indoor & Outdoor post insulators with voltage > 1000 V
10.	IEC 60273/ IS 13947 ( Part1)	Degree of protection provided by enclosures for low voltage Switchgear and control gear.
11.	IEC 60694	Common clauses for high voltage switchgear and control gear standards
12.	IEC 62271-103	High voltage switches for rated voltages above 1 KV and less than 52 KV.
13.	IEC 60137	Bushings for alternating voltages above 1000 V
14.	IEC 60233	Tests for hollow insulators for use in electrical equipment
15.	IEC 60376	New Sulphur hexafluoride (SF6)
16.	IEC 60480	Guidelines for checking and treatment of Sulphur hexafluoride (SF6)
17.	IEC 61243-5	Voltage detection systems
18.	IEC 60044-2	Potential transformers
19.	IEC 62271-209	Cable connections for gas insulated switch gears
20.	IS:2544/1973	Porcelain Post Insulators / Resin cast insulators
21.	IS 8828/1996	MCB
22.	IS 12063/1987	Degree of protection provided for enclosures for electrical equipment.
23.	IS 5/2005	Colors for ready mixed paints and enamels.
24.	IS 5578/1984	Marking of insulated conductor.
25.	11353/1985	Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals
26.	IS 1248/2003	Indicating instruments.
27.	IS 14697/1999 amended up to date & as per updated technical specifications of MSEDCL	HT Static tri vector TOD Energy meters
28.	IS 6875 amended up to date	Control switches.

29.	IS 3231/1986	Electrical Relays for Power System Protection.
30.	IEC 60255 amended up	Numerical protection relays.
31.	IS 8686/1977	Static protective relays.
32.	IS 4794/68 & 86	Push button.
33.	IS 9431/1979	Indoor post insulator of organic material
34.	IEC 60529 / EN 60529	Protection against accidental contact, foreign Objects and water.
35.	IEC 60529	Classification of degrees of protection provided enclosures of electrical equipment
36.	IEC 60298	A.C metal-enclosed switchgear and control gear for rated voltages above 1KV and up to and including 52kV
37.	IEC 1330	High voltage/Low voltage prefabricated substations
38.	IEC 60801	Monitoring and control
39.	BS 159	Bus Bar
40.	CP 1013(British Code of Practice)	Earthing
41.	IEC 60255	Specification for Static Protective Relays
42.	BS 6231	Wires and wiring
43.	IEC 61000	Electromagnetic compatibility
44.	IEC 60129	Alternating current Disconnecter (isolators) and earthing switches
45.	IEC 60060-1, BS 923	High Voltage test technique
46.	IEC 60947-4-1	Control Gears

All Indian Electricity Rules/ Bills amended up to date applicable for clearances, safety and operation of the equipment.

The Ring Main Unit meeting with the requirements of any other standards, which ensures equal or better quality than the standard mentioned above shall also be acceptable. If the Ring Main Unit, offered by the bidder conforms 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.

### 7.0 General Requirement of Ring Main Unit:

The Ring Main Unit shall be installed at 33 kV junction points such as 200kVA, 315kVA, 630kVA distribution transformers centers or feeder branches to isolate faulty section. The Ring Main Unit shall be both Non extensible/Extensible. Two Load break isolators for incoming & outgoing cables and one Circuit breaker for transformer or feeder protection shall be enclosed in the main tank using SF<sub>6</sub> gas as insulating and vacuum as arc quenching medium.

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

**7.02** Both the load break switches and circuit breaker shall be suitable for motorization.

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

**7.03** 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, Ring Main Unit & Switchboard housing shall be in accordance with IEC 298. The design of Ring Main Unit shall be in accordance with the Technical 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.

**7.04** Circuit Breaker supplied with each Ring Main Unit shall be Vacuum Circuit Breaker. Insulating media for Bus Bar, Load Break Isolator, Earth Isolator and other associated equipment in Inner enclosure should be SF<sub>6</sub> Gas.

An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF<sub>6</sub> gas to regenerate the SF<sub>6</sub> gas following arc interruption. A temperature compensating gas pressure indicator offering a simple indication shall constantly monitor the SF<sub>6</sub> insulating medium.

**7.05** Each Ring Main Unit shall include its own power supply unit (including auxiliary transformer, batteries, and battery charger), which shall provide a stable power source for the Ring Main Unit. The auxiliary transformer of rating 500VA 33kV/230 Volt shall be provide a stable power source which will supply **230V AC** for Remote Terminal unit (RTU).

The Ring Main Unit shall also provide the necessary space for housing the Remote Terminal unit (RTU). In addition, space must be provided for auxiliary power transformer, which shall serve as the AC power supply 230 V inputs, along with all other Ring Main Unit devices.

**7.06** Within this context, the general requirements of the Ring Main Unit shall include, but shall not be limited to provision of the following monitoring and control features:

- i) Positions of local/remote switches as used to control local and remote access to circuit breakers and load break switches.
- ii) Power supply indications including battery failure and voltage alarms.
- iii) Open/Closed position of load break switches, circuit breakers, and earthing switches.
- iv) Enclosure door-open indications
- v) SF<sub>6</sub> gas-pressure low alarm
- vi) Circuit breaker spring and load break switch charge (switch readiness) indications
- vii) Circuit breaker relay indications
- viii) Indications of fault current in the Ring Main Unit main feeder circuit as detected by the Fault Passage Indicator (FPI).
- ix) Measurement of 22 kV or 33 kV voltages, current, power, energy, and power factor values as per voltage level.
- x) Load break switch and circuit breaker open/close control
- xi) Fault Passage Indicator (FPI) reset control
- xii) Automatic Water Level Control

Technical Specification for 33 kV, 630 Amps, Extensible / Non extensible type,

## xiii) Relay settings control

The acceptance of the RMUs shall not be complete until they have been demonstrated on a point-to-point basis to be fully interoperable with the Remote Terminal unit (RTU).

**7.07** The Ring Main Unit shall be provided with necessary take off terminal units for automations and all these units should be shielded in an outdoor metal-body enclosure for making them suitable for Outdoor / Indoor use. The insulation/dielectric media of Inner enclosure stainless steel tank should be SF6 gas. The Ring Main Units shall be extensible on both sides.

**7.08** The Ring Main Units should be motorized and suitable to be connected to Field / Feeder Remote Terminal unit (F-RTU) so as to be monitored and controlled through Supervisory Control and data Acquisition (SCADA)/ Distribution Management System (DMS).

**7.09** A remote terminal unit (RTU) is a microprocessor-controlled electronic device that interfaces objects in the physical world to a distributed control system or SCADA (Supervisory Control and Data Acquisition) system by transmitting telemetry data to a master system, and by using messages from the master supervisory. The Supervisory Control and Data Acquisition (SCADA) system is the heart of Distribution Management System (DMS).

**7.10** The Ring Main Unit shall be equipped with main-line load break switches and a fault passage indicator (FPI). Furthermore, to protect each of its transformer / feeders, it shall be equipped with a corresponding set of circuit breakers and self-powered numerical relays. The Ring Main Unit shall include potential-free contacts and control contacts so as to connect to SCADA/DMS via FRTUs, so as to:

- i) Monitor and control the open/closed status of the Ring Main Unit circuit breakers and load break switches.
- ii) Monitor the local/remote position of Ring Main Unit motorized (in case of failure of motor) manually-operated switches that can be used to enable and disable remote monitoring.
- iii) Monitor the health of the power supply, which will include battery failure and low voltage indications.
- iv) Monitor the open/closed status of Ring Main Unit earthing switches.
- v) Monitor the open/closed status of RMU enclosure doors in case of Hinge doors.

FRTU, Modem, Power and I/O cable interface between FRTU and Control panel of Ring Main Unit /sectionalizer are excluded in the scope of supply and these items will be provided by MSEDCL.

### 8.0 Principal Technical Parameters of Ring Main Unit and accessories:

The Ring Main Unit and accessories covered under this specification shall conform to specific parameters given below:

Sr. No.	Description	33 kV Ring Main Unit
<b>A)Ring Main Unit Assembly</b>		
1.	Indoor / Out door	Indoor / Out door
2.	Configurations(Type)	3 Way, M+LLV+ L= Isolator. V= VCB. M=Metering
3.	Reference Standard	IEC-62271-100, 200, 103, IEC-62271-1
4.	Rated Voltage in kV	33



5.	Highest System Voltage in kV, Max.	36
6.	Number of Phase	3
7.	Frequency in HZ.	50 Hz $\pm$ 3%
8.	Short Circuit rating	
	a) Breaking Symmetrical for 3 Sec. in KA	25
	b) Breaking Asymmetrical for 3 Sec. in KA	25
	c) Short time for 3 Sec. in KA.	25
9.	Insulation Level	
	a) Impulse withstand in KV peak.	170
	b) 1 Minute 50 Hz. Voltage withstand in KV rms	70
10.	Internal arc rating for 1 sec. in kV	25
11.	Construction: Material and Size	
	Inner Enclosure	Main Stainless Steel Tank with 2 mm Thickness
	Outer Enclosure	CRCA Sheet of 2 mm thickness or Galvanized Sheet of 1.6 mm thickness
12.	Degree of protection	
	Inner Enclosure	IP 67
	Outer Enclosure	IP 54 (Main Door close) and IP 41 (Main Door open)
13.	The Ring Main Unit and accessories completely wire and tested at factory	Yes
14.	Paint	Polyurethane based powder paint
15.	Color	Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007
16.	Thickness of coat, Min.	150 microns for CRCA Sheet and 80 microns for galvanized sheets
<b>B) Bus Bar</b>		
17.	Reference Standard	IS: 1897, 2008
18.	Grade and Material	Electrolytic Grade Copper
19.	Cross sectional area in mm <sup>2</sup>	400
20.	Size in mm or as per design	40 x 10
21.	Current Density in Amps/mm <sup>2</sup> , Max.	1.6
22.	Continuous Current in Amps	630
23.	Maximum temperature rise over an ambient temperature 50°C.	55°C
24.	Short time current rating for 3 Sec in kA rms	25
25.	Clearance in mm from bare bus bar or as per design	
	Phase to Phase for Isolator or as per design	78
	Phase to Phase for VCB	78

	Phase to Earth for Isolator or as per design	78
	Phase to Earth for VCB or as per design	78
26.	Bus Supports	
	Reference Standard	IEC 60243-1, ASTM D 648
	Voltage Class in kV	33 kV
	Creepage distance in mm or as per design	180 in SF6 gas
	Bus Bar support spacing in mm or as per design	420
27.	Filling SF6 gas pressure (Filling pressure at 20°C), Min.	1.4 Bar
28.	Operating SF6 gas pressure at 20°C, Min.	0.5 Bar
29.	Reference Standard	IEC 62271-100
30.	Rated Voltage in kV	33
31.	Highest System Voltage in kV, Max.	36
32.	Type	Vacuum Type
33.	Rated Frequency in Hz.	50 Hz $\pm$ 3%
34.	No. of Poles	3
35.	Rated Current	630A
36.	Maximum temperature rise over an ambient temperature 50°C.	55°C
37.	Rated operating Duty	0-3min-CO-3min-CO
38.	Rupturing capacity at rated voltage in MVA, Min.	As per design
39.	Breaking Capacity at rated voltage & operating duty	
	Symmetrical in kA rms	25
	Asymmetrical in kA rms	25
40.	Rated making current in kA peak	62.5
41.	Short time current for 3 sec in kA rms	25
42.	Transient Recovery Voltage	
	Rate of rise in kV/ $\mu$ s	0.64 kV/ $\mu$ s as per IEC 62271-100
	Peak Voltage in kV	70
43.	Insulation Level	
	Impulse Voltage with stand on 1.2/50 $\mu$ s full wave in kV	170
	1 minute power frequency voltage withstand in kV	70
44.	Total breaking time for transient fault ( CB + Relay+ trip coil) in ms	<45 ms
45.	Opening time No load condition in ms	<45 ms
46.	Opening time under SF6 gas low or vacuum loss condition in ms	<45 ms
47.	Number of breaks per pole	Single
48.	No of breaker operations permissible without requiring inspection replacement of contacts and other Main parts	

	At 100% rated current	2000
	At 100% rated breaking current, Min.	20
49.	Type of contacts	
	Main	Butt Type
	Arcing	Butt Type
50.	Material of contacts	
	Main	Copper
	Arching	Copper
	Chromium / Silver plated	Chromium / Silver plated
51.	Mechanical Endurance Test for Circuit Breaker, Number of operations	2000
52.	Spring charging mechanism	Motor Operated
53.	Operating mechanism for closing of Circuit Breaker	
	Type	Spring operated Mechanism
	No of breaker operations stored	One
	Trip free or fixed trip	Trip Free
	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material, Min.	Electrolytic grade Copper 25 x 3mm
54.	Operating mechanism for tripping of Circuit Breaker	
	Type	Spring Operated Mechanism
	No of breaker operations stored	One
	Trip free or fixed trip (V)	Trip Free
	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material	Electrolytic grade Copper 25 x 3mm
55.	Breaker Accessories	
	Mechanical safety Interlock	Provided
	Automatic safety Interlock	Provided
	Operational Interlock	Provided
	Emergency manual trip	Provided
	Operation counter	Provided
	Spring charge / discharge indicator	Provided
	Manual spring charging facility	Provided
<b>c) Isolators</b>		
56.	Reference standard	IEC-62271-102 / IEC-62271-103
57.	Nominal Voltage in KV	33
58.	Highest System Voltage in kV, Max.	36

59.	Rated Frequency in HZ	50 Hz $\pm$ 3%
60.	No. Of poles	3
61.	Rated Current in Amps	630
62.	Maximum temperature rise over an ambient temperature 50°C.	60°C
63.	Operation	Close-Open-Earth
64.	Rupturing Capacity at rated voltage	630 Amps at 33kV
65.	Maximum over voltage factor when switching off Loaded feeder cable in kA	62.5
66.	No. of isolator operation permissible without requiring inspection, replacement of contacts and other main parts	
	Mechanical Endurance in Number of operations	1000
	At 100% rated making current in Number of operations	100
	At 100% rated breaking current in Number of operations	100
67.	Isolator provided with the following Mechanical safety	
	Mechanical ON and OFF Indication	Provided
	Cable Earth Indication	Provided
	Operational Counter	Provided
	Manual Spring Charging facility	Provided
<b>D) Current Transformer</b>		
68.	Reference standard	IS:16227, I & II
69.	Type	Ring Type, Resin Cast/Tape wound
70.	Nominal Voltage in KV	33
71.	Highest System Voltage in kV, Max.	36
72.	Rated Frequency in HZ	50 Hz $\pm$ 3%
73.	Current Transformer Ratio	200-100/1Amps
74.	Short circuit withstand	
	Short time current for 1 sec. in kA rms	5
	Dynamic current in kA peak, Min.	7.5
75.	Class of insulation	Class B
76.	Basic insulation level in kV rms	3
77.	Maximum temperature rise over an ambient temperature 50°C.	60°C
78.	Class of Accuracy	
	Metering Core	0.5
	Protection Core	5P10
79.	Rated Burden	2.5 VA
80.	Over Current Rating in %	120
81.	Continuous Over Load in %	120
<b>E) Metering Voltage(Potential) Transformer</b>		
82.	Reference standard	IS:16227, I & III
83.	Type	Resin Cast/Tape wound
84.	Nominal Voltage in KV	33
85.	Highest System Voltage in kV, Max.	36

86.	Rated Frequency in HZ	50 Hz $\pm$ 3%
87.	Voltage Transformer Ratio	33 kV/ $\sqrt{3}$ /110V/ $\sqrt{3}$
88.	Rated Primary Voltage in kV	33 kV/ $\sqrt{3}$
89.	Rated Secondary Voltage in V	110V/ $\sqrt{3}$
90.	Rated Burden in VA	50
91.	Accuracy Class	0.5
92.	Insulation Class	B
93.	Voltage Factor	1.2 Continuous and 1.9 for 8 hrs.
94.	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	70
	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	170
<b>F) Auxiliary Voltage(Potential) Transformer</b>		
95.	Reference standard	IS:16227, I & III
96.	Type	Resin Cast/Tape wound
97.	Nominal Voltage in KV	33
98.	Highest System Voltage in kV, Max.	36
99.	Rated Frequency in HZ	50 Hz $\pm$ 3%
100.	Voltage Transformer Ratio	33 kV / 230V
101.	Rated Primary Voltage in kV	33 kV
102.	Rated Secondary Voltage in V	230V
103.	Rated Burden in VA	500 VA
104.	Voltage Regulation in %	5
105.	Insulation Class	B
106.	Voltage Factor	1.2
107.	Application & Construction Type	Indoor, Single Phase/Two Pole
108.	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	70
	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	170
<b>G) Numerical Protection Relay</b>		
109.	Reference Standard	IEC 60255
110.	Type and Model	3 Over Current(O/C) and 1 Earth fault(E/F)
111.	Current Transformer Secondary Input to Relay	1 A
112.	Operating Curve Type	Inverse Definite Minimum Time (IDMT)Relay
113.	Auxiliary Supply	Self Powered relay for Protection
114.	Rated Frequency in HZ	50 Hz $\pm$ 3%
115.	Over Current Protection	
	Low set Over Current protection	20-200% of CT secondary rated current with increment/decrement by 1 %

	High set Over Current protection	100-2000% of CT secondary rated current with increment/decrement by 50%
116.	Earth Fault Protection	
	Low set Earth Fault protection	5% to 80% of the CT rated current in steps of 1%
	High set Earth Fault protection	100-1000% of the CT rated current in steps of 50%
117.	Mounting	Flush Mounted
118.	Operational Indicator	LCD display and LED annunciation lamps
119.	Contact Details	4 Binary Input(BI) and 6 Binary Output(BO)
120.	Self-diagnosis feature	Yes
121.	Password protection	Yes
122.	Communication Protocol	RS 232 or RS 485 Port for IEC 103, Communication Protocol
123.	Event / fault record, Min.	10 Event and 5 Fault Records available
124.	Setting groups	2 Groups available
125.	Circuit Breaker control available	Yes, Only Trip
<b>H) Tripping Coil</b>		
126.	DC Voltage in Volt	24
127.	Maximum Tripping Current at rated voltage in Amps.	5
	Minimum Permissible voltage variation in %	85 to 110
<b>I) HT three phase four wire CT / PT operated 1 Amps fully Static &amp; AMR compatible TOD Tri - vector Energy Meter</b>		
128.	Reference Standard	IS: 14697, 1999 IS: 15959, 2011
129.	Make	Secure / L&T / other MSEDCL approved make
130.	Auxiliary supply Voltage	110V/ $\sqrt{3}$
131.	Class of Accuracy	0.5S
132.	Type of Display	Customized backlite liquid crystal display
133.	Measuring Parameters as per MSEDCL Specification	
		Instantaneous parameters
		Block Load Profile parameters
		Billing Profile Parameters
		Name Plate details Programmable Parameters
		Event Conditions
		All logging parameters for each of the event condition

		for 3 $\Phi$ / 4W
<b>J) Fault Passage Indicator (FPI) on Short Circuit and Earth fault</b>		
134.	Operating point/Current short circuit in Amp	Adjustable 100/200/300 /400/500 /600/700 /800/900/1000 /1100/1200A ( $\pm 15\%$ )
135.	Operating point/Current earth fault in Amp	Adjustable 10/20/30/40 /60/80/100A ( $\pm 15\%$ )
136.	Response Time in ms	For Short Circuit Adjustable 40/60/80/100/120 /160/200/240 ms Sec( $\pm 100$ m Sec) For Earth Fault Adjustable 40/60/80/160 ms ( $\pm 100$ m Sec)
137.	Auto Reset Time in Hrs	1/2/4/8 hrs (+ / - 1%) after fault
<b>K) Battery Charger</b>		
138.	Input AC Voltage in V	230
139.	Rated Frequency in Hz	50 Hz $\pm 3\%$
140.	Output DC Voltage in V	24
141.	Current Rating in Amps	10
142.	Output DC Voltage for charger	
	Boost Mode in V	27 to 28
	Float Mode in V	27 to 28
143.	Operating Temperature in $^{\circ}\text{C}$	-25 to 60
144.	Temperature Compensation	Junction temperature of SMPS crosses 142 $^{\circ}\text{C}$ , thermal shutdown occurs.
145.	Short Circuit and Overload Protection	Provided
146.	High Voltage Isolation	2 kV for 1 minute
147.	Efficiency	Above 85 %
<b>L) Battery</b>		
148.	Type	Dry Type
149.	Ah Efficiency	> 95%
150.	Self-Discharge	Self-Discharge
151.	Operating Temperature	Normal : +20 $^{\circ}\text{C}$ to +30 $^{\circ}\text{C}$ & Limits : -20 $^{\circ}\text{C}$ to +50 $^{\circ}\text{C}$
152.	Voltage (V)	24V (2 x 12V)
153.	Ah Capacity	7Ah / 12 Ah / 26 Ah
<b>M) Manometer with Non Return Valve</b>		

154.	Type	Analogue
155.	Material	Stainless Steel
156.	Accuracy of calibration pressure	+/-1% at 20°C
157.	Pressure Element	Stainless Steel Welded
158.	Dial	2"
159.	Pointer	Dark
160.	Window	Round
161.	Gas pressure low signal	Indicated by Red Color Zone
162.	Non Return Valve(NRV) Material	Stainless Steel
<b>N) Indoor cable terminations kits</b>		
163.	Type	33 kV touch proof screened termination kit
164.	Materials	Epoxy / EPDM / Silicon Rubber
165.	Size	Up to 3 x 400 sq. mm 33 kV HT cables
166.	Height of Bus bar / transformer / feeder Cable box from ground level	As per Manufacture design
167.	Arrangement for mounting an extra cable at incoming and outgoing side box of Bus bar.	As per Manufacture design
168.	Arrangement for mounting an extra cable at outgoing side box of transformer / feeder.	As per Manufacture design
<b>O) Automatic Water Level Controller</b>		
172.	Position of Automatic Water Level Controller	200 mm below live contacts
173.	Auxiliary contacts	4 NO + 4 NC
174.	Breaker Tripping and Load break Isolator opening due to water level increases signals to Control room	Yes
<b>P) Name Plate</b>		
175.	Material	Anodized Aluminum / Stainless Steel
176.	Thickness	18 swg / 1.00 mm
177.	Size	145 mm x 116 mm
<b>Q) Painting</b>		
178.	Inside	Powder Coated
179.	Outside	Polyurethane based powder paint. Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.



## **9.0 Principle Requirement of Ring Main Unit:**

### **9.1 Enclosure:**

- i) The Ring Main Unit enclosure (Outer) shall be made up of CRCA Sheet of 2 mm thickness or galvanized Sheet of 1.6 mm thickness. The rating of enclosure shall be suitable for operation on three phases, three wire, 33 kV, 50 cycles, A.C. System with short-time current rating of 25kA for 3 seconds for 33kV with Panels. The complete Ring Main Unit Outer enclosure shall be of degree of protection IP 54 (Main Door close) and IP 41 (Main Door open).
- ii) 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.
- iii) The Ring Main Unit Outer enclosure shall be painted with Polyurethane based powder paint. The color of Ring Main Unit Outer enclosure shall be Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.
- iv) Each switchboard shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics.
- v) The Ring Main Unit metal parts shall be made of high thickness high tensile steel which must be grit/short blasted, thermally sprayed with Zinc alloy ( not galvanized), 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 for CRCA Sheet and 80 microns for galvanized Sheet.

### **9.2 Inner enclosure (Main tank):**

- i) The tank shall be robotically welded stainless steel sheet of minimum 2 mm thickness. The tank shall be sealed and no handling of gas is required throughout the 25 years of service life. However, the SF<sub>6</sub> 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 SF<sub>6</sub> gas will be lower than 0.1 % per year. An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF<sub>6</sub> gas to regenerate the SF<sub>6</sub> gas following arc interruption. The degree of protection of the inner enclosure shall be IP 67.
- ii) Oil or Air filled Switchgear will not be considered. The temperature rise test shall be carried out on complete Ring Main Unit and test reports shall be submitted with the offer.
- iii) The compact Ring Main 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.

### **9.3 Configurations recommended:**

The following configurations of Ring Main Units are recommended:

#### **i) Non Extensible:**

Non extensible Ring Main Unit with one number of 200A circuit breaker for transformer protection up to 630 kVA and two number of Load Break Isolators for network sectionalizing with earth isolator.

**ii) Extensible:**

Extensible Ring Main Unit 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 Ring Main Unit.

**9.4 Bus bars:**

The three numbers of continuous Bus bars made up of EC grade tinned copper of rating current 630A shall be provided. The Short time rating current shall be 25 kA for 3 seconds for 33kV. The Bus bar connections shall Anti- oxide greased.

**9.5 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 Ring Main Units under the stipulated service conditions. The SF6 gas shall be tested for purity, dew point air hydrolysable fluorides and water content as per IEC 376,376A and 376B and test certificate shall be furnished to the bidder indicating all the tests as per IEC 376 for each lot of SF6 Gas.

**9.6 Load Break Switches (Load Break Isolators):**

- i) The Load Break Isolators for Incoming and Outgoing supply must be provided and the load break isolators are fully insulated by SF6 gas.
- ii) 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 fascia, which is allowed to move only if the main or earth switch is in the off position.
- iii) The load break isolators shall be remotely operated. Each load break switch shall be of the triple pole, simultaneously operated, automatic type with quick break contacts and with integral earthing arrangement.
- iv) 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 Amps maximum ambient temperature of 50 °C. The temperature rise of Isolator shall be 55°C maximum. The relevant type test report to prove the temperature rise below 55 °C shall be submitted by the bidder with the offer.

**9.7 Current Transformer:**

- i) The Current Transformers being prone to failure due to various reasons, the quality and reliability of the Current Transformers are of vital importance. Current Transformer's insulation used shall be of very high quality, details of which shall be furnished in the technical offer.
- ii) The Current Transformers shall be single wound double ratio, one Current Transformers for metering and one Current Transformers for protection.

- iii) The instrument security factor for metering Current Transformers shall be low enough but not greater than 5 at lower ratio. This shall be demonstrated on metering Current Transformers in accordance with the procedure specified in IS: 16227, I & II and relevant IEC.
- iv) The Current Transformers shall be ring type (Tape wound / resin cast). Contact tips of terminals shall be silver plated.
- v) Correct polarity shall be invariably marked on each terminal.
- vi) A panel shall be provided in each Ring Main Unit enclosure to mount a single wound double ratio, Current Transformers for metering and protection purposes. Current Transformers access for maintenance or any other purpose shall be from the back of these panels.
- vii) Secondary terminals of Current Transformers shall be brought out suitably to a terminal block, which will be easily accessible for testing and terminal connections.
- viii) Further characteristics and features of Current Transformers used for metering and protection are listed as follows:

**Metering Current Transformers:**

- a) Type: Ring Type
- b) Material:, Resin Cast
- c) Burden: 2.5VA
- d) Ratio: 200-100/1 Amps
- e) Accuracy Class for metering: 0.5

**Protection Current Transformers:**

- a) Type: Ring Type
- b) Material:, Resin Cast
- c) Burden: 2.5VA
- d) Ratio: 200-100/1 Amps
- e) Accuracy Class for protection: 5P10.

**9.8 Metering Voltage (Potential) Transformer:**

- i) The Potential Transformers shall be of Resin Cast and they shall conform to IS: 16227, I & III. Their design and construction, in particular, shall be sufficiently robust to withstand the thermal and dynamic stresses during short circuits.
- ii) A panel shall be provided in each Ring Main Unit enclosure to mount Potential Transformers. The primary and secondary contacts (moving & fixed type) shall have firm grip while in service. Service position locking mechanism shall be provided and indicated by bidder in relevant drawing. Rigidity of primary stud point with earth bus in service position shall be confirmed.
- iii) Contact tips of primary/secondary contacts shall be silver plated. Correct polarity shall be distinctly marked on primary and secondary terminal.
- iv) Secondary terminal studs shall be provided with at least three nuts, two plain and two spring washers for fixing leads. The stud nut and washer shall be of brass, duly nickel plated. The minimum outside diameter of the studs shall be 6 mm. The length of at least 15 mm shall be available on the studs for inserting

the leads. The space clearance between nuts on adjacent studs when fitted shall be at least 10 mm.

- v) Each secondary core will be protected by suitable MCB.
- vi) HRC fuses shall be provided on the HV side.
- vii) Further characteristics and features of Potential Transformers used for metering are listed as follows:
  - a) Type: Ring Type
  - b) Material:, Resin Cast
  - c) Burden: 50 VA
  - d) Ratio:  $33 \text{ kV}/\sqrt{3} / 110\text{V}/\sqrt{3}$
  - e) Accuracy Class for metering: 0.5

#### **9.10 Auxiliary Voltage (Potential) Transformer:**

- i) The Auxiliary Potential Transformers shall be of Resin Cast and they shall conform to IS:16227, I & III. Their design and construction, in particular, shall be sufficiently robust to withstand the thermal and dynamic stresses during short circuits.
- ii) A panel shall be provided in each Ring Main Unit enclosure to mount Auxiliary Potential Transformers. The primary and secondary contacts (moving & fixed type) shall have firm grip while in service. Service position locking mechanism shall be provided and indicated by bidder in relevant drawing. Rigidity of primary stud point with earth bus in service position shall be confirmed.
- iii) Contact tips of primary/secondary contacts shall be silver plated. Correct polarity shall be distinctly marked on primary and secondary terminal.
- iv) Further characteristics and features of Potential Transformers used for metering are listed as follows:
  - a) Type: Ring Type
  - b) Material:, Resin Cast
  - c) Burden: 500 VA
  - d) Ratio:  $33 \text{ kV}/\sqrt{3} / 230\text{V}$
  - e) Voltage Regulation: 5 %

Note: Instrument transformers shall be suitable for continuous operation at the ambient temperature prevailing inside the Ring Main Unit enclosure, when the Ring Main Unit is operating at its rated load and the outside ambient temperature is 50°C. The class of insulation shall be E or better.

All instrument transformers shall withstand the power frequency and impulse test voltage specified for the Ring Main Unit assembly. The current transformer shall further have the dynamic and short time ratings at least equal to those specified for the associated Ring Main Unit and shall safely withstand the thermal and mechanical stress

produced by maximum fault currents specified when mounted inside the Ring Main Unit enclosure.

The parameters of instrument transformers specified in this specification are indicative and shall be finalized by the Employer during detailed engineering, considering the actual burden of various relays and other devices finally selected. In case the Bidder finds that the specified ratings are not adequate for the relays

and other devices offered by him, he shall offer instrument transformer of adequate ratings without any cost implication.

All instrument transformers shall have clear indelible polarity markings. All secondary terminals shall be wired to separate terminals on an accessible terminal block.

#### **9.10 Earthing of Bus bars ( Earth Switch):**

- i) 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.
- ii) 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.

#### **9.11 Circuit Breaker (Vacuum media for arc quenching):**

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

For 33 kV System: Rated breaking capacity shall be 25 kA for 3 second.

Rated making current shall be 62.5 kA for 3second.

- ii) The manual operation of the circuit breaker shall not have an effect on the spring charging mechanism.
- iii) 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.
- iv) 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.

#### **9.12 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 front / rear side of the Ring Main Unit.

#### **9.13 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

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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 up to date.

The internal arc fault test on cable box shall be carried out for 33 kV systems at 25 kA for 1 second.

The clearance between phase to phase and phase to earth shall be as per IEC 61243 – 5 amended up to date. The cable termination and gland arrangements shall be appropriate for the type and style of cables used at the time.

The cable boxes for an isolator in its standard design should have sufficient space for connecting two cables per phase. Necessary Right angle Boot should be supplied to the cable terminations. The type of the Right angle Boot should be cold applied insulating Boot.

#### **9.14 Voltage Indicator Lamps and Phase Comparators:**

The Ring Main Unit 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 Ring Main Unit 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.

#### **9.15 Extensible:**

Each combination of Ring Main Unit shall have the provision for extension by load break isolators / breakers in future, with suitable trenching chamber, accessories and necessary Bus bars. 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 25 kA for 1 second for 33 kV system. The Breaker should have a rated current carrying capacity of 200 A for Distribution Transformers and Feeders.

#### **9.16 Wiring and Terminals:**

- a) 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 automation, DC, Control wiring), Spare terminals shall be provided by the bidder. 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.
- b) The wiring shall be carried out using single core multi-strand copper conductor super flexible PVC insulated and shall be flame retardant low smoke type wires of 1.1 KV Grade for AC Power, DC Control and CT circuits. Suitable colored 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.

- c) 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.
- d) 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.
- e) All wires directly connected to trip circuits of breaker or devices shall be distinguished by addition of a red color unlettered ferrule.
- f) 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. Color code for wiring is preferable in the following colors:

Voltage supply: Red, Yellow, Blue for phases, Black for Neutral

CT circuits: Red, Yellow, Blue for phases, Black for Neutral

230V 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.

### **9.17 Earthings:**

The Ring Main Unit outdoor metal clad, Switch Gear, Earth contact of Load break isolators, Neutral and body of Distribution Transformer, M.S. Channels / M.S. Angles etc, shall be equipped with an earth bus securely fixed along the base of the Ring Main Unit.

When several units of the Ring Main Unit (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 bus bar of tinned copper flat shall be as per IEC/IS standards and shall be fixed with the Ring Main Unit. Provision shall be made on end of Ring Main Unit 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.

### **9.18 Motorization :**

All the functions within the Ring Main Unit i.e Isolators / Breakers should be fitted with motor mechanism and closing coil making it suitable to make it ON from remote.

Control Supply and Auxiliaries following has to considered:

- (i) Shunt trip coil – 24VDC for Isolators and Breakers
- (ii) Closing Coil – 24VDC
- (iii) Motor Mechanism – 24VDC
- (iv) 6NO+6NC – Potential free auxiliary contacts for breakers / isolator
- (v) Auxiliary supply should be – 24VDC
- (vi) Battery/ Battery charger with battery backup of at least 1hours
- (vii) Local / Remote switch for breaker and Isolators.

### **9.19 Metering:**

The Ring Main Unit should be provided with separate Metering Module Consisting of Bus connected Potential Transformer and metering cum protection Current Transformer to be provided for VCB function i.e. for Distribution Transformer / Feeder along with provision of installing Tri-vector Meter (TVM). The Potential Transformer with PT Fuse and Ring Core type Current Transformer provided shall be made up of Epoxy Cast Resin. The CT ratio shall as per transformer rating.

### **9.20 Take OFF Terminal Units for Automation:**

The Ring Main Unit should be provided with necessary take off terminal units for automations. Remote operation of the Ring Main Units 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 Ring Main Unit fully energized 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 bidder may wish to advice of options and cost for remote supervisory control units of the Ring Main Unit 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.

**Control and Interlocks:**

The circuit breaker shall normally be controlled remotely from SCADA system closing through Motor and tripping through spring.

The isolators and earth isolator shall normally be controlled remotely from SCADA system closing and opening through Motor.

However, it shall also be designed to control locally from Ring Main Unit panel. Suitable mimic on Panel shall be provided.

Facilities shall be provided for mechanical tripping of the breaker in an emergency. Facility shall also be provided for manual charging of the stored energy mechanism for a complete duty cycle.

Necessary mechanical & Electrical interlocks shall be provided between CB, Isolator & Earth switches for safe operation.



Each CB, Isolator & earth switch shall have 8 NO + 6 NC Auxiliary spare of good quality (corrosion free and easy for making connection) for future use by owner. It should be located at accessible position in panel.

All the binary inputs/outputs shall be wired to the terminals & kept ready for SCADA connectivity.

### **9.21 Fault Passage Indicators (FPI) on Short Circuit and Earth fault:**

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 Fault Passage Indicators (FPI) shall be integral part of Ring Main Unit.

The Fault Passage Indicators (FPI) shall facilitate for detection of short circuit fault and earth fault through Current Transformer inbuilt in Fault Passage Indicators.

### **9.22 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.

### **9.23 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'.

### **9.24 Automatic Water Level Controller Using Mercury Float Switch:**

The float switch shall be provided in Ring Main Unit at 200 mm below live contacts to avoid flash over due to water.

The float switch is a device used to detect the level of water within the Ring Main Unit. The float switch shall be used in the Ring Main Unit as an indicator, an alarm (at Control Room), tripping of Vacuum Circuit Breaker and opening of Load Break switch.

A mercury switch is a switch whose purpose is to allow the flow of electric current in an electrical circuit in a manner that is dependent on the switch's physical position.

Mercury switches shall have 4 NO + 4 NC Auxiliary contacts in a sealed glass envelope which contains a bead of mercury. The envelope may also contain air, an inert gas, or a vacuum. Gravity is constantly pulling the drop of mercury to the lowest point in the envelope. When the switch is tilted in the appropriate direction, the mercury touches a set of contacts, thus completing the electrical circuit through those contacts. 'Normally Open' contact becomes 'Normally Close' contact, hence signals to breaker and motor for tripping of Vacuum Circuit Breaker and opening of Load Break switch. These signals shall be goes to Sub Station Control Room / SCADA Control Room via RTU with opening reason for further action.

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### 9.25 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 Ring Main Unit shall not be increased due to the use of the operating handle. The operating handle should have two workable positions 180° apart.

### 9.26 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.

### 9.27 Danger Board:

The danger Board plate as per relevant IS: 2551, 1982 shall be riveted on the front plate of the Ring Main Unit.

### 9.28 Internal arc rating:

The Ring Main Unit shall have a design such that in the event of an internal arc fault, the operator shall be safe. This should be in accordance with IEC 298 and relevant Test certificates shall be submitted with the Tender.

The Ring Main Unit shall be tested for an internal arc rating of 25 kA for 1 Sec for 33 kV.

Suitable temperature rise test on the Ring Main Unit shall be carried out & test reports shall be submitted with tender for technical bid evaluation.

### 9.29 Specific Requirement for Automation:

The Ring Main Units should be provided with provision of following minimum signals available at separate SCADA terminal box.

Minimum signals for SCADA/DMS - to be wired to separate TBs

Sr. No.	Particulars	Contacts
1.	CB Close / Open	Potential free contacts
2.	LBS Close / Open	Potential free contacts
3.	LBS & CB Earth Switch Close / Open	Potential free contacts
4.	CB Test/Service Position	Potential free contacts

5.	Spring charge Status indication	Potential free contacts
6.	SF6 gas pressure low	Potential free contacts
7.	O/C Operated	Potential free contacts
8.	E/F Operated	Potential free contacts
9.	Local/Remote	Potential free contacts
10.	Common Power Supply Healthy	Potential free contacts
11.	Motor MCB Healthy Status	Potential free contacts
12.	Battery charger Fail	Potential free contacts
13.	RMU Door Open	Potential free contacts
14.	CB Trip Coil Healthy	Potential free contacts
15.	Current Transformer Status	Potential free contacts
16.	Potential Transformer Status	Potential free contacts
17.	FPI Control	Potential free contacts
18.	CB control	Potential free contacts
19.	LBS Control	Potential free contacts
20.	Water Level Alarm	Potential free contacts
21.	CB Open	Potential free contacts
22.	LBS Open	Potential free contacts

## A) Specific requirement for SCADA Connectivity:

- i) Fault Passage Indicator shall be provided per isolator
- ii) DC control supply system should be 24V DC.
- iii) Battery charger to cater load of minimum 10 motorized operation cycles (Close-Open) in absence of battery.
- iv) Battery to cater load of minimum 10 motorized operation cycles (Close-Open) in absence of battery charger. The battery backup should be minimum of 6 Hrs.
- v) Miniature Circuit Breakers (MCB) shall be provided for battery charger supply, RMU Motor supply & FRTU supply (Minimum 2 Amp circuit for future use of FRTU).
- vi) Individual control circuit of Isolator/Circuit Breaker to have point of isolation/protection.
- vii) Individual motor circuit of Isolator/Circuit Breaker to have point of isolation/protection.
- viii) The Ring Main Unit shall have minimum protection of IP54 for Outer Enclosure with gland plate & knock outs. Provision for control cable entry should

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preferably be from Right/ Left top through LV cable box & shall be independent of HV Isolator/Circuit Breaker status. It should be vermin proof.

- ix) Control cable gland plate shall be independent of power cable gland plate.
- x) A point of earthing for control cables shall be electrically isolated from power cable earthing.

xi) Ambient temperature of 50°C max. Allowable temperature rise of battery & battery charger above ambient 40°C.

xii) Local / Remote switch shall be provided on all the isolator & breaker panels for selection of controls.

xiii) Current Transformer & Potential Transformer terminals for all the circuit breakers for Distribution Transformers / Feeders only.

B) Following is the list of I/O requirements for Ring Main Unit modules. Please note that all DI & DO should be potential free contacts.

i) List of potential free contacts for Isolator (Terminals shall be provided):

a) Digital Indications:

1. Isolator ON --02 No. & 2 NC
2. Isolator OFF --02 No. & 2 NC
3. Isolator Earth switch Status (ON/OFF)
4. FPI Operated
5. LOCAL/REMOTE switch position

b) List of commands:

1. Isolator Close
2. Isolator Open
3. FPI reset

ii) List of potential free Contacts for Circuit Breakers (Terminals shall be provided):

a) Digital Indications:

1. Circuit Breaker ON
2. Circuit Breaker OFF
3. Auto Trip
4. LOCAL/REMOTE switch position

b) List of commands:

1. Circuit Breaker Close
2. Circuit Breaker Open

iii) Requirement of Tri-Vector Meter (TVM):

- a) The terminals shall be provided for CT and PT Connections
- b) Space shall be provided for Tri-Vector Meter (TVM) mounting on Outer Enclosure panel

### **9.30 Distribution Automation System Interface:**

The Ring Main Unit shall be equipped so that it can be monitored and controlled via the SCADA. In this respect, it shall interoperate with the RTU that will be housed in the Ring Main Unit Control Cabinet. The RTU in turn will interoperate with the SCADA via the remote communications system.

The Ring Main Unit shall have provisions for opening and closing its switches / breakers using output from the RTU. The Ring Main Unit shall also supply analog and status signals to the RTU for monitoring the condition of the Ring Main Unit's distribution network circuits as well as the components of the Ring Main Unit.

## **10.0 Tests:**

### **a. Type tests:**

The Ring Main Unit and accessories 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. The bidder must provide the original copies of type test reports for verification purpose or produce authentic documents to confirm the type tests are authentic in case of tests carried out at equivalent International Laboratories

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.

Type tests:

- i) Short time current withstand test and peak current withstand test.
- ii) Lightning Impulse voltage with-stand test
- iii) Temperature rise test.
- iv) Short Circuit current making and breaking tests.
- v) Power frequency voltage withstand test (dry).
- vi) Capacitive current switching test confirming to IEC.
- vii) Mechanical operation test.
- viii) Measurement of the resistance of the main circuit.
- ix) Degree of protection of Inner enclosure and outer enclosure
- x) Switch, circuit breaker, earthing switch making capacity.
- xi) Switch, circuit breaker breaking capacity.

- xii) Internal arc withstand Test for Inner Enclosure and Cable Chamber.
- xiii) 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.

In addition to that, Test report of Vacuum Interrupter along with Catalogues & Literatures to be submitted along with the Offer.

#### **b. Acceptance and 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 dispatch.

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

After finalization of the program of 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 ) , MMC, MSEDCL.

All the Ring Main Units must be routine tested for the following:

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 / SF6 gas leak test.
6. Dielectric testing and main circuit resistance measurement.
7. Power frequency voltage
8. Resistance test for the circuit
9. Mechanical operation tests.
10. Micro-ohm test for the assembly inside the tank.
11. Circuit breaker analyzer test so as to ensure the simultaneous closing of all poles  
for VCB.
12. Partial Discharge test on the complete gas tank so as to be assure of the proper  
insulation level and high product life.
13. High voltage withstands.
14. Secondary test to ensure the proper functioning of the live line indicators, fault  
passage indicators and relays.

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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.

### **11.0 Inspection:**

The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder 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 program 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 program.

### **12.0 Qualifying Requirement:**

- a) The Bidder should have proven experience of not less than 10 years in design, manufacture, supply and testing at work for Ring Main Units and accessories offered for equal or higher voltage class. The Ring Main Units and accessories offered by bidder should be in the successful operation, at least for five years as on the date of submission of the tender.
- b) The bidder should have adequate in house testing facilities for conducting acceptance / routine tests in accordance with relevant IS.
- c) Bidder 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, MM Cell is requested to verify this point.
- d) The bidder should furnish all the relevant documentary evidence to establish the fulfillment of the above requirement.
- e) The bidders not meeting the requirement at clause No. 12,(a) 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 Ring Main Units and accessories of same 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.

### **13.0 Prototype Sample:**

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

### **14.0 Manufacturing Facilities:**

As Ring Main Units 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.
6. Computerized SF6 filling and testing facility.
7. Partial Discharge Lab for conducting the partial discharge test.

### **15.0 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 bidder's representative, copies of test certificates.

- 2) Information and copies of test certificates as in (1) 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 Ring Main Unit 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.

1. List of raw materials as well bought out accessories and the names of sub-suppliers selected from those furnished along with offer.
2. Necessary test certificates of the raw material and bought out accessories.
3. 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.

#### **16.0 Drawings and Documentations:**

All drawings shall conform to relevant IEC Standards Specification. All drawings shall be in clear and visible.

The Bidder shall submit following drawings for approval:

- i) General Arrangement Drawing.
  - ii) General Arrangement Drawing with Door Open.
  - iii) Name Plate Drawing.
  - iv) Foundation Drawing.
  - v) Single Line Diagram Drawing.
  - vi) MIMIC Diagram Drawing.
  - vii) Control Schematic Wiring Diagram of Load Break Switch.
  - viii) Control Schematic Wiring Diagram of Circuit Breaker.
  - ix) Control Schematic Wiring Diagram of Earth Switch.
  - x) Control Schematic Wiring Diagram of Automatic Water Level Controller.
  - xi) Control Schematic Wiring Diagram of Voltage Indicator Lamps.
  - xii) Control Schematic Wiring Diagram of Fault Passage Indicators (FPI).
  - xiii) Terminal Block Drawing.
  - xiv) Mechanical Interlock Drawing.
  - xv) Electrical Interlock Drawing.
  - xvi) SF6 Monitoring Pressure Switch and Indication Schematic Drawing.
  - xvii) Schematic Wiring Diagram of Metering Unit.
  - xviii) Vacuum Interrupter Drawing.
  - xix) Danger Plate Drawing.
  - xx) Two Cable Arrangement Drawing.
  - xxi) Technical Detail Sheet Drawing.
  - xxii) Bill of Material.
  - xxiii) Packing List.
1. After issue of letter of acceptance, the successful bidders shall submit 3 identical sets of complete drawings along with detailed bill of materials for approval, to the Chief Engineer (Testing), 5th 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.

2. The manufacturing of the Ring Main Units shall be strictly in accordance with the approved drawings and no deviation will be permitted without the written approval of MSEDCL. All manufacturing and fabrication work in connection with the Ring Main Units prior to the approval of the drawings shall be at the supplier's risk and cost.
  3. Approval of drawings by the purchaser shall not relieve the supplier of any of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the latest revisions of applicable standards, rules and codes of practices.
  4. After approval of the drawings detailed packing lists and bills of materials, the suppliers 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.
  5. Before dispatch of Ring Main Units 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 (MMD), 1st floor, Prakashgad, Bandra(E), Mumbai positively before the dispatch of Ring Main Units. 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 Ring Main Units consignment and shall be listed out in the packing list, when submitted for approval.
  6. In case the supplier fails to furnish contractual drawings and manuals even at the time of supply of Ring Main Units, the date of furnishing of drawings/manuals will be considered as the date of supply of Ring Main Units for the purpose of computing penalties for late delivery.
  7. The successful bidder shall furnish in the form of nicely bound volumes, the manuals covering erection, commissioning, operation and maintenance instructions and all relevant information and drawings pertaining to the Ring Main Unit as well as auxiliary devices. Marked erection drawings shall identify the component parts of the Ring Main Unit as shipped to enable Engineer/Purchaser to carry out erection with his own personnel. Each manual shall also contain one set of all the approved drawings type test reports as well as acceptance test reports to corresponding consignment dispatched. The total quantity of the operating manuals/approved drawings sets to be supplied by the supplier shall be equal to the number of Ring Main Units ordered.
- b.** The Bidder shall submit along with his tender illustrative and descriptive literature in triplicate for various items in the Ring Main Units, which are all essentially required for automation.

The Bidder shall submit following documents along with the tender:

- i) Instruction manuals.
- ii) Catalogues of spares recommended with drawing to indicate each items of spares.
- iii) List of spares and special tools recommended by the supplier.
- iv) Copies of Type Test Certificates as per latest IS/IEC.
- v) Dimensional drawings of each material used for item.
- vi) Actual single line diagram of Ring Main Unit with or without extra combinations shall be made displayed on the front portion of the Ring Main Unit so as to carry out the operations easily.

Operation, Maintenance and erection instruction manual in English language shall be also supplied along with each Ring Main Unit to the respective consignee as per the dispatch instructions given from Material Management Cell under CE (MMD), Corporate Office, Mumbai. The successful bidder shall submit the drawings, bill of materials, packing lists, etc. in time and get these approved from the office of Chief Engineer (Testing), 5th floor, Prakashgad, MSEDCL, Mumbai.

#### **17.0 Name Plate:**

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

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

#### **18.0 Packing and 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:

- a. Name of the consignee.
- b. Details of consignment
- c. Destination.
- d. Total weight of consignment.
- e. Sign showing upper/lower side of the crate.
- f. Handling and unpacking instructions.
- g. Bill of material indicating contents of each package.

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

The bidder 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 bidder to submit the drawings, bill of materials, packing lists, etc. in time and get these approved from the office of Chief Engineer (Quality Control and Testing), 5th 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.

#### **19.0 Training:**

All successful bidders for Ring Main Units 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 finalized 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.

#### **20.0 Performance Guarantee:**

All Ring Main Units and accessories supplied against this specification shall be guaranteed for a period of 66 months from the date of receipt at the consignee's Stores Center 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.

#### **21.0 Annexure:**

The bidder shall fill in the following Annexure 'A' which forms part of the Tender Specification and offer. If the Annexure 'A' is not submitted duly filled in with the offer, the offer shall be liable for rejection.

Annexure 'A' - Principal Technical Parameters of Ring Main Units.

#### **22.0 Schedules:**

The bidder shall fill in the following Schedule which forms part 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 Technical Particulars of 33 kV Ring Main Units.
- Schedule - 'B' - List of Type Test Reports to be enclosed with the offer
- Schedule - 'C' - Schedule of Deviations from Specification
- Schedule - 'D' - Schedule of Bidder's Experience
- Schedule - 'E' - Schedule of Deviations from Specified Standards
- Schedule - 'F' - Deviations from specified Test requirements specified in Relevant Standards and Present Specification
- Schedule - 'G' - Proforma of Undertaking

The Bidder shall submit the list of orders for supply of Ring Main Units executed or under execution during last three years, with full details, in the schedule of Bidders experience (Schedule 'D') to enable the purchaser to evaluate the tender.

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

**23.0 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.

Technical Specification for 33 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

**Annexure 'A'****Principal Technical Parameters of Ring Main Unit and accessories:.**

Sr. No.	Description	33 kV Ring Main Unit
1.	Indoor / Out door	Indoor / Out door
2.	Configurations(Type)	3 Way, M+LLV+ L= Isolator. V= VCB. M=Metering
3.	Reference Standard	IEC-62271-100, 200, 103, IEC-62271-1
4.	Rated Voltage in kV	33
5.	Highest System Voltage in kV, Max.	36
6.	Number of Phase	3
7.	Frequency in HZ.	50 Hz $\pm$ 3%
8.	Short Circuit rating	
	a) Breaking Symmetrical for 3 Sec. in KA	25
	b) Breaking Asymmetrical for 3 Sec. in KA	25
	c) Short time for 3 Sec. in KA.	25
9.	Insulation Level	
	a) Impulse withstand in KV peak.	170
	b) 1 Minute 50 Hz. Voltage withstand in KV rms	70
10.	Internal arc rating for 1 sec. in kV	25
11.	Construction: Material and Size	
	Inner Enclosure	Main Stainless Steel Tank with 2 mm Thickness
	Outer Enclosure	CRCA Sheet of 2 mm thickness or Galvanized Sheet of 1.6 mm thickness
12.	Degree of protection	
	Inner Enclosure	IP 67
	Outer Enclosure	IP 54 (Main Door close) and IP 41 (Main Door open)
13.	The Ring Main Unit and accessories completely wire and tested at factory	Yes

14.	Paint	Polyurethane based powder paint
15.	Color	Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007
16.	Thickness of coat, Min.	150 microns for CRCA Sheet and 80 microns for galvanized sheets
17.	Reference Standard	IS: 1897, 2008
18.	Grade and Material	Electrolytic Grade Copper
19.	Cross sectional area in mm <sup>2</sup>	400
20.	Size in mm or as per design	40 x 10
21.	Current Density in Amps/mm <sup>2</sup> , Max.	1.6
22.	Continuous Current in Amps	630
23.	Maximum temperature rise over an ambient temperature 50°C.	55°C
24.	Short time current rating for 3 Sec in kA rms	25
25.	Clearance in mm from bare bus bar or as per design	
	Phase to Phase for Isolator or as per design	78
	Phase to Phase for VCB	78
	Phase to Earth for Isolator or as per design	78
	Phase to Earth for VCB or as per design	78
26.	Bus Supports	
	Reference Standard	IEC 60243-1, ASTM D 648
	Voltage Class in kV	33 kV
	Creepage distance in mm or as per design	180 in SF6 gas
	Bus Bar support spacing in mm or as per design	420
27.	Filling SF6 gas pressure (Filling pressure at 20°C), Min.	1.4 Bar
28.	Operating SF6 gas pressure at 20°C, Min.	0.5 Bar
29.	Reference Standard	IEC 62271-100
30.	Rated Voltage in kV	33
31.	Highest System Voltage in kV, Max.	36

32.	Type	Vacuum Type
33.	Rated Frequency in Hz.	50 Hz $\pm$ 3%
34.	No. of Poles	3
35.	Rated Current	630A
36.	Maximum temperature rise over an ambient temperature 50°C.	55°C
37.	Rated operating Duty	0-3min-CO-3min-CO
38.	Rupturing capacity at rated voltage in MVA, Min.	As per design
39.	Breaking Capacity at rated voltage & operating duty	
	Symmetrical in kA rms	25
	Asymmetrical in kA rms	25
40.	Rated making current in kA peak	62.5
41.	Short time current for 3 sec in kA rms	25
42.	Transient Recovery Voltage	
	Rate of rise in kV/ $\mu$ s	0.64 kV/ $\mu$ s as per IEC 62271-100
	Peak Voltage in kV	70
43.	Insulation Level	
	Impulse Voltage with stand on 1.2/50 $\mu$ s full wave in kV	170
	1 minute power frequency voltage withstand in kV	70
44.	Total breaking time for transient fault ( CB + Relay+ trip coil) in ms	<45 ms
45.	Opening time No load condition in ms	<45 ms
46.	Opening time under SF6 gas low or vacuum loss condition in ms	<45 ms
47.	Number of breaks per pole	Single
48.	No of breaker operations permissible without requiring inspection replacement of contacts and other Main parts	
	At 100% rated current	2000
	At 100% rated breaking current, Min.	20
49.	Type of contacts	
	Main	Butt Type
	Arcing	Butt Type
50.	Material of contacts	
	Main	Copper
	Arching	Copper
	Chromium / Silver plated	Chromium / Silver plated
51.	Mechanical Endurance Test for Circuit Breaker, Number of operations	2000



52.	Spring charging mechanism	Motor Operated
53.	Operating mechanism for closing of Circuit Breaker	
	Type	Spring operated Mechanism
	No of breaker operations stored	One
	Trip free or fixed trip	Trip Free
	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material, Min.	Electrolytic grade Copper 25 x 3mm
54.	Operating mechanism for tripping of Circuit Breaker	
	Type	Spring Operated Mechanism
	No of breaker operations stored	One
	Trip free or fixed trip (V)	Trip Free
	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material	Electrolytic grade Copper 25 x 3mm
55.	Breaker Accessories	
	Mechanical safety Interlock	Provided
	Automatic safety Interlock	Provided
	Operational Interlock	Provided
	Emergency manual trip	Provided
	Operation counter	Provided
	Spring charge / discharge indicator	Provided
	Manual spring charging facility	Provided
56.	Reference standard	IEC-62271-102 / IEC-62271-103
57.	Nominal Voltage in KV	33
58.	Highest System Voltage in kV, Max.	36
59.	Rated Frequency in HZ	50 Hz $\pm$ 3%
60.	No. Of poles	3
61.	Rated Current in Amps	630
62.	Maximum temperature rise over an ambient temperature 50°C.	60°C
63.	Operation	Close-Open-Earth
64.	Rupturing Capacity at rated voltage	630 Amps at 33kV
65.	Maximum over voltage factor when switching off Loaded feeder cable in kA	62.5
66.	No. of isolator operation permissible without requiring inspection, replacement of contacts and other main parts	
	Mechanical Endurance in Number of operations	1000
	At 100% rated making current in Number of operations	100
	At 100% rated breaking current in	100

	Number of operations	
67.	Isolator provided with the following Mechanical safety	
	Mechanical ON and OFF Indication	Provided
	Cable Earth Indication	Provided
	Operational Counter	Provided
	Manual Spring Charging facility	Provided
68.	Reference standard	IS:16227, I & II
69.	Type	Ring Type, Resin Cast/Tape wound
70.	Nominal Voltage in KV	33
71.	Highest System Voltage in kV, Max.	36
72.	Rated Frequency in HZ	50 Hz $\pm$ 3%
73.	Current Transformer Ratio	200-100/1Amps
74.	Short circuit withstand	
	Short time current for 1 sec. in kA rms	5
	Dynamic current in kA peak, Min.	7.5
75.	Class of insulation	Class B
76.	Basic insulation level in kV rms	3
77.	Maximum temperature rise over an ambient temperature 50°C.	60°C
78.	Class of Accuracy	
	Metering Core	0.5
	Protection Core	5P10
79.	Rated Burden	2.5 VA
80.	Over Current Rating in %	120
81.	Continuous Over Load in %	120
82.	Reference standard	IS:16227, I & III
83.	Type	Resin Cast/Tape wound
84.	Nominal Voltage in KV	33
85.	Highest System Voltage in kV, Max.	36
86.	Rated Frequency in HZ	50 Hz $\pm$ 3%
87.	Voltage Transformer Ratio	33 kV/ $\sqrt{3}$ /110V/ $\sqrt{3}$
88.	Rated Primary Voltage in kV	33 kV/ $\sqrt{3}$
89.	Rated Secondary Voltage in V	110V/ $\sqrt{3}$
90.	Rated Burden in VA	50
91.	Accuracy Class	0.5
92.	Insulation Class	B
93.	Voltage Factor	1.2 Continuous and 1.9 for 8 hrs.
94.	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	70
	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	170
95.	Reference standard	IS:16227, I & III
96.	Type	Resin Cast/Tape wound
97.	Nominal Voltage in KV	33
98.	Highest System Voltage in kV, Max.	36
99.	Rated Frequency in HZ	50 Hz $\pm$ 3%
100.	Voltage Transformer Ratio	33 kV / 230V

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101.	Rated Primary Voltage in kV	33 kV
102.	Rated Secondary Voltage in V	230V
103.	Rated Burden in VA	500 VA
104.	Voltage Regulation in %	5
105.	Insulation Class	B
106.	Voltage Factor	1.2
107.	Application & Construction Type	Indoor, Single Phase/Two Pole
108.	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	70
	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	170
109.	Reference Standard	IEC 60255
110.	Type and Model	3 Over Current(O/C) and 1 Earth fault(E/F)
111.	Current Transformer Secondary Input to Relay	1 A
112.	Operating Curve Type	Inverse Definite Minimum Time (IDMT)Relay
113.	Auxiliary Supply	Self Powered relay for Protection
114.	Rated Frequency in HZ	50 Hz $\pm$ 3%
115.	Over Current Protection	
	Low set Over Current protection	20-200% of CT secondary rated current with increment/decrement by 1 %
	High set Over Current protection	100-2000% of CT secondary rated current with increment/decrement by 50%
116.	Earth Fault Protection	
	Low set Earth Fault protection	5% to 80% of the CT rated current in steps of 1%
	High set Earth Fault protection	100-1000% of the CT rated current in steps of 50%
117.	Mounting	Flush Mounted
118.	Operational Indicator	LCD display and LED annunciation lamps
119.	Contact Details	4 Binary Input(BI) and 6 Binary Output(BO)
120.	Self-diagnosis feature	Yes
121.	Password protection	Yes
122.	Communication Protocol	RS 232 or RS 485 Port for IEC 103, Communication Protocol
123.	Event / fault record, Min.	10 Event and 5 Fault Records available

124.	Setting groups	2 Groups available
125.	Circuit Breaker control available	Yes, Only Trip
126.	DC Voltage in Volt	24
127.	Maximum Tripping Current at rated voltage in Amps.	5
	Minimum Permissible voltage variation in %	85 to 110
128.	Reference Standard	IS: 14697, 1999 IS: 15959, 2011
129.	Make	Secure / L&T / other MSEDCL approved make
130.	Auxiliary supply Voltage	110V/√3
131.	Class of Accuracy	0.5S
132.	Type of Display	Customized backlite liquid crystal display
133.	Measuring Parameters as per MSEDCL Specification	
		Instantaneous parameters
		Block Load Profile parameters
		Billing Profile Parameters
		Name Plate details Programmable Parameters
		Event Conditions
		All logging parameters for each of the event condition for 3 Φ / 4W
134.	Operating point/Current short circuit in Amp	Adjustable 100/200/300 /400/500 /600/700 /800/900/1000 /1100/1200A (±15%)
135.	Operating point/Current earth fault in Amp	Adjustable 10/20/30/40 /60/80/100A (±15%)
136.	Response Time in ms	For Short Circuit Adjustable 40/60/80/100/120 /160/200/240 ms Sec(±100m Sec) For Earth Fault Adjustable 40/60/80/160 ms (±100m Sec)
137.	Auto Reset Time in Hrs	1/2/4/8 hrs (+ / - 1%) after fault
138.	Input AC Voltage in V	230
139.	Rated Frequency in Hz	50 Hz ± 3%
140.	Output DC Voltage in V	24
141.	Current Rating in Amps	10

142.	Output DC Voltage for charger		
	Boost Mode in V		27 to 28
	Float Mode in V		27 to 28
143.	Operating Temperature in °C		-25 to 60
144.	Temperature Compensation		Junction temperature of SMPS crosses 142°C, thermal shutdown occurs.
145.	Short Circuit and Overload Protection		Provided
146.	High Voltage Isolation		2 kV for 1 minute
147.	Efficiency		Above 85 %
148.	Type		Dry Type
149.	Ah Efficiency		> 95%
150.	Self-Discharge		Self-Discharge
151.	Operating Temperature		Normal : +20°C to +30°C & Limits : -20°C to +50°C
152.	Voltage (V)		24V (2 x 12V)
153.	Ah Capacity		7Ah / 12 Ah / 26 Ah
154.	Type		Analogue
155.	Material		Stainless Steel
156.	Accuracy of calibration pressure		+/-1% at 20°C
157.	Pressure Element		Stainless Steel Welded
158.	Dial		2"
159.	Pointer		Dark
160.	Window		Round
161.	Gas pressure low signal		Indicated by Red Color Zone
162.	Non Return Valve(NRV) Material		Stainless Steel
163.	Type		33 kV touch proof screened termination kit
164.	Materials		Epoxy / EPDM / Silicon Rubber
165.	Size		Up to 3 x 400 sq. mm 33 kV HT cables
166.	Height of Bus bar / transformer / feeder Cable box from ground level		As per Manufacture design
167.	Arrangement for mounting an extra cable at incoming and outgoing side box of Bus bar.		As per Manufacture design
168.	Arrangement for mounting an extra cable at outgoing side box of transformer / feeder.		As per Manufacture design

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172.	Position of Automatic Water Level Controller	200 mm below live contacts
173.	Auxiliary contacts	4 NO + 4 NC
174.	Breaker Tripping and Load break Isolator opening due to water level increases signals to Control room	Yes
175.	Material	Anodized Aluminum / Stainless Steel
176.	Thickness	18 swg / 1.00 mm
177.	Size	145 mm x 116 mm
178.	Inside	Powder Coated
179.	Outside	Polyurethane based powder paint. Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.

#### Schedule 'B'

### Guaranteed Technical Parameters of 33 KV, 630 Amps with, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

Sr. No.	Description	33 kV Ring Main Unit	Parameters to be filled by Bidder
<b>A)Ring Main Unit Assembly</b>			
1.	Indoor / Out door	Indoor / Out door	
2.	Manufacturer's Name & address		
3.	Manufacturer's Type Designation		
4.	Model		
5.	Configurations(Type)	L= Isolator. V= VCB. M=Metering	
	Configurations	3 Way, M+LLV+	
6.	Reference Standard	IEC-62271-100, 200, 103 and IEC-62271-1	
7.	Rated Voltage in kV	33	
8.	Highest System Voltage in kV, Max.	36	
9.	Number of Phase	3	
10.	Frequency in HZ.	50 Hz $\pm$ 3%	

Technical Specification for 33 kV, 630 Amps, Extensible / Non extensible type,

Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

11.	Short Circuit rating		
	a) Breaking Symmetrical for 3 Sec. in KA	25	
	b) Breaking Asymmetrical for 3 Sec. in KA	25	
	c) Short time for 3 Sec. in KA.	25	
12.	Insulation Level		
	a) Impulse withstand in KV peak.	170	
	b) 1 Minute 50 Hz. Voltage withstand in KV rms	70	
13.	Internal arc rating for 1 sec. in kV	25	
14.	Construction: Material and Size		
	a) Inner Enclosure	Main Stainless Steel Tank with 2 mm Thickness	
	b) Outer Enclosure	CRCA Sheet of 2 mm thickness or Galvanized Sheet of 1.6 mm thickness	
15.	Degree of protection		
	a) Inner Enclosure	IP 67	
	b) Outer Enclosure	IP 54 (Main Door close) and IP 41 (Main Door open)	
16.	The Ring Main Unit and accessories completely wire and tested at factory	Yes	
17.	Paint	Polyurethane based powder paint	
18.	Color	Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007	
19.	Thickness of coat, Min.	150 microns for CRCA Sheet and 80 microns for	
<b>Overall Dimensions and Weight</b>			
20.	Tolerance to Overall Dimensions	+ 5 %	
	Extensible 3 Way RMU(3 Way, M+LLV+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
<b>B) Bus Bar</b>			
21.	Make	As per Manufacture Design	
22.	Reference Standard	IS: 1897, 2008	
23.	Grade and Material	Electrolytic Grade Copper	
24.	Cross sectional area in mm <sup>2</sup>	400	
25.	Size in mm	40 x 10 or as per Manufacture design	
26.	Current Density in Amps/mm <sup>2</sup> , Max.	1.6	
27.	Continuous Current in Amps	630	

28.	Maximum temperature rise over an ambient temperature 50°C.	55°C	
29.	Short time current rating for 3 Sec in kA rms	25	
30.	Clearance in mm from bare bus bar		
	a) Phase to Phase for Isolator or as per design	78	
	b)Phase to Phase for VCB or as per design	78	
	c)Phase to Earth for Isolator or as per design	78	
	d)Phase to Earth for VCB or as per design	78	
31.	Bus Supports		
	i)Make	As per Manufacture Design	
	ii)Type	As per Manufacture Design	
	iii)Reference Standard	IEC 60243-1, ASTM D 648	
	iv)Voltage Class in kV	33 kV	
	v) Creepage distance in mm or as per design	180 in SF6 gas	
	vi)Bus Bar support spacing in mm or as per design	420	
32.	Filling SF6 gas pressure (Filling pressure at 20°C), Min.	1.4 Bar	
33.	Operating SF6 gas pressure at 20°C, Min.	0.5 Bar	
<b>C)Vacuum Circuit Breaker</b>			
34.	Make	As per Manufacture Design	
35.	Type	As per Manufacture Design	
36.	Reference Standard	IEC 62271-100	
37.	Rated Voltage in kV	33	
38.	Highest System Voltage in kV, Max.	36	
39.	Type	Vacuum Type	
40.	Rated Frequency in Hz.	50 Hz ± 3%	
41.	No. of Poles	3	
42.	Rated Current	630A	
43.	Maximum temperature rise over an ambient temperature 50°C.	55°C	
44.	Rated operating Duty	0-3min-CO-3min-CO	
45.	Rupturing capacity at rated voltage in MVA, Min.	400	
46.	Breaking Capacity at rated voltage & operating duty		
	i)Symmetrical in kA rms	25	
	ii)Asymmetrical in kA rms	25	
	iii)Rated making current in kA peak	62.5	



47.	Short time current for 3 sec in kA rms	25	
48.	Transient Recovery Voltage		
	i)Rate of rise in kV/ $\mu$ s	0.64 kV/ $\mu$ s as per IEC 62271-100	
	ii)Peak Voltage in kV	70	
49.	Insulation Level		
	a)Impulse Voltage with stand on 1.2/50 $\mu$ s full wave in kV	170	
	b)1 minute power frequency voltage withstand in kV	70	
50.	Vacuum Bottle		
	i)Make	As per Manufacture Design	
	ii)Type	As per Manufacture Design	
	iii)Rated Voltage in kV	As per Manufacture Design	
	iv)Rated Current in Amps.	As per Manufacture Design	
51.	Total breaking time for transient fault ( CB + Relay+ trip coil) in ms	<45 ms	
52.	Opening time No load condition in ms	<45 ms	
53.	Opening time under SF6 gas low or vacuum loss condition in ms	<45 ms	
	i)At 100% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	
	ii)At 60% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	
	iii)At 30% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	
	iv)At 10% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	
54.	Number of breaks per pole	Single	
55.	No of breaker operations permissible without requiring inspection replacement of contacts and other Main parts		
	a)At 100% rated current	2000	
	b)At 100% rated breaking current, Min.	20	
56.	Type of contacts		
	i)Main	Butt Type	
	ii)Arcing	Butt Type	
57.	Material of contacts		

	i)Main	Copper	
	ii)Arching	Copper	
	iii)Chromium / Silver plated	Chromium / Silver plated	
58.	Mechanical Endurance Test for Circuit Breaker, Number of operations	2000	
59.	Spring charging mechanism	Motor Operated	
60.	Operating mechanism for closing of Circuit Breaker		
	i)Type	Spring operated Mechanism	
	ii)No of breaker operations stored	One	
	iii)Trip free or fixed trip	Trip Free	
	iv)Earthing for operating mechanism and metal parts	Solidly Earthed	
	v)Earth terminal size and material, Min.	Electrolytic grade Copper 25 x 3mm	
61.	Operating mechanism for tripping of Circuit Breaker		
	i)Type	Spring Operated Mechanism	
	ii)No of breaker operations stored	One	
	iii)Trip free or fixed trip (V)	Trip Free	
	iv) Earthing for operating mechanism and metal parts	Solidly Earthed	
	v)Earth terminal size and material	Electrolytic grade Copper 25 x 3mm	
	vi)Spring charging mechanism		
	a)Make	As per Manufacture Design	
	b)Type	As per Manufacture Design	
	c)Motor, Voltage and Watts	As per Manufacture Design	
62.	Breaker Accessories		
	i)Mechanical safety Interlock	To be Provided	
	ii)Automatic safety Interlock	To be Provided	
	iii)Operational Interlock	To be Provided	
	iv)Emergency manual trip	To be Provided	
	v)Operation counter	To be Provided	
	vi)Spring charge / discharge indicator	To be Provided	
	vii)Manual spring charging facility	To be Provided	
63.	Impact load on foundation design (to include dead load plus impact value on Closing at maximum interrupting rating)in kg		
	Extensible 3 Way RMU(3 Way, M+LLV+)	As per Manufacture Design	
<b>D)Isolators</b>			
64.	Make	As per Manufacture Design	
65.	Type	As per Manufacture Design	

66.	Reference standard	IEC-62271-102 / IEC-62271-103	
67.	Nominal Voltage in KV	33	
68.	Highest System Voltage in kV, Max.	36	
69.	Rated Frequency in HZ	50 Hz $\pm$ 3%	
70.	No. Of poles	3	
71.	Rated Current in Amps	630	
72.	Maximum temperature rise over an ambient temperature 50°C.	60°C	
73.	Operation	Close-Open-Earth	
74.	Rupturing Capacity at rated voltage	630Amps at 33 kV	
75.	Maximum over voltage factor when switching off Loaded feeder cable in kA	62.5	
76.	No. of isolator operation permissible without requiring inspection, replacement of contacts and other main parts		
	i)Mechanical Endurance in Number of operations	1000	
	ii)At 100% rated making current in Number of operations	100	
	iii)At 100% rated breaking current in Number of operations	100	
77.	Isolator provided with the following Mechanical safety		
	a)Mechanical ON and OFF Indication	To be Provided	
	b)Cable Earth Indication	To be Provided	
	c)Operational Counter	To be Provided	
	d)Manual Spring Charging facility	To be Provided	
<b>E) Current Transformer</b>			
78.	Make	As per Manufacture Design	
79.	Reference standard	IS:16227, I & II	
80.	Type	Ring Type, Resin Cast/Tape wound	
81.	Nominal Voltage in KV	33	
82.	Highest System Voltage in kV, Max.	36	
83.	Rated Frequency in HZ	50 Hz $\pm$ 3%	
84.	Current Transformer Ratio	200-100/1Amps	
85.	Short circuit withstand		
	i)Short time current for 3 sec. in kA rms	5	
	ii)Dynamic current in kA peak,	7.5	

	Min.		
86.	Class of insulation	Class B	
87.	Basic insulation level in kV	3	
88.	Maximum temperature rise over an ambient temperature 50°C.	60°C	
89.	Class of Accuracy		
90.	Metering Core	0.5	
91.	Protection Core	5P10	
92.	Rated Burden	2.5 VA	
93.	Over Current Rating in %	120	
94.	Continuous Over Load in %	120	
<b>F) Metering Voltage (Potential) Transformer</b>			
95.	Make	As per Manufacture Design	
96.	Reference standard	IS:16227, I & III	
97.	Type	Resin Cast/Tape wound	
98.	Nominal Voltage in KV	33	
99.	Highest System Voltage in kV, Max.	36	
100.	Rated Frequency in HZ	50 Hz $\pm$ 3%	
101.	Voltage Transformer Ratio	33 kV/ $\sqrt{3}$ /110V/ $\sqrt{3}$	
102.	Rated Primary Voltage in kV	33 kV/ $\sqrt{3}$	
103.	Rated Secondary Voltage in V	110V/ $\sqrt{3}$	
104.	Rated Burden in VA	50	
105.	Accuracy Class	0.5	
106.	Insulation Class	B	
107.	Voltage Factor	1.2 Continuous and 1.9 for 8 hrs.	
108.	One Minute Power Frequency Dry Withstand Voltage Rating		
	a) Primary Winding Induced Test in kV rms	70	
	b)Secondary Winding in kV rms	3	
	c)Rated Impulse Voltage in kV peak	170	
<b>G) Auxiliary Voltage(Potential) Transformer</b>			
109.	Make	As per Manufacture Design	
110.	Reference standard	IS:16227, I & III	
111.	Type	Resin Cast/Tape wound	
112.	Nominal Voltage in KV	33	
113.	Highest System Voltage in kV, Max.	36	
114.	Rated Frequency in HZ	50 Hz $\pm$ 3%	
115.	Voltage Transformer Ratio	33 kV/ $\sqrt{3}$ / 230V	
116.	Rated Primary Voltage in kV	33 kV/ $\sqrt{3}$	
117.	Rated Secondary Voltage in V	230 V	
118.	Rated Burden in VA	500 VA	
119.	Voltage Regulation in %	5	
120.	Insulation Class	B	
121.	Voltage Factor	1.2	

122.	Application & Construction Type	Indoor, Single Phase/Two Pole	
123.	One Minute Power Frequency Dry Withstand Voltage Rating		
	a)Primary Winding Induced Test in kV rms	70	
	b)Secondary Winding in kV rms	3	
	c)Rated Impulse Voltage in kV peak	170	
<b>H) Numerical Protection Relay</b>			
124.	Make	As per Manufacture Design	
125.	Type and Model	As per Manufacture Design	
126.	Reference Standard	IEC 60255	
127.	Type and Model	3 Over Current(O/C) and 1 Earth fault(E/F)	
128.	Current Transformer Secondary Input to Relay	1 A	
129.	Operating Curve Type	Inverse Definite Minimum Time (IDMT)Relay	
130.	Auxiliary Supply	Self Powered relay for Protection	
131.	Rated Frequency in HZ	50 Hz $\pm$ 3%	
132.	Over Current Protection		
	a)Low set Over Current protection	20-200% of CT secondary rated current with increment/decrement by 1 %	
	b)High set Over Current protection	100-2000% of CT secondary rated current with increment/decrement by 50%	
133.	Earth Fault Protection		
	a)Low set Earth Fault protection	5% to 80% of the CT rated current in steps of 1%	
	b)High set Earth Fault protection	100-1000% of the CT rated current in steps of 50%	
134.	a)Mounting	Flush Mounted	
	b)Mounting Dimensions, W X L x H in mm	As per Manufacture Design	
135.	Operational Indicator	LCD display and LED annunciation lamps	
136.	Contact Details	4 Binary Input(BI) and 6 Binary output(BO)	
137.	Self-diagnosis feature	To be Provided	
138.	Password protection	To be Provided	
139.	Communication Protocol	RS 232 or RS 485 Port for IEC 103 Communication Protocol	
140.	Event / fault record, Min.	10 Event and 5 Fault Records available	
141.	Setting groups	2 Groups available	
142.	Circuit Breaker control	Yes, Only Trip	

	available		
<b>I) Tripping Coil</b>			
143.	Make	As per Manufacture Design	
144.	Type	As per Manufacture Design	
145.	DC Voltage in Volt	24, Pulse operated	
146.	Maximum Tripping Current at rated voltage in Amps.	5	
147.	Minimum Permissible voltage variation in %	85 to 110	
148.	Power at Voltage in Watts	As per Manufacture Design	
<b>J) HT three phase four wire CT / PT operated 1 Amps fully Static &amp; AMR compatible TOD Tri - vector Energy Meter</b>			
149.	Reference Standard	IS: 14697, 1999 IS: 15959, 2011	
150.	Make	Secure / L&T / other MSEDCL approved make	
151.	Auxiliary supply Voltage	110V/√3	
152.	Class of Accuracy	0.5S	
153.	Type of Display	Customized backlite liquid crystal display	
154.	Measuring Parameters as per MSEDCL Specification		
	i) Instantaneous parameters	To be Provided	
	ii) Block Load Profile parameters	To be Provided	
	iii) Billing Profile Parameters	To be Provided	
	iv) Name Plate details Programmable Parameters	To be Provided	
	v) Event Conditions	To be Provided	
	vi) All logging parameters for each of the event condition for 3 Φ / 4W	To be Provided	
<b>K) Fault Passage Indicator (FPI) on Short Circuit and Earth fault</b>			
155.	Make	As per Manufacture Design	
156.	Type and Model	As per Manufacture Design	
157.	Operating point/Current short circuit in Amp	Adjustable 100/200/300 /400/500 /600/700 /800/900/1000 /1100/1200A (±15%)	
158.	Operating point/Current earth fault in Amp	Adjustable 10/20/30/40 /60/80/100A (±15%)	
159.	Response Time in ms	For Short Circuit Adjustable 40/60/80/100/120 /160/200/240 ms Sec(±100m Sec) For Earth Fault Adjustable 40/60/80/160 ms (±100m Sec)	

160.	Auto Reset Time in Hrs	1/2/4/8 hrs (+ / - 1%) after fault	
<b>L) Battery Charger</b>			
161.	Make	As per Manufacture Design	
162.	Type and Model	As per Manufacture Design	
163.	Input AC Voltage in V	230	
164.	Rated Frequency in Hz	50 Hz $\pm$ 3%	
165.	Output DC Voltage in V	24	
166.	Current Rating in Amps	10	
167.	Output DC Voltage for charger		
	i)Boost Mode in V	27 to 28	
	ii)Float Mode in V	27 to 28	
168.	Operating Temperature in $^{\circ}$ C	-25 to 60	
169.	Temperature Compensation	Junction temperature of SMPS crosses 142 $^{\circ}$ C, thermal shutdown occurs.	
170.	Short Circuit and Overload Protection	To be Provided	
171.	High Voltage Isolation	2 kV for 1 minute	
172.	Efficiency	Above 85 %	
173.	Mounting Arrangement	As per Manufacture Design	
174.	Dimensions, W x D x H in mm	As per Manufacture Design	
<b>N) Battery</b>			
175.	Make	As per Manufacture Design	
176.	Type	Dry Type	
177.	Ah Efficiency	> 95%	
178.	Self-Discharge	Self-Discharge	
179.	Operating Temperature	Normal : +20 $^{\circ}$ C to +30 $^{\circ}$ C & Limits : -20 $^{\circ}$ C to +50 $^{\circ}$ C	
180.	Voltage (V)	24V (2 x 12V)	
181.	Ah Capacity	7Ah / 12 Ah / 26 Ah	
<b>O) Manometer with Non Return Valve</b>			
182.	Make	As per Manufacture Design	
183.	Type and Model	Analogue, ---	
184.	Material	Stainless Steel	
185.	Accuracy of calibration pressure	+/-1% at 20 $^{\circ}$ C	
186.	Pressure Element	Stainless Steel Welded	
187.	Dial	2"	
188.	Pointer	Dark	
189.	Window	Round	

190.	Gas pressure low signal	Indicated by Red Color Zone	
191.	Non Return Valve(NRV) Material	Stainless Steel	
<b>P) Indoor cable terminations kits</b>			
192.	Make	As per Manufacture Design	
193.	Type	33 kV touch proof screened termination kit	
194.	Materials	Epoxy / EPDM / Silicon Rubber	
195.	Cable Size	Up to 3 x 400 sq. mm 33 kV HT cables	
196.	Height of each Cable box from ground level	As per Manufacture Design	
197.	Arrangement for mounting an extra cable at incoming and outgoing side box of Bus bar.	As per Manufacture Design	
198.	Arrangement for mounting an extra cable at outgoing side box of transformer / feeder.	As per Manufacture Design	
<b>Q) Automatic Water Level Controller</b>			
199.	Make	As per Manufacture Design	
200.	Type and Model	As per Manufacture Design	
201.	Position of Automatic Water Level Controller	200 mm below live contacts	
202.	Auxiliary contacts	4 NO + 4 NC	
203.	Breaker Tripping and Load break Isolator opening due to water level increases; signals to Control room	To be Provided	
<b>R) Name Plate</b>			
204.	Material	Anodized Aluminum / Stainless Steel	
205.	Thickness	18 swg / 1.00 mm	
206.	Size	145 mm x 116 mm	
<b>S) Painting</b>			
207.	Inside	Powder Coated	
208.	Outside	Polyurethane based powder paint. Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.	
<b>T) Danger Board</b>			
209.	Reference Standard	IS: 2551, 1982	
210.	Material	Mild Steel	
211.	Thickness in mm, Min.	1.6	
212.	Size H x L in mm	200 x 250	
<b>U) Type Test</b>			
213.	Following Type Test carried out within 5 years at NABL		



	laboratories in India or equivalent International Laboratories, Yes / No		
214.	Short time Current withstand test and peak current withstand test.	Yes	
215.	Lightening Impulse voltage with-stand test	Yes	
216.	Temperature rise test.	Yes	
217.	Short Circuit current making and breaking tests.	Yes	
218.	Power frequency voltage withstand test (dry).	Yes	
219.	Capacitive current switching test confirming to IEC.	Yes	
220..	Mechanical operation test.	Yes	
221.	Measurement of the resistance of the main circuit.	Yes	
222.	Degree of protection of Inner enclosure and outer enclosure	Yes	
223.	Switch, circuit breaker, earthing switch making capacity.	Yes	
224.	Switch, circuit breaker breaking capacity.	Yes	
225.	Internal arc withstand Test for Inner Enclosure and Cable Chamber.	Yes	
226.	Checking of partial discharge on complete unit.	Yes	
227.	Guarantee of Ring Main Units and accessories supplied against this specification	66 months from the date of receipt at the consignee's Stores Center or 60 months from the date of commissioning	

**Schedule 'C'**  
**List of Type Test Reports to be enclosed with the offer**

Sr. No.	Description of Type Test	Type & Make of Ring Main Unit & its rating	IS/IEC Clause No.	Testing Lab. & Date of Testing	Type test report No., dt & pages	Whether certificate of compliance with IS/IEC is enclosed with T.R.
1.						
2.						
3.						
4.						

Name of the firm \_\_\_\_\_  
Signature of the bidder \_\_\_\_\_  
Designation \_\_\_\_\_  
Date \_\_\_\_\_

**Schedule 'D'**  
**Schedule of Deviations from Specification**

Sr. No.	Clause No.	Details of Deviations
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

Name of the firm \_\_\_\_\_  
Signature of the bidder \_\_\_\_\_  
Designation \_\_\_\_\_

Date \_\_\_\_\_

**Schedule 'E'**  
**Schedule of Bidder's Experience**

Bidder 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 along with size & qty	Period of supply and commissioning	Name & Address to whom reference may be made
1.				
2.				
3.				
4.				
5.				
6.				
7.				

Name of the firm \_\_\_\_\_  
Signature of the bidder \_\_\_\_\_  
Designation \_\_\_\_\_  
Date \_\_\_\_\_

**Schedule 'F'**

**Deviations from specified Test requirements specified in Relevant Standards  
and Present Specification**

Sr. No.	Name of Test	Standard No. & Clause No.	Requirement of standards	Proposed deviation	Reasons for deviation.
1.	Type Test				
2	Additional Test				
3	Acceptance Test				

Name of the firm\_\_\_\_\_

Signature of the bidder\_\_\_\_\_

Designation\_\_\_\_\_

Date\_\_\_\_\_

33 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

**Schedule 'G'**  
**Proforma Of Undertaking**

We hereby confirm that ---Rating Ring Main Units offered by us against this tender are of the same design and type as have been supplied to M.S.E.D.C.L. against earlier order No. \_\_\_\_\_ dtd. \_\_\_\_\_ and all the Type Test Reports thereof were approved by C.E. (Quality Control and Testing) vide letter No. \_\_\_\_\_ dtd. \_\_\_\_\_ (copy enclosed.)

We further confirm that the said Type Test have been carried out at \_\_\_\_\_ within five years prior to the date of opening of present tender.

Seal and signature of Bidder

Technical Specification for 33 kV, 630 Amps, Extensible / Non extensible type,  
Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

**MATERIAL SPECIFICATIONS CELL**

TECHNICAL SPECIFICATION

OF

TAMPER PROOF SERVICE CONNECTION BOX

FOR

L.T. LINES / CONSUMER MAINS

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**TECHNICAL SPECIFICATIONS OF TAMPER PROOF SERVICE CONNECTION BOX FOR LT  
LINES/CONSUMER MAINS.**

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**TECHNICAL SPECIFICATIONS OF TAMPER PROOF SERVICE CONNECTION BOX FOR LT LINES/CONSUMER MAINS.**

**1.00 SCOPE**

- 1.01** This specification covers the design, manufacture, testing of tamper proof, shock proof and rust proof Service Connection Boxes duly fitted with spring loaded constant pressure multi connection Bus Bar in Thermoset casing system. The Box is intended to be used for giving Service Connections to consumers. It should be suitable for outdoor use for mounting on pole as well as for mounting in meter cabinet of multistoried buildings.
- 1.02** It is not the intent to specify herein complete details of design and construction. The Service connection boxes offered shall conform to relevant standard and high quality and workmanship capable to perform continuous and satisfactory operations in the actual service conditions at site
- 1.03** Bidder shall have proven experience of 3 years of manufacturing of similar products and supplying to electrical utilities

**2.00 SERVICE CONDITIONS**

The material to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions:

2.1	Maximum ambient temperature (deg C)	50
2.2	Minimum ambient temperature (deg C)	3.5
2.3	Relative humidity (%)	10 to 100
2.4	Maximum rainfall (mm)	1450
2.5	Maximum wind pressure (kg/sq m)	150
2.6	Maximum altitude above mean sea level (Meters)	1000
2.7	Isoceraunic level (days/year)	50
2.8	Seismic level (Horizontal acceleration) (g)	0.3
2.9	Climate Moderately hot and humid tropical climate, conducive to rust and fungus growth.	

**3.00 APPLICABLE STANDARDS**

All components used in the manufacture of the materials shall conform to the relevant Indian standards and especially to the followings.

3.1	IS:14772/2020	General Requirements for Enclosures for Accessories for Household and Similar Fixed Electrical Installations - Specification
3.2	IS:13947/1993 (Part 1)	Specification for Low-voltage Switchgear and Control gear - Part 1 : General Rules& Annex 'C' for Degrees of Protection provided by enclosures of electrical Equipments
3.3	IS: 13410/ 1992	Glass reinforced polyester sheet moulding compounds (SMC)
3.4	IS: 13411/1992	Glass reinforced polyester dough moulding compounds (DMC)
3.5	IS: 732/1989	Code of Practice for Electrical Wiring Installations
3.6	IS: 4249/1967	Classification and methods of tests for non-ignitable and self-extinguishing properties of solid electrical insulating materials

**4.00 GENERAL TECHNICAL REQUIREMENTS**

**TECHNICAL SPECIFICATIONS OF TAMPER PROOF SERVICE CONNECTION BOX FOR LT LINES/CONSUMER MAINS.**

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**4.01 Enclosure**

- 4.0.1 The service connection box shall be made out of thermosetting plastic i.e. glass reinforced polyester sheet moulding compound (SMC) conforming IS: 13410-1992 grade and also conform to self-extinguishing properties as per IS-4249 & requirements of this specification
- 4.0.2 The enclosures shall be made of high grade virgin material with anti- corrosive, rust proof, shock proof, dust and vermin proof, U.V. stabilized with flame retardant property.
- 4.0.3 The S. C. box shall comply with the requirement of IP- 44 type as per the IS – 13947 or the latest version thereof.
- 4.0.4 The wall thickness of the box shall be minimum 2mm. The S.C. Box should have minimum 40 mm clearance on all three sides and bottom clearance of minimum 60 mm for pole mounted boxes & 100 mm for boxes used in the metering cabinet.
- 4.0.5 The enclosures should be suitable for outdoor use, Pole mounting and should not soften, bend or melt at high temperature. It should have flame retardant properties and material of it should not generate burning droplets in the event of fire.
- 4.0.6 The Service Connection Box shall be suitable for housing Bus Bar system with adequate clearances. The General arrangement drawing shall be as per the attached drawing.
- 4.0.7 The base and door should be single piece moulded individually with rounded corners without any construction/ fabrication joint.
- 4.0.8 The door in closed position should overlap on base such that direct entry of screw driver, tool or rod is not possible.
- 4.0.9 Concealed hinges should be provided to the S. C. boxes.
- 4.0.10 The Box should have positive locking system by way of bolt and nuts in addition to “U” Clamp as shown in the Drawing. “U” clamp should have matching Holes on base and door to facilitate wire sealing.
- 4.0.11 Holes for in-coming and out-going Cables should be provided at bottom as shown in the G.A. Drawing. Suitable number of holes with rubber grommets of suitable size shall be provided at the bottom of S. C. box for incoming and outgoing cables.
- 4.0.12 The box should have holes on the back-side as shown in Drawing for fixing it on Pole with suitable clamping arrangement or in metering cabinet in the buildings.
- 4.0.13 The Bus Bar mounting system should be angled and stepped so as to facilitate easy connection and disconnection of cable without twisting and sharp bending of wire/cable. The mounting steps shall be made out of Thermosetting Plastic insulating material as given above.
- 4.0.14 Fixing of accessories like clamp, handles etc. and all metal part excluding hardware shall be of stainless steel only.
- 4.0.15 The surface appearance or part of S. C. Box must be smooth, nonporous and homogeneous, free from ripples, defects and marks. No fillers or fibres should be visible at any place.
- 4.0.16 One no Earthing Bolt of size M6 having length of min 25mm with two washers & nuts shall be provided on the connection box for necessary earthing

**4.02 Spring loaded busbar**

- 4.02.1 The Bus Bars module shall have casings made out Thermosetting Plastic confirming to IS-13410. Each module shall contain two Bus Bar; assembly of sliding type pressure plate &

**TECHNICAL SPECIFICATIONS OF TAMPER PROOF SERVICE CONNECTION BOX FOR LT LINES/CONSUMER MAINS.**

spring at bottom of each pressure plate. All such assemblies shall be housed in the casing along with Bus bar. The assembly shall facilitate definite pressure overlap electrical connection on Bus bar.

- 4.02.2 The Bus Bars shall be made out of Aluminum. The size of Bus Bars shall be adequate as per rating.
- 4.02.3 The pressure plates shall have built in flat flap to hold conductor flat on Bus Bar. It shall ensure definite overlap contact on the Bus Bar so as to avoid loose contact subsequent over heating at contact. Thus it shall help in line loss reduction.
- 4.02.4 Multiple modules shall be fitted in a box so as to fulfill the system requirement.
- 4.02.5 The current carrying parts shall be of electrolytic grade and the hardware, spring, links etc. used along with shall be of non- magnetic type. The Bus bar shall be made of Aluminum with total cross section of 100 sq mm & length as per the requirement. (Two nos of aluminum conductors of 50 sq mm. each making a total of 100 sq mm may be used.)
- 4.02.6 The pressure plates which keep pressing the cable conductor & springs with sufficient strength of thickness 2mm. The diameter of the spring wire shall not be less than 2.0 mm. Both are to be made of Stainless steel only.
- 4.02.7 The springs are required to be retained in the housing by means of a stainless steel rod at the bottom end of the housing so as to exert pressure on the pressure plate when cable is inserted in the bus bar.
- 4.02.8 The connection system shall be spring loaded so that no fasteners are required to add a new connection from the distribution system. Also each connected cable shall have a pressure applied to it at the point of connection to provide connection integrity & eliminate loose connections.
- 4.02.9 Provision for one incoming circuit of single/three phase with neutral of cable size 50 or 35 or 16 Sq mm cable & outgoing connections of cable size 2.5 to 6 sq mm. size as per requirement on each phase bus bar & neutral shall be provided.
- 4.02.10 Single/Three phase S. C. Boxes shall have following combinations.
- |                               |                               |
|-------------------------------|-------------------------------|
| 1) one incoming & 3 outgoing  | 2) one incoming & 6 outgoing  |
| 3) one incoming & 9 outgoing  | 4) one incoming & 12 outgoing |
| 5) one incoming & 15 outgoing | 6) one incoming & 18 outgoing |

The successful bidder shall submit the detailed drawings of the boxes for necessary approval of C.E.(Testing & Quality Control) or Concerned C.E. of the Zone

## **5.00 TESTS**

### **5.01 TYPE TESTS**

Type tests as mentioned in annexure A shall be carried out on SMC material as per IS 13410/13411. In addition to above following type tests shall be carried out on complete box.

1. High Voltage test on Bus bar as per IS 8623 (A.C. voltage 2.5KV applied for one minute.
2. Temperature Rise Test at 100% rated current as per IS 8623.

**TECHNICAL SPECIFICATIONS OF TAMPER PROOF SERVICE CONNECTION BOX FOR LT LINES/CONSUMER MAINS.**

3. Degree of protection Test for IP44 as per IS 13947/1993 (Part 1).
4. Mechanical Strength Test as per IS 14772:2020

**5.02 ACCEPTANCE**

Following acceptance tests shall be carried out.

- 1) Acceptance tests
- 2) **TEST CERTIFICATES**

The material offered shall be fully type tested as per relevant IS and this specification. The successful Bidder shall furnish detailed type test reports before commencement of supply for necessary approval of the CE Concerned. The detailed Type Test Reports shall be furnished with relevant oscillogram and certified Drawings of the material tested. The purchaser reserves the right to demand repetition of some or all the Type tests in presence of purchaser's representative at purchaser's cost.

The type test report of meter box having identical constructional and other features carried out during last five years prior to due date of opening of offer shall be valid.

All the Type Tests shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Government of India such as CPRI Bangalore/ Bhopal, ERDA Baroda, to prove that the material offered meet requirements of the specification. The tenderer should also furnish certificate from laboratories that laboratories are having all the requisite test facility available in house. The type tests reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable

**6.00 TESTING AND MANUFACTURING FACILITIES**

**6.01** The manufacturers must have necessary machinery for production of SMC Service Connection LT Distribution Box.

**6.02** The manufacturer should have in house testing facilities for carrying out acceptance test as per mentioned above

**7.00 GUARANTEE :**

The material supplied shall be guaranteed for the period of 60 months from the date of commissioning or 66 months from the date of dispatch whichever is earlier.

**8.00 MARKING**

The following information shall be legibly and indelibly marked to show the following

- a) Purchase order number and date
- b) Year and month of manufacture
- c) Name of Purchaser: MSEDCL
- d) Guarantee: 5 years
- e) Name and trademark of manufacturer
- f) Danger logo (Screen Printed)

**9.00 SCHEDULES**

The tenderer shall fill in the following schedules and submit along with the offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

**TECHNICAL SPECIFICATIONS OF TAMPER PROOF SERVICE CONNECTION BOX FOR LT LINES/CONSUMER MAINS.**

Schedule A – Guaranteed technical particulars.

**ANNEXURE - A**

**Specifications for Fiberglass Reinforced Plastic Sheet Moulding Compound**

- 1) Sheet Moulding Compound shall conform to IS:13410-1992
- 2) The Surface appearance of the door must be smooth, nonporous, and homogeneous, free of ripples, defects, and marks. No filler or fiber shall be visible at any place.
- 3) Other properties of SMC material shall be as follows & shall pass the test mentioned against the same.

Sr. No.	Test	Reference Standard	Required Value
1	Ratings	14772:2020, Cl. 6	As per IS and specification
2	Classification	14772:2020, Cl. 7	As per IS
3	Marking	14772:2020, Cl. 8	Manufacturer Name & Danger Logo Screen Printing
4	Dimensions	14772:2020, Cl. 9	As per specification and drawing
5	Protection against Electric Shock	14772:2020, Cl. 10	As per IS
6	Provision for Earthing	14772:2020, Cl. 11	As per IS
7	Construction	14772:2020, Cl. 12	No Crack or Damage
8	Resistance to ageing, protection against ingress of solid objects and against harmful ingress of water	14772:2020, Cl. 13	No Crack or Damage
9	Insulation resistance and electric strength	14772:2020, Cl. 14	Insulation resistance shall be not less than 5 MΩ. No flashover or breakdown shall occur during the electrical strength test
10	Mechanical Strength	14772:2020, Cl. 15	No Crack or Damage
11	Resistance to Heat	14772:2020, Cl. 16	No ball impression
12	Creepage distance, clearance and distance through seating compound	14772:2020, Cl. 17	As per IS
13	Resistance to insulating material to abnormal	14772:2020, Cl. 17	No Flame and Glowing

**TECHNICAL SPECIFICATIONS OF TAMPER PROOF SERVICE CONNECTION BOX FOR LT LINES/CONSUMER MAINS.**

	heat and fire		
14	Resistance to Tracking	IS-14772:2020, Cl. 19	No failure or breakdown occurs before 50 Drops 175V
15	Resistance to corrosion	IS 14772:2020, Cl. 20	No sign of rust observed
16	Heat Deflection Temperature	IS 13411:1992	> 150 deg C
17	Exposure to Flame	IS 4249:1967	Self-Extinguishing
18	Flammability	UL-94/IS-11731	V0
19	Melting Point	IS:13360 (Part-6/Sec-10):1992	Does not melt upto 400 deg C
20	Glow wire test at 960 Deg C	IS:11000	No flame and glowing observed
21	Ball Pressure Test	IEC-335	No Ball Impression Observed
22	UV Ageing Test for 200 Hours	ASTM-G-154	No Colour Change, no chalking and No discoloration observed
23	Water Absorption	IS:13411-1992	< 0.20%
24	Material Identification	As per Laboratory Method	Glass reinforced polyester Sheet Moulding compound (SMC)
25	Glass content, percent by mass (Min.)	IS:13410-1992	20
26	Izod impact strength (Notched), KJ/m <sup>2</sup>	IS:13410-1992	55
27	Flexural Strength ,MPa , Min	IS:13410-1992	170
28	Power Arc Resistance Sec. Min.	IS:13410-1992	180
29	Modulus of Elasticity, 10 <sup>3</sup> , MPa	IS:13410-1992	12 to 15
30	Tracking Resistance CTI, Min	IS:13410-1992	1000
31	Tensile strength, MPa, Min	IS:13410-1992	70
32	Density of moulding, g/ml	IS:13410-1992	1.8 to 2.1
33	Volume resistivity, ohmcm, min	IS:13410-1992	1 x 10 <sup>14</sup>
34	Surface resistivity (24H in water), Ohm, min	IS:13410-1992	1 x 10 <sup>13</sup>
35	Flow, mm, Min	IS:13411-1992	As per IS
36	Mould shrinkage, linear percent, Max	IS:13411-1992	As per IS
37	Post shrinkage, Max	IS:13411-1992	As per IS

**TECHNICAL SPECIFICATIONS OF TAMPER PROOF SERVICE CONNECTION BOX FOR LT LINES/CONSUMER MAINS.**

38	Dielectric Strength at 90oC in Oil KV/mm	IS:13410-1992	11
39	Dissipation factor (4 days at 80 % RH & 1 KHz)	IS:13410-1992	0.01
40	Oxygen Index,% Min	IS:13410-1992	24

**SCHEDULE - "A"**

**GUARANTEED AND TECHNICAL PARTICULARS**

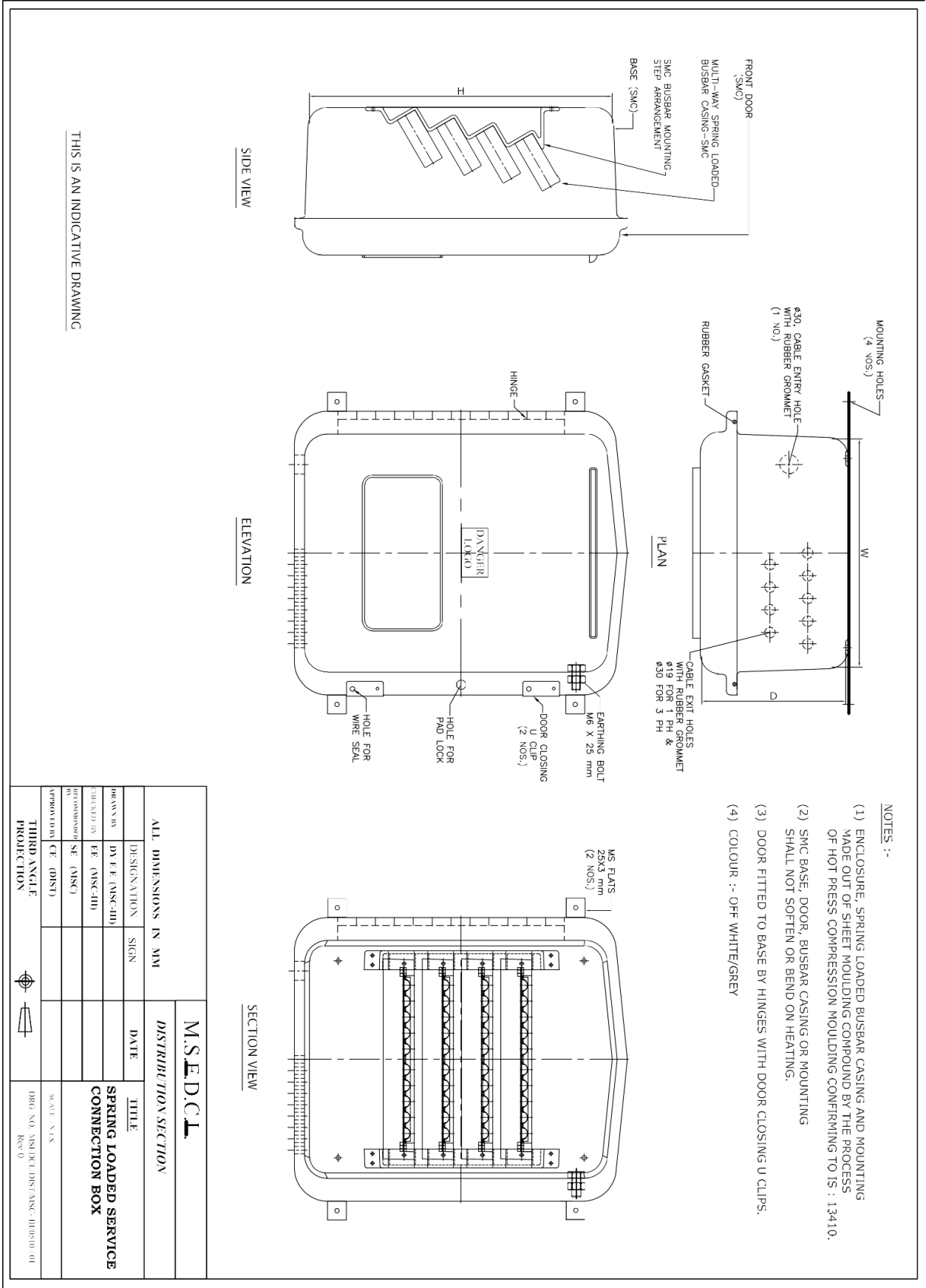
<b>Sr. No.</b>	<b>Parameter Name</b>	<b>Parameter type</b>
1.	Name or Trademark of Manufacturer.	Text
2.	Type of Service connection Box (Type & total No. of Outgoing connections ) provided	Text
3.	Rated normal voltage	Text
4.	Material of construction	Text
5.	Thickness of SMC sheet for enclosure	Text
6.	Dimensions of Service connection Box Width x Depth x Height (in mm)	Text
7.	Degree of protection of the Box	Text
8.	Sealing U clamps details {2 Nos. S.S."U" Clamp of minimum thickness (0.8 ± 0.1 mm)}	Text
9.	No. of Holes provided for cables A) Incoming Cable B) For Outgoing Cables	Text
10.	Minimum side clearances from spring loaded Bus Bar module in the box ( in mm)	Text
11.	Marking on the box is as per the specifications	Text
12.	<b>Fiberglass Reinforced Plastic Sheet Moulding Compound</b>	Text
12.1	Material (Thermosetting Plastic)	Text
12.2	Grade of material (SMC as per IS:13410-1992)	Text
12.3	Heat deflection Temperature (As per IS:13411)(min 150°C)	Text
12.4	Exposure to flame (Ref. Std. IS:4249) (Self-Extinguishing)	Text
12.5	Melting Point (Ref. Std. IS:13360) (Does not melt)	Text
12.6	Door material (U.V. resistant & resistant to salty & humid atmosphere)	Text
12.7	Specific Gravity as per IS:10192 of SMC material (1.8)	Text
12.8	Dielectric Strength as per IS:1998	Text
12.9	Tensile Strength as per IS:867-1963 (1058 Kg/sq.cm)	Text
12.10	Cross Breaking Strength as per ASTM D790 (1723 Kg/sq.cm)	Text
12.11	Insulation Resistance(As per ASTM D257)	Text
12.12	Water Absorption as per IS:14772:2020	Text
12.13	Mechanical Strength as per IS:14772:2020	Text
13.	Type of clamping/fixing Arrangement for box	Text

**TECHNICAL SPECIFICATIONS OF TAMPER PROOF SERVICE CONNECTION BOX FOR LT LINES/CONSUMER MAINS.**

14.	Type of hinges for door ( Clause no. 4.01.9)	Text
15.	Number of hinges provided.	Text
16.	Earthing bolt as per specification with earthing logo provided	Boolean
17.	<b>Spring Loaded bus bar system</b>	
17.1	Mounting Material of spring loaded Bus Bar & mounting Bus bar Supports (Thermosetting Plastic (SMC) as per IS-13410-1992)	Text
17.2	Material of Bus Bar (Aluminium )	Text
17.3	Cross Section area and length of Bus Bar (Total 100 Sq. mm) (2 Nos. of 50 Sq.mm each)	Text
17.4	Length of bus bar (mm)	Text
17.5	No. of Bus Bar module complete with fitting	Text
17.6	Pressure Plate thick & MoC (Thickness 2.0 mm stainless)	Text
17.7	Distance between Bus Bars module (Center to Centre distance 35 mm (Min.)	Text
18	Details of Type Tests Carried out	Text
19	Other detail if any	Text



**TECHNICAL SPECIFICATIONS OF TAMPER PROOF SERVICE CONNECTION BOX FOR LT LINES/CONSUMER MAINS.**



## MATERIAL SPECIFICATIONS CELL

### TECHNICAL SPECIFICATION

6/8 WAY LT FEEDER PILLER WITH PROVISION OF  
ENERGY METER, AIR CIRCUIT BREAKER, MS/SMC BOX

**INDEX**

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## 1.00 SCOPE

This specification covers design, manufacture, testing, inspection at manufacturer's works, packing and supply of LT Feeder Pillars made out of either complete enclosure of Mild Steel or complete enclosure of thermosetting plastic i.e. glass reinforced polyester sheet molding compound confirming to IS: 13410/1992. The system shall be A.C.

3 phase, 4 wire, 433 V, 50 Hz with effectively grounded neutral. L.T. feeder pillars shall be 6Way/8Way with ACB along with provision for Energy meter and Resin cast CT arrangement at various stores/sites in Maharashtra state.

It is not the intent to specify herein complete details of design and construction. The equipment offered shall conform to relevant standard and high quality and workmanship capable to perform continuous and satisfactory operations in the actual service conditions at site. Bidder shall have proven experience of 3 years of manufacturing of similar products and supplying to electrical utilities.

## 2.00 SERVICE CONDITIONS:

The feeder pillar to be supplied against this specification shall be suitable for satisfactory continuous operation under the following environmental conditions:

a) Maximum ambient temperature	55°C
b) Maximum ambient temperature in shade	45°C
c) Minimum temperature of air in shade	35°C
d) Maximum daily average temperature	40°C
e) Maximum yearly weighted average temperature	32°C
f) Relative Humidity	10 to 95 %
g) Maximum Annual rainfall	1450 mm
h) Maximum wind pressure	150 kg/m <sup>2</sup>
i) Maximum altitude above mean sea level	1000 meter
j) Isoceraunic level	50 days/year
k) Seismic level (Horizontal acceleration)	0.3 g
l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.	

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

**3.00 STANDARDS** (to which feeder pillar shall comply):

IS: 5039/1983	Distribution pillars for voltage not exceeding 1000 V
IS:14772/2000	General Requirements for Enclosures for Accessories for Household and Similar Fixed Electrical Installations - Specification
IS :13947/1993(Part 1) & (Part 2)	Specification for Low-voltage Switchgear and Controlgear – Part 1 : General Rules& Annex ‘C’ for Degrees of Protection provided by enclosures of electrical Equipments Part 2 : Circuit Breakers
IS: 13410/1992	Glass reinforced polyester sheet molding compounds (SMC)
IS: 13411/1992	Glass reinforced polyester dough molding compounds (DMC)
IS: 13703/1993	Low voltage Fuses (part 1,Part 2 sec1, Part 2 sec 2 & Part 4)
IS/IEC 127-2 : 1989	Miniature Fuses - Part 2 : Cartridge Fuse Links – Specification
IS/IEC 127-6 :1994	Miniature Fuses - Part 6 : Fuse Holders for Miniature Cartridge Fuse Links - Specification
IS:8623/1993 (Part 1,2 &3)	Specification for Low-Voltage Switchgear and Controlgear Assemblies for general requirement of L.T. Switchgears
IS: 4237/1982	General arrangement for switch gear and control Gear for voltage not exceeding 1000 V with enclosure Box
IS: 732/1989	Code of Practice for Electrical Wiring Installations
IS: 5082/1998	Wrought aluminum and aluminum alloy bars, rods, tubes and sections for electrical purposes
IS: 6005/1998	Code of practice for phosphating iron and steel
IS: 5/2004	Colour for ready mixed paints and enamel
IS: 8588(Part-1/ 1977	Thermostatic bimetals: General requirements and methods of tests

**4.00 PRINCIPLE TECHNICAL PARAMETERS:**

Rated Supply Voltage : 3 phase, 440 V, 50Hz  
 Rated Current : 800A, 1000A,1250 A (as per requirement)  
 Insulation level: 1100V AC 50 Hz Continuous  
 : 2.5 kV for 1 Min  
 : 2000 V DC

Rated short circuit Current :80KA  
 Temperature rise : Shall not exceed delivery operating temperature of components conforming to relevant standards limited to 30° C above ambient.

**5.00 GENERAL TECHNICAL PARAMETERS:****5.1) CUBICLE**

5.1.1 The cubicle of LT feeder pillars shall be made out of either 10 SWG (3.25 mm thick) cold rolled M.S sheet steel, plates and shaped sections or thermosetting plastic i.e. glass reinforced polyester sheet molding compound (SMC) conforming IS: 13410- 1992 as per the requirements specified. All panel edges and door edges shall be reinforced against distortion by rolling, bending etc. The complete cubical shall be rigid self supporting and free standing. The enclosure shall comply with the requirement of IP- 43 type as per the IS – 13947 or the latest version thereof. The enclosure shall be anti corrosive, dust proof, rust proof, vermin and water proof, ultra violet stabilized and flame retardant property.

5.1.2 The LT feeder pillars shall have front and rear compartments. Front compartment shall be suitable for HRC fuses and the rear for cable terminations. Asbestos sheet of at least 6 mm thick shall be provided for separation between front & rear compartments; between ACB & Meter compartment; between R-Y-B HRC fuse compartments. L.T. Feeder pillar shall have Air Circuit Breaker of rating 800/1000/1250 Amp on incoming circuit as per the actual requirement and HRC fuse base with links of 630/400A on outgoing circuits as per the requirement with necessary interconnecting Bus Bars/ Links etc.

5.1.3 The cubicles shall have center lift up type slanting roof rain hood made up of 10 SWG MS sheets or minimum 10 SWG SMC sheets conforming to IS: 13410-1992. The depth and width of the rain hood shall be at least 120% of the depth and width of the pillars. The doors shall not be detachable after fixing the rain hood.

5.1.4 The base and doors of cubicle shall be individually in one piece except for fixing of the accessories like hinges, clamps, mounting clamps, bolts etc. The Average minimum thickness of the MS/SMC sheet for cubicle and door shall be 4mm for SMC and 10 SWG for MS sheet for 6way/8way Pillar. The details of SMC material shall be as per the annexure 'I' attached. Base and doors shall have flange / collars as shown in drawing. Collar of Base and doors shall overlap by 10mm.

5.1.5 Standard General Arrangement of Air Circuit Breaker, HRC fuse base with links, Link Disconnecter, Bus Bars, connecting links, Cable termination arrangement etc. inside the L.T. pillars shall be as per the drawings attached with the specification for various types of L. T. Feeder

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

pillars. The clearances & creepage distances shall be in accordance with IS: 13947(Part 1) / 1993. Air Circuit breaker's operating handle shall be accessible only after opening of the doors.

5.1.6 The general overall dimensions of L.T. feeder pillars shall be as in the table below. The enclosure shall have doors from front & back side. The complete cubical shall be rigid self supporting and freestanding.

The dimensions mentioned below are overall dimensions without rain hood. However, Compact size with adequate clearances as per I. E. Rules 1956/IS: 13947 (Part 1) / 1993 is also acceptable.

Width	1400 mm for 6 Way and 1930 mm for 8 way
Depth	650 mm
Height	1850 mm

The supplier shall submit their own drawing for approval of the competent authority before manufacturing. Proto shall be inspected by the representative of the C.E. (Testing) before bulk manufacturing.

5.1.7 Suitable no. of hinges as mentioned below shall be fitted from inside of the box to fix the doors. Hinges shall be 50 mm in length and made from 2mm thick M. S. sheet. Hinge pin diameter shall be minimum 4mm. Doors shall be fixed with three screws in each hinge. The hinges shall not be visible from outside. On closing of doors, right door shall rest on the left door. Hinges shall be of such construction that the doors shall be swung open by not less than 150°. The details of doors & hinges to be provided shall be as mentioned below:

Front Door-3 no., Back Door-3 no., Hinges/door-3

5.1.8 The doors shall be centrally closed with "Godrej" type triple position locking arrangement and shall be operational with a common handle from outside the door. Movement of handle will lock the doors at center, top & bottom. A Nylon washer shall be provided between the handle and door to avoid penetration of water. One central lock with brass levers shall be provided inside the door. Key way with suitable cover shall be provided on the door for operating the lock from outside. Two keys shall be supplied for each pillar. In addition cleat arrangement shall be provided for putting two nos. of padlocks for each size of doors.

5.1.9 Four Louvers (two on each side) shall be provided to L.T. feeder

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

pillars. Louvers with stainless steel wire mesh with shall be provided on both sides of the feeder pillars and at the top and bottom of both sides of L.T. pillars. Mounting of components inside the enclosure shall allow free air circulation keeping the clearances as per specification.

5.1.10 The cubicles shall be provided with pedestal arrangement having suitable no. of bottom holes for grouting bolts at all four corners & at the middle as per requirement.. The pedestal shall be covered from all sides with 10 SWG M.S./ SMC sheets.

5.1.11 Suitable no. of detachable gland plates made up of 10 SWG MS sheets/SMC material shall be provided in the cubicle at the bottom. Gland plate shall be provided with suitable size cable gland & with four screws for fixing the plate from inside. Size & no. of the glands to be provided will be intimated to the successful tenderer along with approval of drawings.

Fuse base shall be mounted on MS / SMC base channel of size 60 x 20 x 3.15 mm thick. All Nuts & Bolts in electrical circuit shall be of non-magnetic stainless steel.

5.1.12 A bayonet lamp holder complying with IS: 1258/1987 with a tumbler switch complying with IS: 3854/1988, a three pin plug & socket complying with IS: 1293/1988 with necessary fuses & wiring shall be provided inside the pillar on the front bottom portion of the shade near the neutral bus bar.

5.1.13 Rigid stand shall be made from M.S. angle or FRP Pultruded sections as per IS: 6146. Horizontal and vertical members of the cubicle shall be of size 50 x 50 x 6 mm.

5.1.14 Two galvanized earthing Bolts of M12 X 50 mm size shall be welded from inside and projecting outside of the box. Two Nuts with washers shall be provided on each bolt.

5.1.15 Enameled name plate of the supplier, type of pillar and M.S.E.D.C.L. Tender Number & date shall be displayed on front door.

5.1.16 Enameled Danger Board with "DANGER 440 VOLTS" mark shall be displayed on the left hand side of front and back doors as per IS 2551.

5.1.17 Toughened glass window with rubber gasket of 175 mm X 90 mm size should be provided on main door of cubicle in such a way to see meter readings.



**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

**5.2) AIR CIRCUIT BREAKERS**

5.2.1 Air Circuit Breakers of the following rating & technical specifications shall be provided for the Incomer of L.T. Feeder pillars with ACB, with split Bus bar type & with split with ACB as per the actual requirement.

5.2.2 ACB shall be of 440V, 50 HZ, 800/1000/1250 A (as per actual requirement) with short time current rating of 50KA for 1 sec. Air Circuit Breaker shall conform to IS: 13947 part - 2 of 1993 with latest amendments. Other technical details shall be as below:

Sr. No.	Particulars	Requirements
1	Rated operational voltage (V) at 50 Hz	440V
2	Rated frequency (Hz)	50
3	Current rating Amps (rms)	800/1000/1250 A
4	Rated insulation voltage (V) at 50 Hz	1000
5	Number of poles	3
6	Mounting arrangement	Fixed type front mounting
7	Rated impulse withstand voltage(kV)	12 KV
8	Rated Ultimate Short circuit breaking capacity at 415 V, 50 Hz ( kA rms) Icu	50
9	Rated Service Short circuit breaking capacity at 415 V,50 Hz ( kA rms), Ics	50
10	Rated short circuit making capacity at 50Hz (kA peak), expressed as multiples of Icu	2.1
11	Rated short time withstand current for 1 sec at 50 Hz (kA rms), Icw, expressed as percentage of Icu	50 KA
12	Line-load reversibility	Required
13	Category of utilization	B
14	Shutters on 'Trip' & 'Close' push button with sealing facility	Required
15	Accessory mounting	Accessories shall be front accessible plug in type. Accessories namely motor shunt trip & closing coil, UVT

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

		etc. should be common for the entire range & shall be suitable for both AC & DC voltages.
16	Operating mechanism	Spring charging stored energy type, Manual & Automatic.
17	Mechanical life (Operating cycles)	20000
18	Electrical life (Operating cycles) per set of arcing contacts	5000
19	Indications	Breaker shall have following mechanical indications: 1. ON, 2. OFF, 3. TRIP 4. SPRING CHARGE STATUS
20	Sensing	True RMS based
21	Type	Microprocessor based
22	Control Terminal	Control Terminal should be front accessible & minimum 25 pairs of contacts shall be available.  Minimum ten Auxiliary NO / NC contacts shall be provided for electrical interlocking between ACBs.
23	Working temperature	Suitable for operation at 50°C
24	Protection required	Following protections with selective ranges required.
24a	Overload	Pick – up: 0.4 to 1.0 Time delay : 0.2 to 40 sec.
24b	Short Circuit	Pick – up: 2 to 10 Time delay: 20 to 400 msec
24c	Instantaneous over current	Pick – up: 4 to 16 & OFF
24d	Earth fault	Pick – up: 0.2 to 0.6 & OFF Time delay: 100 to 400 msec
25	Metering Required	Provision for following measurement functions shall be made on the ACB i) 3 phase current

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

		ii) 3 phase voltage iii) KWH iv) KVAH v) Power Factor vi) Max. demand(KVA) vii) Fault History of Minimum 50events
26	Indication	Release shall give individual indication for each type of fault.
27	Power	Release shall be self powered & independent of incoming supply.
28	Safety	Local controls shall be secured by padlocking arrangement

For Air Circuit Breakers used for Bus coupler /split bus bar purpose, metering is not required to be provided as per requirement at sr. no. 25 of the above table.

**5.3) BUS BARS:**

5.3.1 The bus bars shall be made up of electrolytic grade aluminum confirming to grade 63401 WP of IS:5082.

5.3.2 The bus bars shall be with PVC sleeves of Colour Red, Yellow ,Blue and black for top ,middle and Bottom and below bottom(neutral) busbar respectively Or painted with non deteriorating type Epoxy paint for full length as below:

Red colour for top busbar.

Yellow colour for middle bus bar,

Blue colour for bottom bus bar,

Black colour for neutral bus bar below bottom bus bar

5.3.3 Size of the bus bar For R,Y&B phase shall be 60 x 10 mm and for Neutral it shall be 50 x 6 mm.

5.3.4 Electrolytic grade aluminum twin flat cable terminals (Z Patti) shall be provided in staggered formation for connecting cable cores for each phase from rear side in all. L. T. pillars (except mini pillar). The arrangement shall be suitable for taking Load current reading with clip on type of meter. Insulated horizontal Bakelite bar of at least 50 x 12 mm shall be provided to support and take care of weight of cables, jointing etc.

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

5.3.5 Neutral bus bar shall have one terminal for each circuit way and shall be provided with two nickel plated, nuts, bolts, spring washers and plain washers at each end for earthing. Cross sectional area of neutral bus bar shall be at least 50% of cross sectional area of phase bus bar.

5.3.6 Suitable insulated phase barriers of at least 6 mm thick asbestos cement sheet shall be provided between front and rear compartment, between adjacent set of phase and neutral bus bars and between doors and bus bars with firm fixing arrangements.

5.3.7 The current rating – current carrying parts shall not generally exceed the limits those given in Clause No.5.4.7 Higher current rating adopted if any in special cases shall be subject to successful temperature rise tests carried out in reputed laboratories.

5.3.8 Minimum clearances, wherever shown, shall be as per General Arrangement Indicative Drawing enclosed with this specification. Other clearances shall be as per requirement of IS: 4237/1982 amended up to date.

5.3.9 There should be provision to insert Ring type CTs of required ratio into the bus bars. Ratios are 200/5, 300/5A, 500/5A, 1000/5A for 100/200/315/630 kVA distribution transformer respectively. The feeder pillar manufacturers shall provide ring CTs of appropriate capacities only. It shall be part of the feeder pillar. Ring CTs have to be procured from MSEDCL's approved vendor. Feeder pillar manufacturers should provide the required wires for CT connections of standard size & colour.

**5.4) FUSE BASE ASSEMBLY:**

5.4.1 The Fuse bases shall be suitable for HRC fuse links and strips. All fuse bases shall be identical and interchangeable irrespective of whether they are provided in incoming or outgoing circuits and shall be capable to carry rated normal current without exceeding safe temperature as per relevant standard duly tested at Lab like CPRI,ERDA etc.

5.4.2 The base of the HRC Fuse shall be of non-tracking, heat resistant insulating porcelain material of superior electrical and mechanical properties equivalent to Dough Molding Compound (DMC). The Fuse Base shall be sturdy in construction. The insulation shall not get affected due to dust, moisture etc, at wide fluctuation in temperature. The holes for fasteners shall be plugged by insulating filling compound which shall not drain at operating temperature in service.

5.4.3 The contacts shall be made up of electrolytic grade copper alloy with corrugated terminal pad and spring action to yield high contact pressure. G. I. spring ring shall be made out of at least 6 mm dia. spring

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

steel round. The spring action shall not get affected by operations and variations in operating temperatures in service.

5.4.4 Thermostatic bimetal device shall be provided between terminal pad and bus bars and between terminal pad and cable terminals ( Z Patti) to prevent bimetallic deterioration.

5.4.5 HRC Fuse Base should withstand the breaking capacity of the fuse link of 80kA.

5.4.6 The complete assembly shall be so fixed and secured that there shall be no turn, fall out displacement and vibration of any part during inserting and removal of fuses/Links. Load current reading, cable end connection etc

5.4.7 The current rating adopted shall generally not exceed the following limits. Higher current density adopted if any in special corrugated and other shapes shall be subject to successful temperature rise tests carried out in reputed laboratory.

Size of section mm x mm	Maximum current in Amps	
	Single Section	Double Section
30 x 3	205	385
30 x 5	270	500
40 x 3	280	500
40 x 5	350	650
40 x 10	515	975
50 x 5	425	780
50 x 10	625	1150
60 x 5	500	900
60 x 10	730	1330
80 x 5	680	1170
80 x 10	940	1700

**5.5) FUSE LINKS:**

The HRC Fuse Links shall be sturdy in construction of “Din Type”. Corrugated fuse links shall be made out of electrolytic grade copper flat of at least 4 mm thick and shall be capable of carrying the rated current of the fuse base and shall be suitable for inserting and pulling out by insulated fuse pulling handle. Breaking capacity shall be 80 kA. For fault indication red pop up indicator should come out instantly on fusing. Manufacturer’s name, current rating, breaking capacity and type shall be marked on HRC fuse link.

The successful bidder shall submit the complete type test reports as per specification for approval of CE (Testing & QC) before commencement of supply.

**5.6) PAINTING:**

5.6.1 The M.S. cubicles shall be provided with anti corrosive high quality post office red colour paint conforming to shade No 538 of IS:5 from inside and outside to withstand the corrosive and humid atmosphere. The colour of SMC cubicle shall be red conforming to shade No 538 of IS:5

5.6.2 For M.S. Cubicle, all interiors and exteriors of the cubicle shall be degreased in 5% solution at 75°C for 15 minutes. They shall then be washed in hot water bath at 65°C to remove all rust, scale corrosion, grease and other adhering foreign matter and shall be rinsed in cold running water.

5.6.3 M.S. cubicles shall then be pickled in 25% hot sulphuric acid at 65°C for 5 minutes. Care shall be taken to avoid over pickling by addition of adequate quantities of inhibitor and avoid loss of tensile strength. The cubicle shall then be rinsed in cold running water and put in alkaline solution at 65°C for 1 to 2 minutes. The cubicle shall then be immersed in cold water (still agitated) to remove all traces of alkali and untreated salt. The cubicle shall then be dipped in deoxidize chamber to ensure complete removal of moisture.

5.6.4 Corrokill rust converter conforming to IS 13515 shall be preferably applied as primer. The cubicle stoved at 150°C for 10 to 12 minutes. It shall then be cooled, filled with putty to get smooth and flawless surface. Enameled paint shall then be sprayed and towed at 150°C for about 12 minutes.

**6.00 TESTS:****6.1) TYPE TESTS:**

6.1.1 Type test reports as per cl.no.8.1.1 of IS: 5039/1983 shall be submitted along with the offer for the type and rating of circuit breakers offered, Type test reports shall be from any NABL approved laboratory such as M/s CPRI, ERDA. Type tests carried out prior to five years of the date of opening of the tender are not valid.

Following Type Test Reports shall be submitted for approval.

**(a) ON COMPLETE L. T. PILLER:**

Type tests as per IS:5039/1983 shall be carried out on complete L.T. feeder pillars .

1. Verification of temperature rise limits (As per Cl.8.2)

- 2.Verification of Dielectric Properties (As per Cl.8.3)
- 3.Verification of short circuit strength (As per Cl.8.4)
- 4.Verification of clearance & creepage distances (As per Cl.8.5)
- 5.Verification of Degree of protection for IP- 43 (As per Cl.8.6)

(b)ON AIR CIRCUIT BREAKER:

All type tests as per IS: 13947/1993 (Part II amended up to date) shall be carried out on Air Circuit Breakers

(c)ON HRC FUSES BASE AND HRC FUSE LINKS:

All type tests on HRC fuses and HRC fuse links shall be carried out as per IS:13703/of 1993 (Part I & II amended up to date) for HRC Fuse Base and HRC fuse link.

**6.2) ROUTINE TESTS:**

It should be carried out on all boxes on complete L.T. Feeder Pillar. In case of bought out items, routine and acceptance tests as per relevant IS and this specification shall be carried out at the original manufacturers' works.

1. Overall Dimensions Checking.
2. Insulation Resistance Tests.
3. High Voltage Test at 2500 V, 50 Hz AC for one minute.
4. Operation Test HRC fuse base and fuse links.

**7.00 TEST CERTIFICATES:**

The L.T. Pillar enclosure, Air Circuit Breakers, HRC fuse, HRC Fuse Link etc. offered shall be fully type tested as per relevant IS and this specification. The successful Bidder shall furnish detailed type test reports before commencement of supply. The detailed Type Test Reports shall be furnished with relevant oscillogram and certified Drawings of the equipment tested. The purchaser reserves the right to demand repetition of some or all the Type Tests in presence of purchaser's representative at purchaser's cost.

All the type tests shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Government of India such as CPRI Bangalore/Bhopal, ERDA Baroda to prove that the complete L.T. Pillar, meet the requirements of the specification.

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

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Following test certificates and documents shall be furnished at the time of inspection.

- a) Chemical analysis certificate and documents showing genuine source of procurement of electrolytic grade conductivity Aluminum Sections.
- b) Chemical analysis certificate and Document for having genuine & standard SMC body material of L.T. feeder pillar as per specification & IS: 13410. Source of procurement of the same shall be furnished.
- c) Document showing genuine source of procurement of steel sheet and sections.
- d) Certificate of temperature rise test.
- e) Certificate of painting with degreasing, pickling phosphate, and painting and oven treatment by seven tank oven process in respect of M.S. Cubicles.

The supplier shall conduct voltage withstand test and operations tests at the time of inspection.

**8.00 PROTOTYPE SAMPLE:**

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

**9.00 INSPECTION:**

9.1 The supplier shall prepare a prototype and offer the same for inspection and approval before taking up mass production.

9.2 All routine & acceptance tests and inspection of material shall be carried out at the place of manufacturer. The manufacturer shall offer the Inspector (representing the purchaser) all reasonable facilities, free of charge at the time of Inspection

9.3 The supplier shall offer inspection of the material at his works before dispatch. If required the supplier shall also offer inspection of manufacturing painting and assembly processes and quality control system. If any material is not found in line with relevant specification the supplier shall carry out the modification and offer for re-inspection.

9.4 Inspection and acceptance shall not absolve the supplier of his responsibility to supply the material in accordance with the specifications. The purchaser reserves the right to reject the material not confirming the relevant specifications.



**10.00 DRAWINGS AND DOCUMENTATION:**

10.1 The successful bidder shall submit set of all drawings of the L.T. Pillar and its components in triplicate to CE (Testing & QC) office and get the same approved before commencement of supply.

10.2 Following indicative drawings are enclosed herewith.

Outdoor Type 6/8 way L.T. feeder Pillar with ACB with Energy Meter-  
Drawing No.MSEDCL/MS I/feeder Piller/08

10.3 The tenderer shall furnish all details and clarifications required if any for scrutiny and evaluation of the offer.

10.4 Manufacture of material to be supplied shall be done strictly as per approved drawing.

10.5 Approval of drawing shall not absolve the supplier of his liability for ensuring correctness according to applicable standards & regulations.

10.6 The Bidder/Supplier shall fill-in the following schedules which form part of the specification if any schedule is not filled or incompletely filled the offer is liable to be treated as incomplete and rejected.

Schedule-A: Guaranteed technical particulars

Schedule-B: Deviations from specifications

Schedule-C: Bidder's/Supplier's Experience

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**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

**ANNEXURE - I**

Specifications for Fiberglass Reinforced Plastic Sheet moulding compound used for Pillar Body and doors

1. SMC Sheet Molding Compound shall conform to IS:13410-1992
2. The Surface appearance of the door must be smooth, non porous, and homogeneous, free of ripples, defects, and marks. No filler or fiber shall be visible at anyplace.
3. Other properties of SMC material shall be as follows & shall pass the test mentioned against the same.

Sr. No.	Characteristic	Requirement	Type of test	Method of test Ref. to
1	Material.	Thermosetting Plastic		
2	Grade of material	SMC Electrical grade S3		IS:13410-1992
3	Grade of material for frame	FRP Pultruded sections		As per IS :6746
<b>Material requirement for Sheet Molding Compound</b>				
4	Glass content, percent by mass (Min.)	20	Type	Annexure A of S:13411-1992
5	Mould shrinkage, linear % Max	0.25	Acceptance	Annexure B of IS:13411-1992
6	Flow, mm, Minimum	170	Acceptance	Annexure C of IS:13411-1992
<b>Requirement for Molded Sheet Molding Compound</b>				
7	Water Absorption, % Max	0.20	Type	Annexure D of IS:13411-1992
8	Izod impact strength (Notched), KJ/m <sup>2</sup>	55	Type	Annexure E of IS:13411-1992
9	Flexible Strength ,MPa , Min	170	Type	Annexure F of IS:13411-1992
10	Power Arc Resistance Sec.Min.	180	Type	Annexure G of IS:13411-1992
11	Modulus of Elasticity, 103 ,MPa	12 to 15	Type	IS: 8543 Part-4 (Sec-1)/1984
12	Tracking Resistance CTI,Min	1000	Type	IS: 2824/1975
13	Dielectric Strength at 90oC in Oil KV/mm	11	Type	IS:6262/1971
14	Dissipation factor (4 days at 80 % RH & 1 KHz)	0.01	Type	IS: 4486/1967
15	Heat Distortion Temperature, °C ,Min	150	Type	Annexure H of IS:13411-1992

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

16	Oxygen Index,% Min	24	Type	IS: 13360 art-6 (Sec-6)/1992
17	Post shrinkage, % Max	0.01	Acceptance	Annexure B of IS:13411-1992
18	Tensile Strength ,MPa , Min	70	Acceptance	IS: 8543 Part-4 (Sec-1)/1984
19	Density of Moulding, g/ml	1.8 to 2.1	Routine	IS: 8543 Part-I /Sec 2/1979
20	Surface resistivity (24 H in water), Ohm,Min	$1 \times 10^{13}$	Routine	IS: 3396/1979
21	Volume resistivity, Ohm-cm, Min	$1 \times 10^{14}$	Routine	IS: 3396/1979
22	Exposure to flame	Self-Extinguishing		IS:4249
23	Melting Point	test up to 400°C		IS:13360 Part 6 : Sec 10 : 1992
24	Cross Breaking Strength	1723 Kg/sq.cm		As per ASTM D790
25	Shear Strength	879 Kg/sq.cm		As per ASTM D732
26	Flammability ( V2)	UL 94 or IS : 11731 (Pt.II)		IS : 11731 (Part-II)
27	Water absorption			IS : 14772
28	Mechanical Strength			IS : 14772
29	Marking, Dimensions and construction			IS : 14772

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

**SCHEDULE – A**

**GUARANTEED TECHNICAL PARTICULARS (GTP) OF L. T. FEEDER PILLER WITH ACB**

Sr. No.	Parameter Name	Parameter type
1	Name or Trademark of Manufacturer.	Text
2	Type of L.T. Pillar	Text
3	Rated normal voltage	Text
4	Material of construction of L. T. Pillar enclosure & doors	Text
5	Thickness of SMC sheet / M.S.sheet for enclosure	Text
6	Thickness of SMC/MS sheet for doors	Text
7	Colour of the L. T. Pillar enclosure	Text
8	Dimensions of cubicle without rain hood – Width x Depth x Height (in mm)	Text
9	Dimensions of rain hood – Width x Depth x Height of center lift (in mm)	Text
10	<b>Fiberglass Reinforced Plastic Sheet Molding Compound</b>	
10(a)	Material (Thermosetting Plastic)	Text
10(b)	Grade of material (SMC as per IS:13410-1992)	Text
10(c)	Grade of material for frame (FRP Pultruded sections as per IS 6746)	Text
10(d)	Heat deflection Temperature (As per IS:13411) (min 150°C)	Text
10(e)	Exposure to flame (Ref. Std. IS:4249) (Self-Extinguishing)	Text
10 (f)	Melting Point (Ref. Std. IS:13360) (Does not melt)	Text
10(g)	Fiberglass reinforcement (Minimum 25%)	Text
10(h)	Density of Fiberglass materials (450 gms. Per sq. mt.)	Text
10 (i)	Maximum permissible Temperature(≥ 90° C)	Text
10 (j)	Door material (U.V. resistant & resistant to salty & humid atmosphere)	Text
10(k)	Insulation Resistance (As per ASTM D257)	Text
10 (l)	Specific Gravity as per IS:10192 of SMC material (1.8)	Text
10 m	Dielectric Strength as per IS:1998 (12kV /mm)	Text
10(n)	Tensile Strength as per IS:867-1963 (1058 Kg/sq.cm)	Text
10(o)	Cross Breaking Strength as per ASTM D790 (1723 Kg/sq.cm)	Text
10(p)	Shear Strength as per ASTM D732 (879 Kg/sq.cm)	Text
10(q)	Ball Pressure Test as per IS:335	Text
10 (r)	Water Absorption as per IS:14772	Text
10(s)	Mechanical Strength as per IS:14772	Text
11	Hinges	
11(a)	Hinges : Type	Text
11(b)	Hinges : Length (50mm)	Text
11(c)	Hinges : Thickness of material	Text
11(d)	Hinges : pin Diameter	Text

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

11(e)	Number of hinges per door	Text
12	Type of locking arrangements	Text
13	Number of padlocking arrangements	Text
14	Number and size of ventilating louvers with wire mesh	Text
15	Details of painting	Text
16	Dimensions and details of asbestos sheets	Text
17	Dimensions and details of bakelite sheets	Text
18	Dimensions and details of gland plates	Text
19	<b>Bus Bar, Fuse Base &amp; Fuse Link</b>	
19(a)	Size of bus bar	Text
19(b)	Size of neutral bus bar	Text
19(c)	Grade and specification of material of Bus bars	Text
19(d)	Rated normal current of Bus bars	Text
19(e)	Rated safe temperature of Bus bars	Text
19(f)	Make & Type of Fuse base assembly	Text
19(g)	Grade and specification of material of Fuse base contacts	Text
19(h)	Thickness and dimensions of contacts of fuse base	Text
19(i)	Rated normal current of Fuse base	Text
19(j)	Rated safe temperature of Fuse base	Text
19(k)	Grade and specification of material of Fuse links	Text
19(l)	Make & Type of Fuse link	Text
19m	Rated normal current of Fuse link	Text
19(n)	Rated safe temperature of Fuse link	Text
19(o)	Grade and specification of material of spring steel round	Text
19(p)	Dimensions of spring steel round	Text
20.	Make & Type of bimetallic lugs	Text
21.	One Minute P. F. withstand voltage	Text
22	Rated short time current	Text
23	Rated temperature rise	Text
24	Size & Thickness of Bakelite sheets provided	Text
25	<b>Air Circuit Breaker</b>	
25(a)	Make & Type	Text
25(b)	Rated Voltage (440V)	Text
25(c)	Rated Current (800/1000/1200 Amps as per requirement)	Text
25(d)	Rated Frequency (Hz)	Numeric
25(e)	Whether facilities as per table in cl.no.5.6 are included in ACB offered	Boolean
25(f)	Whether Type test reports for ACB & other components are submitted separately	Text
26	List of test conducted on similar equipment's	Text
27	List of copies of test certificate enclosed	Text
28	Any other details	Text

**SCHEDULE – B**  
**DEVIATIONS FROM SPECIFICATION**

All deviations from this specification shall be set out by the tenderer clause by clause in this schedule. Unless mentioned in this schedule the tender shall be deemed to confirm to the specification.

Sr.No.	Clause Number	Details of deviations	Justification

NAME OF FIRM \_\_\_\_\_

NAME &amp; SIGNATURE OF TENDERER \_\_\_\_\_

DESIGNATION \_\_\_\_\_

DATE \_\_\_\_\_

**SCHEDULE - C****SCHEDULE OF TENDERERS' EXPERIENCE**

The Bidder/Supplier shall furnish a list of similar orders executed under execution by him and name of persons to whom reference may be made by the purchaser in care such a reference is considered necessary.

Sr.No.	Name and Description of work executed	Month and year of commissioning	Client	Name of person

NAME OF FIRM \_\_\_\_\_

NAME &amp; SIGNATURE OF TENDERER \_\_\_\_\_

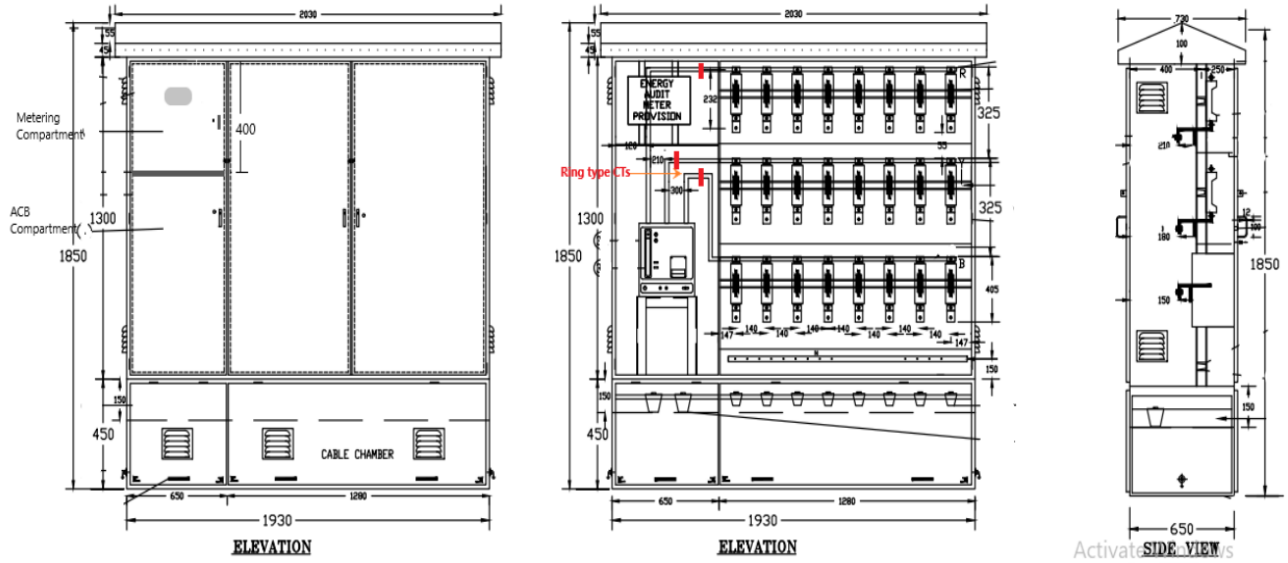
DESIGNATION \_\_\_\_\_

DATE \_\_\_\_\_

**TECHNICAL SPECIFICATION OF 6/8 WAY LT FEEDER PILLER WITH METER, AIR CIRCUIT BREAKER, MS/SMC BOX**

**INDICATIVE DRAWING**

**Drawing for 8 way LT Feeder Piller with provision of meter & ACB**





**MATERIAL SPECIFICATIONS CELL**

**TECHNICAL SPECIFICATION**

**MINI PILLER, 2 /3 WAY ,4 WAY ( WITH AND WITHOUT  
AIR CIRCUIT BREAKER) LT FEEDER PILLER WITH  
MS/SMC BOX**

**INDEX**

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## 1.00 SCOPE

This specification covers design, manufacture, testing, inspection at manufacturer's works, packing and supply of LT Feeder Pillars made out of either Complete enclosure of Mild Steel or complete enclosure of thermosetting plastic i.e. glass reinforced polyester sheet molding compound confirming to IS: 13410/1992. The system shall be A.C. 3 phase, 4 wire, 433 V, 50 Hz with effectively grounded neutral. L.T. feeder pillars shall be 4Way with & without ACB, 2 Way, 3 Way L.T. feeder pillars and mini pillars at various stores/sites in Maharashtra state.

It is not the intent to specify herein complete details of design and construction. The equipment offered shall conform to relevant standard and high quality and workmanship capable to perform continuous and satisfactory operations in the actual service conditions at site. Bidder shall have proven experience of 3 years of manufacturing of similar products and supplying to electrical utilities.

## 2.00 SERVICE CONDITIONS:

The feeder pillar to be supplied against this specification shall be suitable for satisfactory continuous operation under the following environmental conditions:

- |  |                       |
|--|-----------------------|
| a) Maximum ambient temperature   | 55°C                  |
| b) Maximum ambient temperature in shade  | 45°C                  |
| c) Minimum temperature of air in shade   | 35°C                  |
| d) Maximum daily average temperature   | 40°C                  |
| e) Maximum yearly weighted average temperature   | 32°C                  |
| f) Relative Humidity   | 10 to 95 %            |
| g) Maximum Annual rainfall   | 1450 mm               |
| h) Maximum wind pressure   | 150 kg/m <sup>2</sup> |
| i) Maximum altitude above mean sea level   | 1000 meter            |
| j) Isoceraunic level   | 50 days/year          |
| k) Seismic level (Horizontal acceleration)   | 0.3 g                 |
| l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth. |                       |

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**3.00 STANDARDS** (to which feeder pillar shall comply):

IS: 5039/1983	Distribution pillars for voltage not exceeding 1000 V
IS:14772/2000	General Requirements for Enclosures for Accessories for Household and Similar Fixed Electrical Installations - Specification
IS:13947/1993 (Part 1)&(Part 2)	Part 1 : General Rules& Annex 'C' for Degrees of Protection provided by enclosures of electrical Equipments.
	Part 2 : Circuit Breakers
IS: 13410/1992	Glass reinforced polyester sheet molding compounds (SMC)
IS: 13411/1992	Glass reinforced polyester dough molding compounds (DMC)
IS: 13703/1993	Low voltage Fuses (part 1,Part 2 sec1, Part 2 sec 2 & Part 4)
IS/IEC 127-2 : 1989	Miniature Fuses - Part 2 : Cartridge Fuse Links – Specification
IS/IEC 127-6 :1994	Miniature Fuses - Part 6 : Fuse Holders for Miniature Cartridge Fuse Links - Specification
IS:8623/1993 (Part 1,2 &3)	Specification for Low-Voltage Switchgear and Control gear Assemblies for general requirement of L.T. Switchgears
IS: 4237/1982	General arrangement for switch gear and control Gear for voltage not exceeding 1000 V with enclosure Box
IS: 732/1989	Code of Practice for Electrical Wiring Installations
IS: 5082/1998	Wrought aluminum and aluminum alloy bars, rods, tubes and sections for electrical purposes
IS: 6005/1998	Code of practice for phosphating iron and steel
IS: 5/2004	Colour for ready mixed paints and enamel
IS: 8588(Part-1/ 1977	Thermostatic bimetals: General requirements and methods of tests

**4.00 PRINCIPLE TECHNICAL PARAMETERS:**

Rated Supply Voltage : 3 phase, 440 V, 50Hz  
 Rated Current :600A, 800A, (as per requirement)  
 Insulation level : 1100V AC 50 Hz Continuous  
 : 2.5 kV for 1 Min  
 : 2000 V DC

Rated short circuit  
 Current :80KA  
 Temperature rise : Shall not exceed delivery operating temperature of components conforming to relevant standards limited to 30° C above ambient.

**5.00 GENERAL TECHNICAL PARAMETERS:****5.1) CUBICLE**

5.1.1 The cubicle of LT feeder pillars shall be made out of either 10 SWG (3.25 mm thick) cold rolled M.S sheet steel, plates and shaped sections or thermosetting plastic i.e. glass reinforced polyester sheet molding compound (SMC) conforming IS: 13410- 1992 as per the requirements specified. All panel edges and door edges shall be reinforced against distortion by rolling, bending etc. The complete cubical shall be rigid self-supporting and free standing. The enclosure shall comply with the requirement of IP- 43 type as per the IS – 13947 or the latest version thereof. The enclosure shall be anti corrosive, dust proof, rust proof, vermin and water proof, ultra violet stabilized and flame retardant property.

5.1.2 The LT feeder pillars shall have front and rear compartments. Front compartment shall be suitable for HRC fuses and the rear for cable terminations. Asbestos sheet of at least 6 mm thick shall be provided for separation between front & rear compartments; between ACB & HRC fuse compartment; between R-Y-B HRC fuse compartments.

L.T. 4 way feeder pillar shall have Air Circuit Breaker or HRC fuse base with links of 630A on incoming circuit as per the requirement and HRC fuse base with links of 400A on outgoing circuits as per the requirement with necessary interconnecting Bus Bars/ Links etc.

5.1.3 The cubicles shall have center lift up type slanting roof rain hood made up of 10 SWG MS sheets or minimum 10 SWG SMC sheets conforming to IS: 13410-1992. The depth and width of the rain hood shall be at least 120% of the depth and width of the pillars. The doors shall not be detachable after fixing the rainhood.

5.1.4 The base and doors of cubicle shall be individually in one piece except for fixing of the accessories like hinges, clamps, mounting clamps, bolts etc. The Average minimum thickness of the MS/SMC sheet for cubicle and door shall be 10 SWG /3.15 mm respectively for the Mini Pillar, 2 Way, 3 Way Feeder Pillar & 4mm SMC sheet or 10 SWG MS sheet for 4 Way (with and without ACB) Feeder Pillar. The details of SMC material shall be as per the annexure 'I' attached. Base and doors shall have flange / collars as shown in drawing. Collar of Base and doors shall overlap by 10mm.

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

5.1.5 Standard General Arrangement of Air Circuit Breaker, HRC fuse base with links, Link Disconnecter, Bus Bars, connecting links, Cable termination arrangement etc. inside the L.T. pillars shall be as per the drawings attached with the specification for various types of L. T. Feeder pillars. The clearances & creepage distances shall be in accordance with IS: 13947(Part 1) / 1993. Air Circuit breaker's operating handle shall be accessible only after opening of the doors.

5.1.6 The general overall dimensions of L.T. feeder pillars shall be as in the table below. The enclosure shall have doors from front & back side. The complete cubical shall be rigid self supporting and freestanding.

The dimensions mentioned below are overall dimensions without rain hood. However, Compact size with adequate clearances as per I. E. Rules 1956/IS: 13947 (Part 1) / 1993 is also acceptable.

Dimension	Mini pillar with fuse	L. T. Pillar without ACB		L. T. Pillar with ACB
		2/3way	4 way	4way
Width	750	500	800	1550
Depth	400	500	500	850
Height	1400	1750	1750	1750

The supplier shall submit their own drawing for approval of the competent authority before manufacturing. Proto shall be inspected by the representative of the C.E. (Testing) before bulk manufacturing.

5.1.7 Suitable no. of hinges as mentioned below shall be fitted from inside of the box to fix the doors. Hinges shall be 50 mm in length and made from 2 mm thick M. S. sheet. Hinge pin diameter shall be minimum 4 mm. Doors shall be fixed with three screws in each hinge. The hinges shall not be visible from outside. On closing of doors, right door shall rest on the left door. Hinges shall be of such construction that the doors shall be swung open by not less than 150 degree. The details of doors & hinges to be provided shall be as mentioned below:

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

Particulars	L. T. Pillar without ACB			4 way with ACB
	Mini pillar with fuse	2/3 way	4 way	
Front Door	1	1	2	3
Back Door	1	1	2	3
Hinges/door	2	3	3	3

5.1.8 For Mini pillar locking device with flap cover on front and back door (2 no's each ) should be provided. For 2/3/ 4 way feeder pillars the doors shall be centrally closed with “Godrej” type triple position locking arrangement and shall be operational with a common handle from outside the door. Movement of handle will lock the doors at center, top & bottom. A Nylon washer shall be provided between the handle and door to avoid penetration of water. One central lock with brass levers shall be provided inside the door. Key way with suitable cover shall be provided on the door for operating the lock from outside. Two keys shall be supplied for each pillar. In addition cleat arrangement shall be provided for putting two nos. of padlocks for each size of doors.

5.1.9 Four Louvers (two on each side) shall be provided to L.T. feeder pillars. Louvers with stainless steel wire mesh with shall be provided on both sides of the feeder pillars and at the top and bottom of both sides of L.T. pillars. Mounting of components inside the enclosure shall allow free air circulation keeping the clearances as per specification.

5.1.10 The cubicles shall be provided with pedestal arrangement having suitable no. of bottom holes for grouting bolts at all four corners & at the middle as per requirement.. The pedestal shall be covered from all sides with 10 SWG M.S./SMC sheets.

5.1.11 Suitable no. of detachable gland plates made up of 10 SWG MS sheets/SMC material shall be provided in the cubicle at the bottom. Gland plate shall be provided with suitable size cable gland & with four screws for fixing the plate from inside. Size & no. of the glands to be provided will be intimated to the successful tenderer along with approval of drawings.

Fuse base shall be mounted on MS / SMC base channel of size 60 x 20 x 3.15 mm thick. All Nuts & Bolts in electrical circuit shall be of non-magnetic stainless steel.

5.1.12 A bayonet lamp holder complying with IS: 1258/1987 with a tumbler switch complying with IS: 3854/1988, a three pin plug & socket complying with IS: 1293/1988 with necessary fuses & wiring shall be provided inside the pillar on the front bottom portion of the shade near the neutral busbar.

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

5.1.13 Rigid stand shall be made from M.S. angle or FRP Pultruded as per IS: 6146. The size of the angle shall be of size 50 x50 x6 mm.

5.1.14 Two galvanized earthing Bolts of M12 X 50 mm size shall be welded from inside and projecting outside of the box. Two Nuts with washers shall be provided on each bolt.

5.1.15 Enameled name plate of the supplier, type of pillar and M.S.E.D.C.L. Tender Number & date shall be displayed on front door.

5.1.16 Enameled Danger Board with "DANGER 440 VOLTS" mark shall be displayed on the left hand side of front and back doors as per IS 2551.

**5.2) AIR CIRCUIT BREAKERS**

5.2.1 Air Circuit Breakers of the following rating & technical specifications shall be provided for the Incomer of L.T. Feeder pillars with ACB, as per the actual requirement.

5.2.2 ACB shall be of 440V, 50 HZ, 600/800 A (as per actual requirement) with short time current rating of 50KA for 1 sec. Air Circuit Breaker shall conform to IS: 13947 part - 2 of 1993 with latest amendments. Other technical details shall be as below:

Sr. No.	Particulars	Requirements
1	Rated operational voltage (V) at 50 Hz	440V
2	Rated frequency (Hz)	50
3	Current rating Amps (rms)	600/800 A
4	Rated insulation voltage (V) at 50 Hz	1000
5	Number of poles	3
6	Mounting arrangement	Fixed type front mounting
7	Rated impulse withstand voltage(kV)	12 KV
8	Rated Ultimate Short circuit breaking capacity at 415 V, 50 Hz( kArms) Icu	50
9	Rated Service Short circuit breaking capacity at 415 V,50 Hz ( kA rms), Ics	50
10	Rated short circuit making capacity at 50Hz(kA peak), expressed as multiples of Icu	2.1



**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

11	Rated short time withstand current for 1 sec at 50 Hz (kA rms), I <sub>cw</sub> , expressed as percentage of I <sub>cu</sub>	50 KA
12	Line-load reversibility	Required
13	Category of utilization	B
14	Shutters on 'Trip' & 'Close' push button with sealing facility	Required
15	Accessory mounting	Accessories shall be front accessible plug in type.  Accessories namely motor shunt trip & closing coil, UVT etc. should be common for the entire range & shall be suitable for both AC & DC voltages.
16	Operating mechanism	Spring charging stored energy type, Manual & Automatic.
17	Mechanical life (Operating cycles)	20000
18	Electrical life (Operating cycles) per set of arcing contacts	5000
19	Indications	Breaker shall have following mechanical indications: 1. ON, 2. OFF, 3. TRIP 4. SPRING CHARGE STATUS
20	Sensing	True RMS based
21	Type	Microprocessor based
22	Control Terminal	Control Terminal should be front accessible & minimum 25 pairs of contacts shall be available.  Minimum ten Auxiliary NO / NC contacts shall be provided for electrical interlocking between ACBs.
23	Working temperature	Suitable for operation at 50°C
24	Protection required	Following protections with

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

		selective ranges required.
24a	Overload	Pick – up: 0.4 to 1.0 Time delay : 0.2 to 40 sec.
24b	Short Circuit	Pick – up: 2 to 10 Time delay: 20 to 400 msec
24c	Instantaneous over current	Pick – up: 4 to 16 & OFF
24d	Earth fault	Pick – up: 0.2 to 0.6 & OFF Time delay: 100 to 400 msec
25	Metering Required	Provision for following measurement functions shall be made on the ACB i) 3 phase current ii) 3 phase voltage iii) KWH iv) KVAH v) Power Factor vi) Max. demand(KVA) vii) Fault History of Minimum 50events
26	Indication	Release shall give individual indication for each type of fault.
27	Power	Release shall be self powered& independent of incoming supply.
28	Safety	Local controls shall be secured by padlocking arrangement

**5.3) BUS BARS:**

5.3.1 The bus bars shall be made up of electrolytic grade aluminum conforming to grade 63401 WP of IS: 5082.

5.3.2 The bus bars shall be with PVC Sleeves or painted with non deteriorating type Epoxy paint for full length with colour code as below:

Red colour for top busbar.

Yellow colour for middle bus bar

Blue colour for bottom bus bar,

Black colour for neutral bus bar below bottom bus bar

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

5.3.3 Size of the bus bar For R,Y & B phase shall be as tabulated below.

Type of Bus bar	Mini pillar with fuse	L. T. pillars without ACB		L. T. Pillar with ACB
		2/3way	4 way	4way
For R,Y& B phase	50 x 6 mm	60 x10 mm	60x10 mm	60 x10 mm
For Neutral	50 x 6 mm	40 x 6 mm	50 x 6 mm	50 x 6 mm

5.3.4 Electrolytic grade aluminum twin flat cable terminals (Z Patti) shall be provided in staggered formation for connecting cable cores for each phase from rear side in all. L. T. pillars (except mini pillar). The arrangement shall be suitable for taking Load current reading with clip on type of meter. Insulated horizontal Bakelite bar of at least 50 x 12mm shall be provided to support and take care of weight of cables, jointing etc.

5.3.5 Neutral bus bar shall have one terminal for each circuit way and shall be provided with two nickel plated, nuts, bolts, spring washers and plain washers at each end for earthing. Cross sectional area of neutral bus bar shall be at least 50% of cross sectional area of phase bus bar.

5.3.6 Suitable insulated phase barriers of at least 6 mm thick asbestos cement sheet shall be provided between front and rear compartment, between adjacent set of phase and neutral bus bars and between doors and bus bars with firm fixing arrangements.

5.3.7 The current rating – current carrying parts shall not generally exceed the limits those given in Clause No.5.4.7 Higher current rating adopted if any in special cases shall be subject to successful temperature rise tests carried out in reputed laboratories.

5.3.8 Minimum clearances, wherever shown, shall be as per General Arrangement Indicative Drawing enclosed with this specification. Other clearances shall be as per requirement of IS: 4237/1982 amended up to date.

**5.4) FUSE BASE ASSEMBLY:**

5.4.1 The Fuse bases shall be suitable for HRC fuse links and strips. All fuse bases shall be identical and interchangeable irrespective of whether they are provided in incoming or outgoing circuits and shall be capable to carry rated normal current without exceeding safe temperature as per relevant standard duly tested at Lab like CPRI, ERDA etc.

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

5.4.2 The base of the HRC Fuse shall be of non-tracking, heat resistant insulating porcelain material of superior electrical and mechanical properties equivalent to Dough Molding Compound (DMC). The Fuse Base shall be sturdy in construction. The insulation shall not get affected due to dust, moisture etc, at wide fluctuation in temperature. The holes for fasteners shall be plugged by insulating filling compound which shall not drain at operating temperature in service.

5.4.3 The contacts shall be made up of electrolytic grade copper alloy with corrugated terminal pad and spring action to yield high contact pressure. G. I. spring ring shall be made out of at least 6 mm dia. spring steel round. The spring action shall not get affected by operations and variations in operating temperatures in service.

5.4.4 Thermostatic bimetal device shall be provided between terminal pad and bus bars and between terminal pad and cable terminals ( Z Patti) to prevent bimetallic deterioration.

5.4.5 HRC Fuse Base should withstand the breaking capacity of the fuse link of 80kA.

5.4.6 The complete assembly shall be so fixed and secured that there shall be no turn, fall out displacement and vibration of any part during inserting and removal of fuses/Links. Load current reading, cable end connection etc

5.4.7 The current rating adopted shall generally not exceed the following limits. Higher current density adopted if any in special corrugated and other shapes shall be subject to successful temperature rise tests carried out in reputed laboratory.

Size of section mm x mm	Maximum current in Amps	
	Single Section	Double Section
30 x 3	205	385
30 x 5	270	500
40 x 3	280	500
40 x 5	350	650
40 x 10	515	975
50 x 5	425	780
50 x 10	625	1150
60 x 5	500	900
60 x 10	730	1330
80 x 5	680	1170
80 x 10	940	1700

**5.5) FUSE LINKS:**

The HRC Fuse Links shall be sturdy in construction of “Din Type”. Corrugated fuse links shall be made out of electrolytic grade copper flat of at least 4 mm thick and shall be capable of carrying the rated current of the fuse base and shall be suitable for inserting and pulling out by insulated fuse pulling handle. Breaking capacity shall be 80kA. For fault indication red pop up indicator should come out instantly on fusing. Manufacturer’s name, current rating, breaking capacity and type shall be marked on HRC fuse link.

The successful bidder shall submit the complete type test reports as per specification for approval of CE (Testing & QC) before commencement of supply.

**5.6) PAINTING:**

5.6.1 The M.S. cubicles shall be provided with anti corrosive high quality post office red colour paint conforming to shade No 538 of IS.5 from inside and outside to withstand the corrosive and humid atmosphere. The colour of SMC cubicle shall be red conforming to shade No 538 of IS:5

5.6.2 For M.S. Cubicle, all interiors and exteriors of the cubicle shall be degreased in 5% solution at 75°C for 15 minutes. They shall then be washed in hot water bath at 65°C to remove all rust, scale corrosion, grease and other adhering foreign matter and shall be rinsed in cold running water.

5.6.3 M.S. cubicles shall then be pickled in 25% hot sulphuric acid at 65°C for 5 minutes. Care shall be taken to avoid over pickling by addition of adequate quantities of inhibitor and avoid loss of tensile strength. The cubicle shall then be rinsed in cold running water and put in alkaline solution at 65°C for 1 to 2 minutes. The cubicle shall then be immersed in cold water (still agitated) to remove all traces of alkali and untreated salt. The cubicle shall then be dipped in deoxidize chamber to ensure complete removal of moisture.

5.6.4 Corrokill rust converter conforming to IS 13515 shall be preferably applied as primer. The cubicle stoved at 150°C for 10 to 12 minutes. It shall then be cooled, filled with putty to get smooth and flawless surface. Enameled paint shall then be sprayed and towed at 150°C for about 12minutes.

**6.00 TESTS:****6.1) TYPE TESTS:**

6.1.1 Type test reports as per cl.no.8.1.1 of IS: 5039/1983 shall be submitted along with the offer for the type and rating of circuit breakers offered, Type test reports shall be from any NABL approved laboratory such as M/s CPRI, ERDA. Type tests carried out prior to Five years of the date of opening of the tender are not valid.

Following Type Test Reports shall be submitted for approval.

**(a) ON COMPLETE L. T. PILLER:**

Type tests as per IS:5039/1983 shall be carried out on complete L.T. feeder pillars .

1. Verification of temperature rise limits (As per Cl.8.2)
2. Verification of Dielectric Properties (As per Cl.8.3)
3. Verification of short circuit strength (As per Cl.8.4)
4. Verification of clearance & creepage distances (As per Cl.8.5)
5. Verification of Degree of protection for IP- 43 (As per Cl.8.6)

**(b) ON AIR CIRCUITBREAKER:**

All type tests as per IS: 13947/1993 (Part II amended up to date) shall be carried out on Air Circuit Breakers

**(c) ON HRC FUSES BASE AND HRC FUSELINKS:**

All type tests on HRC fuses and HRC fuse links shall be carried out as per IS:13703/of 1993 (Part I & II amended up to date) for HRC Fuse Base and HRC fuse link.

**6.2) ROUTINE TESTS:**

It should be carried out on all boxes on complete L.T. Feeder Pillar. In case of bought out items, routine and acceptance tests as per relevant IS and this specification shall be carried out at the original manufacturers' works.

1. Overall Dimensions Checking.
2. Insulation Resistance Tests.
3. High Voltage Test at 2500 V, 50 Hz AC for one minute.
4. Operation Test HRC fuse base and fuse links.

**7.00 TEST CERTIFICATES:**

The L.T. Pillar enclosure, Air Circuit Breakers, HRC fuse, HRC Fuse Link etc. offered shall be fully type tested as per relevant IS and this specification. The successful Bidder shall furnish detailed type test reports before commencement of supply. The detailed Type Test Reports shall be furnished with relevant oscillogram and certified Drawings of the equipment tested. The purchaser reserves the right to demand repetition of some or all the Type Tests in presence of purchaser's representative at purchaser's cost.

All the type tests shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Government of India such as CPRI Bangalore/Bhopal, ERDA Baroda to prove that the complete L.T. Pillar, meet the requirements of the specification.

Following test certificates and documents shall be furnished at the time of inspection.

- a) Chemical analysis certificate and documents showing genuine source of procurement of electrolytic grade conductivity Aluminum Sections.
- b) Chemical analysis certificate and Document for having genuine & standard SMC body material of L.T. feeder pillar as per specification & IS: 13410. Source of procurement of the same shall be furnished.
- c) Document showing genuine source of procurement of steel sheet and sections.
- d) Certificate of temperature rise test.
- e) Certificate of painting with degreasing, pickling phosphate, and painting and oven treatment by seven tank oven process in respect of M.S. Cubicles.

The supplier shall conduct voltage withstand test and operations tests at the time of inspection.

**8.00 PROTOTYPE SAMPLE:**

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

**9.00 INSPECTION:**

9.1 The supplier shall prepare a prototype and offer the same for inspection and approval before taking up mass production.

9.2 All routine & acceptance tests and inspection of material shall be carried out at the place of manufacturer. The manufacturer shall offer the Inspector (representing the purchaser) all reasonable facilities, free of charge at the time of Inspection

9.3 The supplier shall offer inspection of the material at his works before dispatch. If required the supplier shall also offer inspection of manufacturing painting and assembly processes and quality control system. If any material is not found in line with relevant specification the supplier shall carry out the modification and offer for re-inspection.

9.4 Inspection and acceptance shall not absolve the supplier of his responsibility to supply the material in accordance with the specifications. The purchaser reserves the right to reject the material not confirming the relevant specifications.

**10.00 DRAWINGS AND DOCUMENTATION:**

10.1 Following indicative drawings are enclosed herewith.

- i) Outdoor Type L.T. Mini Pillar drawing no. MSEDCL/MS I/ MB/01/R1 (3sheet)
- ii) Outdoor Type 2/3 way L.T. feeder Pillar drawing no. MSEDCL/MS I/ feeder pillar/ 02 R1 (4sheet)
- iii) Outdoor Type 4 way L.T. feeder Pillar with ACB - Drawing no. MSEDCL/MS I / feeder pillar/ 03 R0 (3 sheet).
- iv) Outdoor Type 4 way L.T. feeder Pillar drawing no. MSEDCL/MS I/ feeder pillar 04 R1 ( 4sheet)

10.2 The tenderer shall furnish all details and clarifications required if any for scrutiny and evaluation of the offer.

10.3 Manufacture of material to be supplied shall be done strictly as per approved drawing.

10.4 Approval of drawing shall not absolve the supplier of his liability for ensuring correctness according to applicable standards & regulations.

10.5 The Bidder/Supplier shall fill-in the following schedules which form part of the specification if any schedule is not filled or incompletely filled the offer is liable to be treated as incomplete and rejected.

Schedule-A: Guaranteed technical particulars

Schedule-B: Deviations from specifications

Schedule-C: Bidder's/Supplier's Experience



**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**ANNEXURE - I**

Specifications for Glass reinforced polyester Sheet Moulding Compound (SMC) used for Pillar Body and doors

1. Sheet Molding Compound shall conform to IS: 13410-1992
2. The Surface appearance of the door must be smooth, non porous, and homogeneous, free of ripples, defects, and marks. No filler or fiber shall be visible at anyplace.
3. Other properties of SMC material shall be as follows & shall pass the test mentioned against the same.

Sr. No.	Characteristic	Requirement	Type of test	Method of test Ref. to
1	Material.	Thermosetting Plastic		
2	Grade of material	SMC Electrical grade S3		IS:13410-1992
3	Grade of material for frame	FRP Pultruded sections		As per IS :6746
<b>Material requirement for Sheet Molding Compound</b>				
4	Glass content, percent by mass (Min.)	20	Type	Annexure A of S:13411-1992
5	Mould shrinkage, linear %Max	0.25	Acceptance	Annexure B of IS:13411-1992
6	Flow, mm, Minimum	170	Acceptance	Annexure C of IS:13411-1992
<b>Requirement for Molded Sheet Molding Compound</b>				
7	Water Absorption, % Max	0.20	Type	Annexure D of IS:13411-1992
8	Izod impact strength (Notched), KJ/m <sup>2</sup>	55	Type	Annexure E of IS:13411-1992
9	Flexible Strength ,MPa , Min	170	Type	Annexure F of IS:13411-1992
10	Power Arc Resistance Sec. Min.	180	Type	Annexure G of IS:13411-1992
11	Modulus of Elasticity, 10 <sup>3</sup> ,MPa	12 to 15	Type	IS: 8543 Part-4 (Sec-1)/1984
12	Tracking Resistance CTI, Min	1000	Type	IS: 2824/1975
13	Dielectric Strength at 90°C in Oil KV/mm	11	Type	IS:6262/1971

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

14	Dissipation factor (4 days at 80 % RH & 1 KHz)	0.01	Type	IS: 4486/1967
15	Heat Distortion Temperature, °C ,Min	150	Type	Annexure Hof IS:13411-1992
16	Oxygen Index,% Min	24	Type	IS: 13360 art-6 (Sec-6)/1992
17	Post shrinkage, % Max	0.01	Acceptance	Annexure B of IS:13411-1992
18	Tensile Strength ,MPa , Min	70	Acceptance	IS: 8543 Part-4 (Sec-1)/1984
19	Density of Moulding, g/ml	1.8 to 2.1	Routine	IS: 8543 Part-I /Sec 2/1979
20	Surface resistivity (24 H in water), Ohm, Min	$1 \times 10^{13}$	Routine	IS: 3396/1979
21	Volume resistivity, Ohm-cm, Min	$1 \times 10^{14}$	Routine	IS: 3396/1979
22	Exposure to flame	Self-Extinguishing		IS:4249
23	Melting Point	test up to 400°C		IS:13360 Part 6 : Sec 10 : 1992
24	Cross Breaking Strength	1723 Kg/sq.cm		As per ASTM D790
25	Shear Strength	879 Kg/sq.cm		As per ASTM D732
26	Flammability ( V2)	UL 94 or IS : 11731 (Pt.II)		IS : 11731 (Part-II)
27	Water absorption			IS : 14772
28	Mechanical Strength			IS : 14772
29	Marking, Dimensions and construction			IS : 14772

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**SCHEDULE – A**

**1. GUARANTEED TECHNICAL PARTICULARS (GTP) OF MINI L. T.PILLER**

Sr. No.	Parameter Name	Parameter type
1	Name or Trademark of Manufacturer.	Text
2	Type of L.T. Pillar	Text
3	Rated normal voltage	Text
4	Material of construction of L. T. Pillar enclosure & doors	Text
5	Thickness of SMC sheet / M.S. sheet for enclosure	Text
6	Thickness of SMC sheet/M.S. sheet for doors	Text
7	Colour of the L. T. Mini Pillar enclosure	Text
8	Dimensions of cubicle without rain hood – Width x Depth x Height (in mm)	Text
9	Dimensions of rain hood – Width x Depth x Height of center lift (in mm)	Text
10	<b>Fiberglass Reinforced Plastic Sheet Molding Compound</b>	
10(a)	Material (Thermosetting Plastic)	Text
10(b)	Grade of material (SMC as per IS:13410-1992)	Text
10(c)	Grade of material for frame (FRP Pultruded sections as per IS 6746)	Text
10(d)	Heat deflection Temperature (As per IS:13411) (min 150°C)	Text
10(e)	Exposure to flame (Ref. Std. IS:4249) (Self-Extinguishing)	Text
10 (f)	Melting Point (Ref. Std. IS:13360) (Does not melt)	Text
10(g)	Fiberglass reinforcement (Minimum 25%)	Text
10(h)	Density of Fiberglass materials (450 gms. Per sq. mt.)	Text
10 (i)	Maximum permissible Temperature ( $\geq 90^{\circ}$ C)	Text
10 (j)	Door material (U.V. resistant & resistant to salty & humid atmosphere)	Text
10(k)	Insulation Resistance (As per ASTM D257)	Text
10 (l)	Specific Gravity as per IS:10192 of SMC material (1.8)	Text
10 m	Dielectric Strength as per IS:1998 (12kV /mm)	Text
10(n)	Tensile Strength as per IS:867-1963 (1058 Kg/sq.cm)	Text
10(o)	Cross Breaking Strength as per ASTM D790 (1723 Kg/sq.cm)	Text
10(p)	Shear Strength as per ASTM D732 (879 Kg/sq.cm)	Text
10(q)	Ball Pressure Test as per IS:335	Text
10 (r)	Water Absorption as per IS:14772	Text
10(s)	Mechanical Strength as per IS:14772	Text
11	Hinges	
11(a)	Hinges : Type	Text
11(b)	Hinges : Length (50mm)	Text
11(c)	Hinges : Thickness of material	Text
11(d)	Hinges : pin Diameter	Text
11(e)	Number of hinges per door	Text

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

12	Type of locking arrangements	Text
13	Number of padlocking arrangements	Text
14	Number and size of ventilating louvers with wire mesh	Text
15	Details of painting	Text
16	Dimensions and details of gland plates	Text
17	<b>Bus Bar, Fuse Base &amp; Fuse Link</b>	
17(a)	Size of bus bar	Text
17(b)	Size of neutral bus bar	Text
17(c)	Grade and specification of material of Bus bars	Text
17(d)	Rated normal current of Bus bars	Text
17(e)	Rated safe temperature of Bus bars	Text
17(f)	Make & Type of Fuse base assembly	Text
17(g)	Grade and specification of material of Fuse base contacts	Text
17(h)	Thickness and dimensions of contacts of fuse base	Text
17(i)	Rated normal current of Fuse base	Text
17 (j)	Rated safe temperature of Fuse base	Text
17(k)	Grade and specification of material of Fuse links	Text
17(l)	Make & Type of Fuse link	Text
17m	Rated normal current of Fuse link	Text
17(n)	Rated safe temperature of Fuse link	Text
17(o)	Grade and specification of material of spring steel round	Text
17(p)	Dimensions of spring steel round	Text
18.	Make & Type of bimetallic lugs	Text
19.	One Minute P. F. withstand voltage	Text
20	Rated short time current	Text
21	Rated temperature rise	Text

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**2.GUARANTEED TECHNICAL PARTICULARS (GTP) OF L. T. 2/3 AND 4 WAY WITHOUT ACB FEEDER PILLER**

Sr. No.	Parameter Name	Parameter type
1	Name or Trademark of Manufacturer.	Text
2	Type of L.T. Pillar	Text
3	Rated normal voltage	Text
4	Material of construction of L. T. Pillar enclosure & doors	Text
5	Thickness of SMC sheet / M.S. sheet for enclosure	Text
6	Thickness of SMC sheet/M.S. sheet for doors	Text
7	Colour of the L. T. Pillar enclosure	Text
8	Dimensions of cubicle without rain hood – Width x Depth x Height (in mm)	Text
9	Dimensions of rain hood – Width x Depth x Height of center lift (in mm)	Text
10	<b>Fiberglass Reinforced Plastic Sheet Molding Compound</b>	
10(a)	Material (Thermosetting Plastic)	Text
10(b)	Grade of material (SMC as per IS:13410-1992)	Text
10(c)	Grade of material for frame (FRP Pultruded sections as per IS 6746)	Text
10(d)	Heat deflection Temperature (As per IS:13411) (min 150°C)	Text
10(e)	Exposure to flame (Ref. Std. IS:4249) (Self-Extinguishing)	Text
10 (f)	Melting Point (Ref. Std. IS:13360) (Does not melt)	Text
10(g)	Fiberglass reinforcement (Minimum 25%)	Text
10(h)	Density of Fiberglass materials (450 gms. Per sq. mt.)	Text
10 (i)	Maximum permissible Temperature ( $\geq 90^{\circ}$ C)	Text
10 (j)	Door material (U.V. resistant & resistant to salty & humid atmosphere)	Text
10(k)	Insulation Resistance (As per ASTM D257)	Text
10 (l)	Specific Gravity as per IS:10192 of SMC material (1.8)	Text
10 m	Dielectric Strength as per IS:1998 (12kV /mm)	Text
10(n)	Tensile Strength as per IS:867-1963 (1058 Kg/sq.cm)	Text
10(o)	Cross Breaking Strength as per ASTM D790 (1723 Kg/sq.cm)	Text
10(p)	Shear Strength as per ASTM D732 (879 Kg/sq.cm)	Text
10(q)	Ball Pressure Test as per IS:335	Text
10 (r)	Water Absorption as per IS:14772	Text
10(s)	Mechanical Strength as per IS:14772	Text
11	Hinges	
11(a)	Hinges : Type	Text
11(b)	Hinges : Length (50mm)	Text
11(c)	Hinges : Thickness of material	Text
11(d)	Hinges : pin Diameter	Text
11(e)	Number of hinges per door	Text

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

12	Type of locking arrangements	Text
13	Number of padlocking arrangements	Text
14	Number and size of ventilating louvers with wire mesh	Text
15	Details of painting	Text
16	Dimensions and details of asbestos sheets	Text
17	Dimensions and details of Bakelite sheets	Text
18	Dimensions and details of gland plates	Text
19	<b>Bus Bar, Fuse Base &amp; Fuse Link</b>	
19(a)	Size of bus bar	Text
19(b)	Size of neutral bus bar	Text
19(c)	Grade and specification of material of Bus bars	Text
19(d)	Rated normal current of Bus bars	Text
19(e)	Rated safe temperature of Bus bars	Text
19(f)	Make & Type of Fuse base assembly	Text
19(g)	Grade and specification of material of Fuse base contacts	Text
19(h)	Thickness and dimensions of contacts of fuse base	Text
19(i)	Rated normal current of Fuse base	Text
19 (j)	Rated safe temperature of Fuse base	Text
19(k)	Grade and specification of material of Fuse links	Text
19(l)	Make & Type of Fuse link	Text
19m	Rated normal current of Fuse link	Text
19(n)	Rated safe temperature of Fuse link	Text
19(o)	Grade and specification of material of spring steel round	Text
19(p)	Dimensions of spring steel round	Text
20.	Make & Type of bimetallic lugs	Text
21.	One Minute P. F. withstand voltage	Text
22	Rated short time current	Text
23	Rated temperature rise	Text
24	Size & Thickness of Bakelite sheets provided	Text
25	Any other details	Text

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**3.GUARANTEED TECHNICAL PARTICULARS (GTP) OF L. T. 4 WAY WITH ACB FEEDER PILLER**

Sr. No.	Parameter Name	Parameter type
1	Name or Trademark of Manufacturer.	Text
2	Type of L.T. Pillar	Text
3	Rated normal voltage	Text
4	Material of construction of L. T. Pillar enclosure & doors	Text
5	Thickness of SMC sheet / M.S. sheet for enclosure	Text
6	Thickness of SMC sheet/M.S. sheet for doors	Text
7	Colour of the L. T. Pillar enclosure	Text
8	Dimensions of cubicle without rain hood – Width x Depth x Height (in mm)	Text
9	Dimensions of rain hood – Width x Depth x Height of center lift (in mm)	Text
10	<b>Fiberglass Reinforced Plastic Sheet Molding Compound</b>	
10(a)	Material (Thermosetting Plastic)	Text
10(b)	Grade of material (SMC as per IS:13410-1992)	Text
10(c)	Grade of material for frame (FRP Pultruded sections as per IS 6746)	Text
10(d)	Heat deflection Temperature (As per IS:13411) (min 150°C)	Text
10(e)	Exposure to flame (Ref. Std. IS:4249) (Self-Extinguishing)	Text
10 (f)	Melting Point (Ref. Std. IS:13360) (Does not melt)	Text
10(g)	Fiberglass reinforcement (Minimum 25%)	Text
10(h)	Density of Fiberglass materials (450 gms. Per sq. mt.)	Text
10 (i)	Maximum permissible Temperature ( $\geq 90^{\circ}$ C)	Text
10 (j)	Door material (U.V. resistant & resistant to salty & humid atmosphere)	Text
10(k)	Insulation Resistance (As per ASTM D257)	Text
10 (l)	Specific Gravity as per IS:10192 of SMC material (1.8)	Text
10 m	Dielectric Strength as per IS:1998 (12kV /mm)	Text
10(n)	Tensile Strength as per IS:867-1963 (1058 Kg/sq.cm)	Text
10(o)	Cross Breaking Strength as per ASTM D790 (1723 Kg/sq.cm)	Text
10(p)	Shear Strength as per ASTM D732 (879 Kg/sq.cm)	Text
10(q)	Ball Pressure Test as per IS:335	Text
10 (r)	Water Absorption as per IS:14772	Text
10(s)	Mechanical Strength as per IS:14772	Text
11	Hinges	
11(a)	Hinges : Type	Text
11(b)	Hinges : Length (50mm)	Text
11(c)	Hinges : Thickness of material	Text
11(d)	Hinges : pin Diameter	Text
11(e)	Number of hinges per door	Text

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

11(e)	Number of hinges per door	Text
12	Type of locking arrangements	Text
13	Number of padlocking arrangements	Text
14	Number and size of ventilating louvers with wire mesh	Text
15	Details of painting	Text
16	Dimensions and details of asbestos sheets	Text
17	Dimensions and details of bakelite sheets	Text
18	Dimensions and details of gland plates	Text
19	<b>Bus Bar, Fuse Base &amp; Fuse Link</b>	
19(a)	Size of bus bar	Text
19(b)	Size of neutral bus bar	Text
19(c)	Grade and specification of material of Bus bars	Text
19(d)	Rated normal current of Bus bars	Text
19(e)	Rated safe temperature of Bus bars	Text
19(f)	Make & Type of Fuse base assembly	Text
19(g)	Grade and specification of material of Fuse base contacts	Text
19(h)	Thickness and dimensions of contacts of fuse base	Text
19(i)	Rated normal current of Fuse base	Text
19 (j)	Rated safe temperature of Fuse base	Text
19(k)	Grade and specification of material of Fuse links	Text
19(l)	Make & Type of Fuse link	Text
19m	Rated normal current of Fuse link	Text
19(n)	Rated safe temperature of Fuse link	Text
19(o)	Grade and specification of material of spring steel round	Text
19(p)	Dimensions of spring steel round	Text
20.	Make & Type of bimetallic lugs	Text
21.	One Minute P. F. withstand voltage	Text
22	Rated short time current	Text
23	Rated temperature rise	Text
24	Size & Thickness of Bakelite sheets provided	Text
25	<b>Air Circuit Breaker</b>	
25(a)	Make & Type	Text
25(b)	Rated Voltage (440V)	Text
25(c)	Rated Current (600/800) Amps as per requirement)	Text
25(d)	Rated Frequency (Hz)	Numeric
25(e)	Whether facilities as per table in cl.no.5.6 are included in ACB offered	Boolean
25(f)	Whether Type test reports for ACB & other components are submitted separately	Text
26	List of test conducted on similar equipment's	Text
27	List of copies of test certificate enclosed	Text
28	Any other details	Text



**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT  
FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX****SCHEDULE – B****DEVIATIONS FROM SPECIFICATION**

All deviations from this specification shall be set out by the tenderer clause by clause in this schedule. Unless mentioned in this schedule the tender shall be deemed to confirm to the specification.

Sr. No.	Clause Number	Details of deviations	Justification

NAME OF FIRM \_\_\_\_\_

NAME &amp; SIGNATURE OF TENDERER \_\_\_\_\_

DESIGNATION \_\_\_\_\_

DATE \_\_\_\_\_

**SCHEDULE - C****SCHEDULE OF TENDERERS' EXPERIENCE**

The Bidder/Supplier shall furnish a list of similar orders executed under execution by him and name of persons to whom reference may be made by the purchaser in care such a reference is considered necessary.

Sr. No.	Name and Description of work executed	Month and year of commissioning	Client	Name of person

NAME OF FIRM \_\_\_\_\_

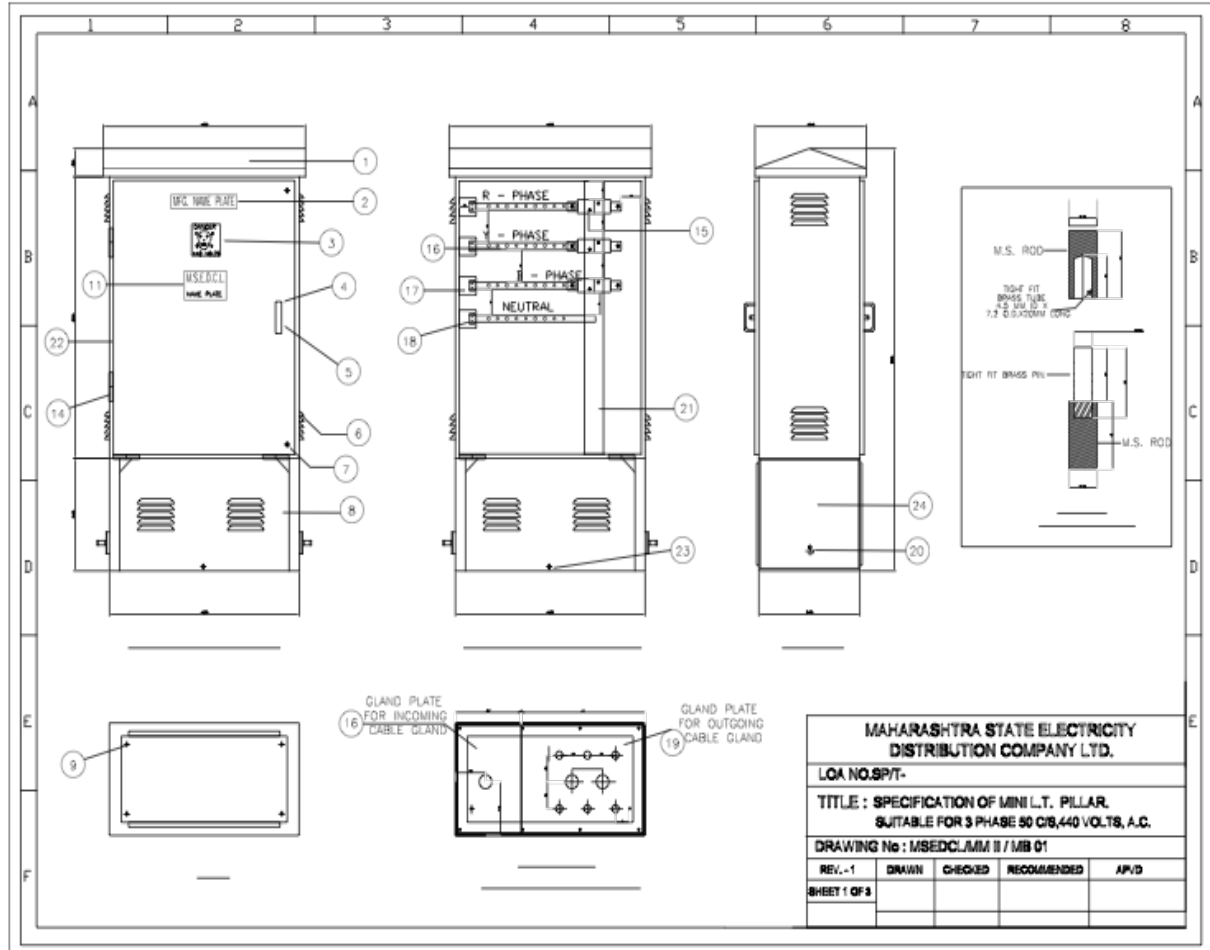
NAME &amp; SIGNATURE OF TENDERER \_\_\_\_\_

DESIGNATION \_\_\_\_\_

DATE \_\_\_\_\_

**INDICATIVE DRAWING**

**(A) LT Mini Piller**



**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

LEGEND	
1.	SLANTING ROOF TOP TO BE BOLTED/WELDED IN SUCH WAY THAT DOORS CANNOT BE REMOVED AND CAP BETWEEN BODY OF THE PILLAR AND ROOF SHALL BE 12 MM FOR VENTILATION
2.	MANUFACTURER'S NAME PLATE AT TOP OF THE DOOR.
3.	ENAMELLED DANGER BOARD ON FRONT & BACK LEFT HAND SIDE DOOR SIZE 200*150 MM.
4.	DOOR HANDLE MADE FROM 12MM M.S./SMC ROUND WITH 100 MM GAP AND 50 MM CLEARANCE WELDED TO THE DOOR.
5.	WELDED ANGLE 38 * 38* 3 MM THK. CLEAT WITH 12 MM HOLE
6.	LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE.
7.	LOCKING DEVICE WITH FLAP COVER ON FRONT AND BACK DOOR-2 NOS EACH
8.	FOUR SIDE BOTTOM COVERS SHOULD BE PROVIDED OF 10 SWG M.S./ 4MM SMC SHEET AND WITH BLACK PAINT THE FRONT AND BACK COVERS FIXED BY HEAVY DUTY BRASS HINGES -2 NOS EACH COVERS HAVING LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE BOLTED ARRANGEMENT PROVIDED FOR FIXING BOTH SIDE COVERS.
9.	FOUR NOS. HOLE 14MM SUITABLE FOR 12.5 MM FOUNDATION BOLTS
10.	PORCELAIN FUSE BASE SILVER PLATED ELECTROLYTIC COPPER CONTACTS .
11.	ENAMELLED NAME PLATE WITH M.S.E.D.C.I. MUMBAI L.T. MINI PILLAR AND ORDER NO. SHOULD BE DISPLAYED ON THE FRONT DOOR SIZE : 200*200 MM
12.	'C' TYPE BRACKET OF SIZE 90*80*15 MM WELDED TO PILLAR BODY AT BOTH END FOR SUPPORTING BUSBAR MOUNTING CHANNEL ( 'C' TYPE BRACKET 2 MM THK.)
13.	PORCELAIN BASE FOR MOUNTING BUSBARS.
14.	HEAVY DUTY TWO BRASS HINGES FOR EACH DOOR WITH BRASS PIN & SLEEVES NON DETACHABLE TYPE.
15.	ALUMINIUM BUSBAR FOR OUTGOING SUPPLY SIZE 50*6 MM AND 360 MM LONG FOR 'R' PHASE.
16.	ALUMINIUM BUSBAR FOR OUTGOING SUPPLY SIZE 50*6 MM AND 360 MM LONG FOR 'Y' PHASE.
17.	ALUMINIUM BUSBAR FOR OUTGOING SUPPLY SIZE 50*6 MM AND 360 MMLONG FOR 'B' PHASE.
18.	ALUMINIUM NEUTRAL BUSBAR SIZE 50*6 MM AND 360 MM LONG.
19.	GLAND PLATE OF 10 GAUGE M.S./SMC SHEET WITH FLANGED TYPE BRASS GLANDS FOR PVC/XLPE CABLES ( GLAND HOLES SIZE – MM / B-50 MM /C-37 MM/ D-32MM.
20.	2 NOS HOLES 12 MM FOR EARTHING ON SIDE COVER PLATE.
21.	60*20*3.15 MM THK M.S./SMC CHANNEL FIXED ON 'C' BRACKET BY SCREW FOR MOUNTING BUSBARS BAKELITE STRIP OF 3 MM THK THROUGHOUT THE CHANNEL TO BE FIXED.
22.	DOORS OF M.S./SMC CUBICLE SHALL BE OF MS/SMC MATERIAL
23.	50*50*6 MM THK M.S./SMC ANGLE FRAME FOR PADESTAL ONLY.
24.	BOLTED COVER OF 10 GAUGE for M.S./SMC SHEET FIXED TO BOTH SIDE.

<b>MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.</b>				
LOA NO.SP/T-				
TITLE : SPECIFICATION OF MINI L.T. PILLAR. SUITABLE FOR 3 PHASE 80 C/S, 440 VOLTS, A.C.				
DRAWING No : MSEDCL/MM II / MB 01				
REV. -1	DRAWN	CHECKED	RECOMMENDED	AP/D
SHEET 2 OF 3				

**NOTE :THESE DRAWINGS ARE INDICATIVE DRAWINGS AND SUPPLIER HAS TO SUBMITT THE DETAIL DRAWINGS FOR APPROVAL.**

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**SPECIFICATION OF L.T. MINI PILLAR**

1. OUTDOOR TYPE MINI PILLAR WITH H.R.C FUSE SUITABLE FOR THREE PHASE 400 AMP 50 Hz SYSTEM.
2. THE FEEDER PILLAR SHOULD BE FABRICATED OUT OF 10 GAUGE MS STEEL/SMC SHEET MATERIAL WITH SLANTING ROOF TOP AND ADEQUATELY VENTILATED BY PROVIDING 3 MM GAP USING 3 MM WASHER WELDED TO BODY LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE.
3. THE BOTTOM PEDESTAL OF THE PILLAR SHOULD BE PROVIDED WITH M.S./SMC ANGLE FRAME OF 50*50*6 MM THK. AND COVERED BY 10 GAUGE M.S. SHEET WITH HEAVY DUTY 2 BRASS HINGES AT FRONT & BACK COVERS HAVING LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE AT BOTH SIDE OF PEDESTAL COVERED WITH BOLTED 10 GAUGE M.S./SMC SHEET. THERE WILL BE NO ANGLE FRAME FOR TOP BODY OF THE PILLAR M.S./SMC COVERS SHOULD BE PROVIDED WITH BLACK PAINT.
4. AFTER CARRYING OUT NECESSARY ANTI-CORROSIVE TREATMENT THE MINI PILLAR SHOULD BE PAINTED BY OVEN BAKED PAINT (NOT BY AIR DRY PAINTING) WITH POST OFFICE RED COLOUR AND BOTTOM SKIRT WITH BLACK COLOUR FROM INNER AND OUTER SIDE ( FOR MSD CUBICLE).
5. THE FRONT AND BACK DOORS SHOULD BE PROVIDED WITH HEAVY DUTY 3 NOS BRASS HINGES WITH STEEL PINS AND SLEEVE ON EACH DOOR AND M.S. HANDLE FOR OPENING THE DOOR. EACH DOOR SHOULD OPEN BY MINIMUM 135 DEGREE . ANGLE CLEAT SHOULD BE PROVIDED ON THE FRONT & BACK DOOR FOR PUTTING THE PADLOCK. THE OVER ALL ARRANGEMENT SHOULD BE VERMIN PROOF AND ALSO WATER PROOF
6. HINGES TO BE PROVIDED FROM INSIDE OF BOX SHALL NOT BE VISIBLE FROM OUTSIDE.
7. ELECTROLYTIC ALLUMINIUM BUSBAR OF SIZE 50*50*6 MM 1 NO PER PHASE DULY PAINTED WITH EPOXY PAINT RED/ YELLOW/ BLUE FOR R/ Y/ B PHASE OR WITH PVC SLEEVES AND SAME SIZE OF BUSBAR FOR NEUTRAL SHOULD BE USED WITH BLACK EPOXY PAINT OR WITH PVC SLEEVES.
8. ENAMELLED NAME PLATE WITH 'M.S.E.D.C.L MINI L.T. PILLAR AND ORDER NO MARKED ON IT / SHOULD BE DISPLAYED ON THE RIGHT HAND SIDE OF THE FRONT DOOR. ENAMELLED 'DANGER' BOARD SHOULD BE DISPLAYED ON THE LEFT HAND SIDE OF THE FRONT AND BACK SIDE DOOR RIGIDLY FIXED BY RIVETING ETC. ALL THE NUT-BOLTS IN ELECTRICAL CIRCUITS SHOULD BE OF STAINLESS STEEL ONLY.

**MAHARASHTRA STATE ELECTRICITY  
DISTRIBUTION COMPANY LTD.**

LOA NO.SPT-

**TITLE : SPECIFICATION OF MINI L.T. PILLAR.  
SUITABLE FOR 3 PHASE 50 CBS, 440 VOLTS, A.C.**

**DRAWING No : MSEDCL/MM II / MB 01**

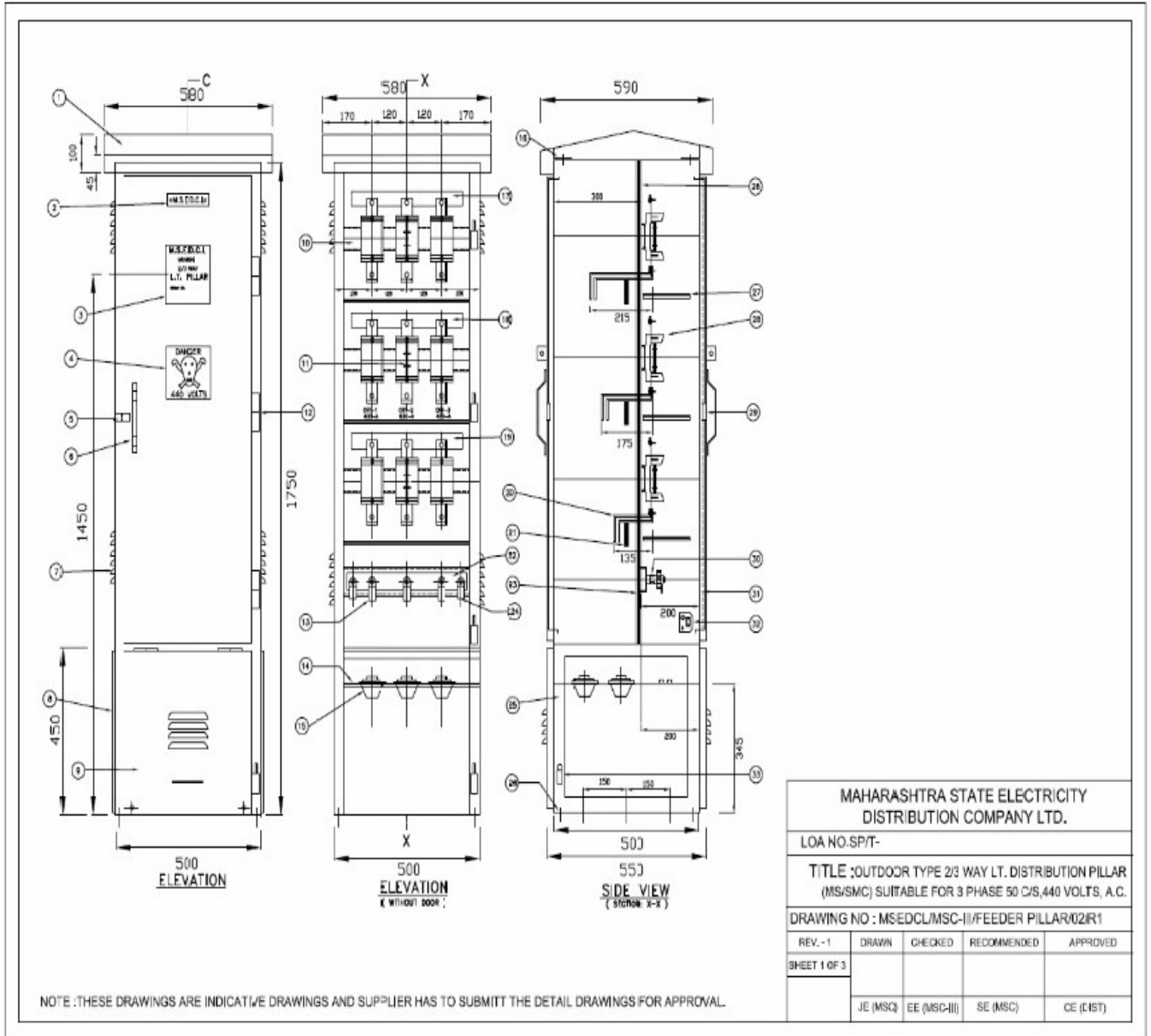
REV. -1	DRAWN	CHECKED	RECOMMENDED	APVD
SHEET 3 OF 3				

**NOTE :THESE DRAWINGS ARE INDICATIVE DRAWINGS AND SUPPLIER HAS TO SUBMITT THE DETAIL DRAWINGS FOR APPROVAL.**

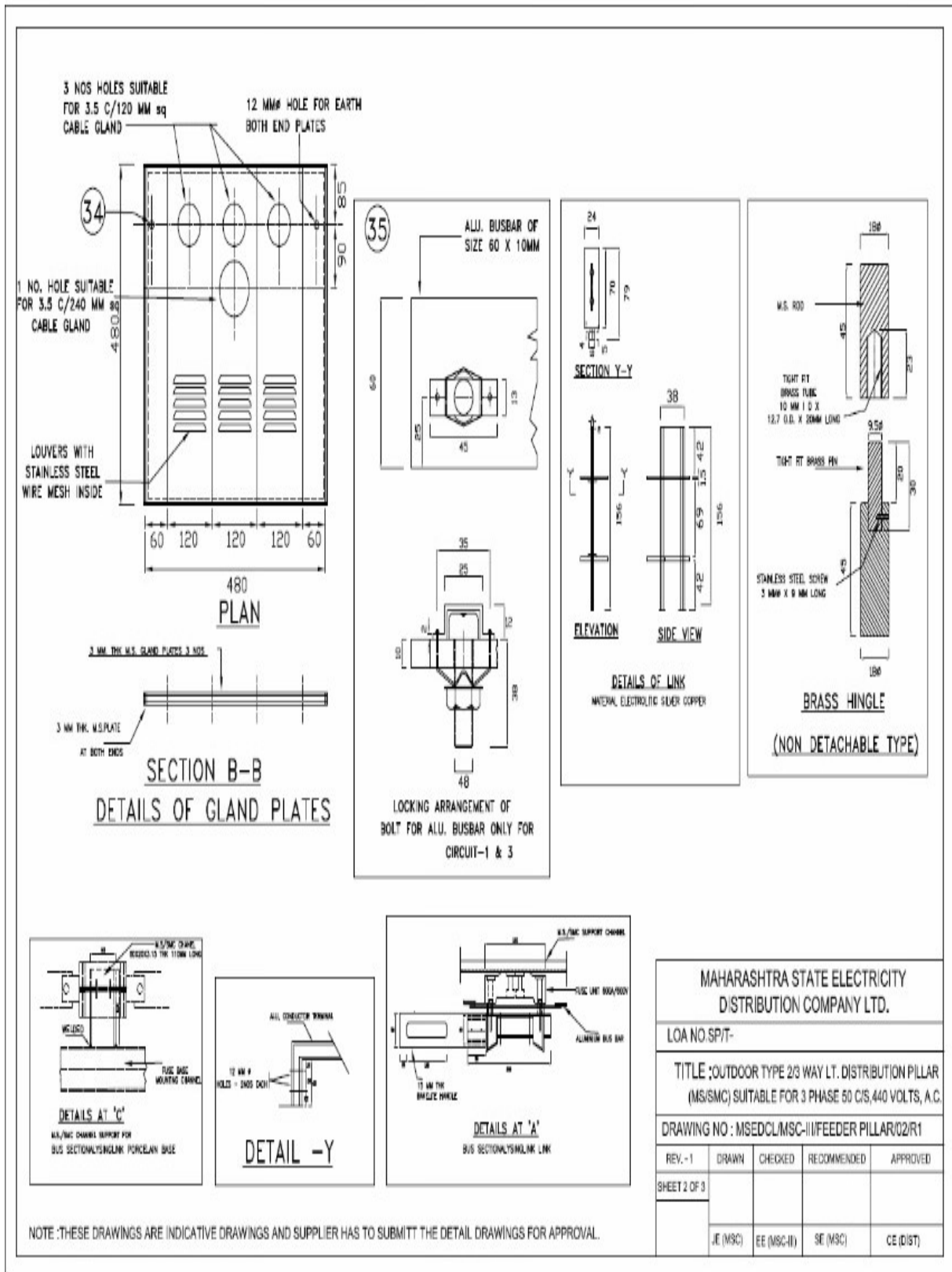
**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**INDICATIVE DRAWING**

**(B) 2/3 Way LT feeder Pillar**



**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**



MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.			
LOA NO.SP/T-			
TITLE :OUTDOOR TYPE 2/3 WAY LT. DISTRIBUTION PILLAR (MS/SMC) SUITABLE FOR 3 PHASE 50 CIS,440 VOLTS, A.C.			
DRAWING NO : MSEDCL/MS-C-III/FEEDER PILLAR/02/R1			
REV. -1	DRAWN	CHECKED	APPROVED
SHEET 2 OF 3			
	JE (MSC)	EE (MSC-II)	SE (MSC)
			CE (DIST)

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**Legend & Specification for 2/3 Way LT feeder Pillar**

LEGENDS	
1.	SLANTING ROOF TOP TO BE BOLTED/WELDED IN SUCH WAY THAT DOOR CANNOT BE REMOVED AND GAP BETWEEN BODY OF THE PILLAR AND ROOF SHALL BE 12 MM FOR VENTILATION.
2.	MANUFACTURER'S NAME PLATE AT TOP OF THE DOOR.
3.	ENAMELLED NAME PLATE WITH M.S.E.D.C.L 2/3 WAY LT. PILLAR AND ALSO ORDER NO. MARKED ON IT SHOULD BE DISPLAYED ON THE RIGHT HAND SIDE DOOR SIZE : 200* 200 MM.
4.	ENAMELLED DANGER BOARD ON FRONT AND BACK LEFT HAND SIDE DOOR SIZE 200*150 MM.
5.	WELDED ANGLE CLEAT OF 38*38*3 MM THK WITH 100 MM GAP HOLE 12MM DIA SHOULD BE PROVIDED FOR PADLOCK.
6.	DOOR HANDLE MADE FROM 12 MM M.S./SMC ROUND WITH 100 MM GAP AND 50 MM CLEARANCE WELDED TO THE DOOR.
7.	LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE.
8.	BOLTED COVER OF 10 GAUGE M.S./SMC SHEET FIXED TO THE BOTH SIDE OF PEDESTAL.
9.	FOUR SIDE BOTTOM COVERS SHOULD BE PROVIDED OF 10 GAUGE M.S./SMC SHEET AND WITH BLACK PAINT THE FRONT AND BACK COVERS FIXED BY HEAVY DUTY BRASS HINGES -2 NOS EACH COVERS HAVING LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE BOLTED ARRANGEMENT PROVIDED FOR FIXING BOTH SIDE COVERS
10.	50*20*3.15 MM THK M.S./SMC CHANNEL FOR MOUNTING USE BASE.
11.	630 AMPS 600 VOLTS SOLID LINKS REMOVABLE TYPE ELECTROLYTIC COPPER FOR INCOMING -3 NOS (CORRUGATED LINKS)
12.	HEAVY DUTY THREE BRASS HINGES FOR EACH DOOR WITH BRASS STAINLESS STEEL PIN & SLEEVES. NON DETACHABLE TYPE.
13.	SUITABLE LUGS ALUMINIUM COMPRESSION TYPE -3 NOS.
14.	3 MM THICK M.S./SMC PLATE FOR MOUNTING CABLE GLANDS.
15.	FLANGED TYPE BRASS CABLE GLANDS SUITABLE FOR 3.5C/ 240 MM SQ CABLE -1 NO AND 3.5C/120MMSQ CABLE -2 NOS.
16.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60*10 MM THK. 1 NO WITH PVC SLEEVES OR DULY PANTED WITH EPOXY RED PAINT FOR 'R' PHASE
17.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60*10 MM THK. 1 NO WITH PVC SLEEVES OR DULY PANTED WITH EPOXY YELLOW PAINT FOR 'Y' PHASE
18.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60*10 MM THK. 1 NO WITH PVC SLEEVES OR DULY PANTED WITH EPOXY BLUE PAINT FOR 'B' PHASE
19.	CONDUCTOR TERMINALS TO SUIT STAGGERED FORMATION OF CABLE CORE.
20.	BAKELITE STRIP FOR SUPPORTING CONDUCTOR TERMINALS 12MM THK.
21.	NEUTRAL ELECTROLYTIC ALUMINIUM BUSBAR 40*6 MM -1 NO. DULY PANTED WITH EPOXY BLACK PAINTED OR BLACK PVC SLEEVES
22.	40*20*3.15 MM THK M.S./ SMC ANGLE -2 NOS FOR MOUNTING FUSE BASE CHANNEL.
23.	LUG FOR EARTH ALUMINIUM COMPRESSION TYPE 2 NOS.
24.	50*50*6 MM THK M.S./SMC ANGLE FRAME FOR PEDESTAL ONLY.
25.	12 MM HOLES 14 MM SUITABLE FOR 12.5 MM FOUNDATION BOLTS.
26.	ANGLE FOR SUPPORTING ASBESTOS CEMENT SHEET 6 MM THK ( TO FORMED TWO SEPARATE COMPARTMENT)
27.	GODREJ TYPE LOCKING ARRANGEMENT CENTRALLY OPERATED THREE POSITION ON BOTH DOORS.
28.	PORCELAIN BASE SUPPORTS FOR NEUTRAL BUSBAR.
29.	MS/SMC CUBICLE SHALL BE PROVIDED WITH MS/SMC DOORS .
30.	EARTHING TERMINAL WITH ALU. LUG AT BOTH END PLATES.
31.	12 MM HOLE FOR EARTH CONNECTION AT BOTH END PLATES.
32.	ALUMINIUM BUSBAR ARE FITTED S.S HEX BOLTS LOCKED BY RIVETING BRACKETS ON BUSBAR

NOTE :THESE DRAWINGS ARE INDICATIVE DRAWINGS AND SUPPLIER HAS TO SUBMITT THE DETAIL DRAWINGS FOR APPROVAL.

<b>MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.</b>				
LOA NO.SP/T-				
TITLE :SPECIFICATION OF 2/3 WAY L.T. DISTRIBUTION PILLAR. SUITABLE FOR 3 PHASE 60 C/S,440 VOLTS, A.C.				
DRAWING No : MS/EDCL/MM II / FEEDER PILLAR/02				
REV. -1	DRAWN	CHECKED	RECOMMENDED	AP'D
SHEET 3 OF 4				



**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

SPECIFICATION OF 2/3 WAY L.T. FEEDER PILLAR				
1.	OUTDOOR TYPE 2/3 WAY L.T. DISTRIBUTION FEEDER PILLAR 600A/800A AS PER ACTUAL SUITABLE FOR 3 PHASE 50 Hz. 440 VOLTS A.C. SYSTEM WITH ALU BUSBARS.			
2.	THE FEEDER PILLAR SHOULD BE FABRICATED OUT OF 10 GAUGE MILDSTEEL / 3.15 MM SMC SHEET WITH SLATING ROOF TOP AND ADEQUATELY VENTILATED BY PROVIDING 3MM GAP USING 3MM WUSHER WEDDED TO BODY LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE.			
3.	THE BOTTOM PEDESTAL OF THE PILLAR SHOULD BE PROVIDED WITH M.S.ANGLE FRAME OF 50*50*6 MM THK.AND COVERED BY 10 GAUGE M.S./SMC SHEET WITH HEAVY DUTY 4 BRASS HINGES AT FRONT & BACK COVERS HAWK LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE TO BE PROMOTED AT BOTH SIDE OF PEDESTAL WITH BOLTED ARRANGEMENT. M.S./SMC COVERS SHOULD BE PROMOTED WITH BLACK PAINT.			
4.	AFTER CARING OUT NECESSARY ANTI-CORROSIVE TERAMENT THE FEEDER PILLAR SHOULD BE PAINTED BY OVEN BAKED PAINT. (NOT BY AIR DRY PAINTING) WITH POS OFFICE RED COLOUR FROM INSIDE AND DURE SIDE OF BODY AND BOTTOM SKIRT WITH ANTI CORROSIVE BLACK COLOUR FROM INSIDE AND OUTER SIDE (FOR MS CUBICLE).			
5.	THE FRONT AND BACK DOORS SHOULD BE PROVIDED WITH HEAVY DUTY 3 NOS BRASS HINGES WITH STEEL PINS AND SLEEVE ON EACH DOOR AND M.S./SMC HANDLE FOR OPENING THE DOOR EACH DOOR SHOULD OPEN BY MINIMUM 135 DEGREE. FULL GREASED GODREJ TYPE LOCKING ARRANGEMENT CENTRALLY OPERATED HAVING THREE POSITION LOCKING ON BOTH DOORS WITH TWO KEYS FOR PADLOCKING OF DOOR ANGLE CLEAT SHOULD BE PROVIDED ON THE FRONT AND BACK DOOR FOR PUTTING THE PADLOCK . THE OVER ALL ARRANGEMENT SHOULD BE VERMIN PROOF AND ALSO WATER PROOF.			
6.	INSIDE THE PILLAR TWO COMPARTMENTS SHOULD BE FORMED BY USING ASBESTOS SHEET OF THICKNESS 6 MM SEPARATORS NEAR PART WILL BE USED FOR CABLE CONNECTIONS FRONT PORTION WILL BE USED FOR FUSE REPLACEMENT. SIMILARLY IN BETWEEN PHASES 'R' – 'Y' – 'B' & 6 MM THK ASBESTOS SHEET SEPARATORS SHOULD BE PROVIDED.			
7.	ELECTROLYTIC ALUMINIUM BUSBAR OF SIZE 60 X 10MM 1 NO. FOR PHASE DULY PAINTED WITH EPOXY PAINT RED/ YELLOW/ BLUE FOR R/ Y/ B PHASE RESPECTIVELY OR PVC SLEEVES OF COLOUR RED/BLUE/YELLOW FOR R/Y/B PHASE. SHOULD BE USED. FOR NEUTRAL ONE BUSBAR OF ALUMINIUM SIZE 40*6 MM SHOULD BE USED WITH BLACK EPOXY PAINT OR BLACK COLOUR PVC SLEEVES.			
8.	1 NO. PER PHASE OF 630 AMPS PORCLEIN FUSE BASES WITH REMOVABLE TYPE ELECTROLYTIC COPPER SILVER PLATED SOLID LINKS SHOULD BE USED FOR INCOVER. FOR OUTGOING CIRCUITS 2 NOS .PER PHASE OF 630 AMPS PORCLEIN FUSE BASES SUITABLE FOR STANDARD L.T. HRC FUSES SHOULD BE USED.			
9.	ELECTROLYTIC ALUMINIUM STRIPS ARRANGEMENTS SUITABLE FOR CONNECTING OUTGOING CABLE BY MEANS OF COMPRESSION TYPE ALUMINIUM LUGS AS SHOWN IN THE DRAWING SHOULD BE PROVIDED PROPER SIZE S.S NUT BOLT WITH S.S WASHER SHOULD BE PROVIDED FOR EACH CIRCUIT.			
10.	3 MM THK M.S./SMC GLAND PLATES OF SAME WIDTH - 3 NOS WITH FLANGE TYPE BRASS CABLE GLANDS OF SUITABLE SIZE SHOULD BE PROVIDED THESE M.S./SMC GLAND PLATES SHOULD HAVE LOUVERS WITH STAINLESS STEEL WIRE MESH FITTED TO THEM TO PROVIDED PROPER VENTILATION.			
11.	ENAMELLED NAME PLATE WITH M.S.E.D.C.L 2/3 WAY LT FEEDER PILLER WITH ORDER NO DETAILS WORKED ON IT . SHOULD BE DISPLAYED ON THE RIGHT HAND SIDE OF THE FRONT DOOR. ENAMELLED 'DANGER' BOARD SHOULD BE DISPLAYED ON THE LEFT HAND SIDE OF THE FRONT DOOR AND BACK SIDE DOOR RIGIDLY BY REVETTING ETC.			
12.	ALL THE NUT-BOLTS IN ELECTRICAL CIRCUITS SHOULD BE OF NONMAGNETIC STAINLESS STEEL ONLY.			

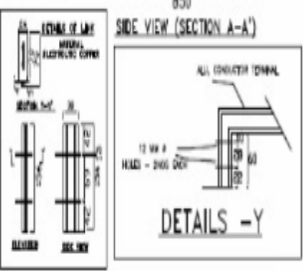
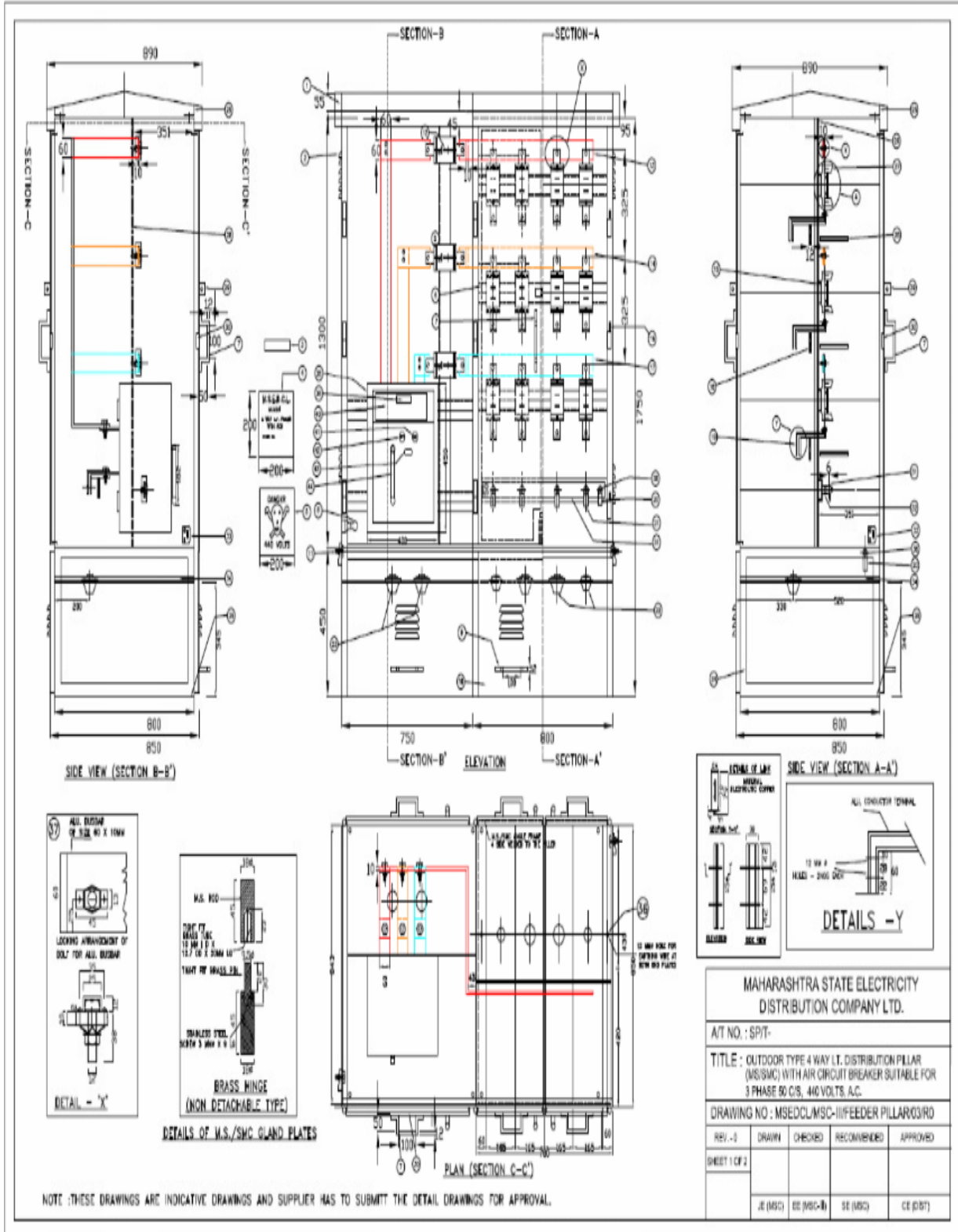
<b>MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.</b>				
LOA NO.SP/7-				
TITLE : SPECIFICATION OF 2/3 WAY L.T. DISTRIBUTION PILLAR, SUITABLE FOR 3 PHASE 50 C/8,440 VOLTS, A.C.				
DRAWING No : MS/EDCL/MM II / FEEDER PILLAR/02				
REV.-1	DRAWN	CHECKED	RECOMMENDED	AP/D
SHEET 4 OF 4				

NOTE :THESE DRAWINGS ARE INDICATIVE DRAWINGS AND SUPPLIER HAS TO SUBMITT THE DETAL DRAWINGS FOR APPROVAL.

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**INDICATIVE DRAWING**

**(C) 4 Way LT feeder Piller with ACB**



**MAHARASHTRA STATE ELECTRICITY  
DISTRIBUTION COMPANY LTD.**

A/T NO. : SP/7-

TITLE : OUTDOOR TYPE 4 WAY LT. DISTRIBUTION PILLAR (MS/SMC) WITH AIR CIRCUIT BREAKER SUITABLE FOR 3 PHASE 50 C/S, 410 VOLTS. A.C.

DRAWING NO : MSEDCLMSC-II/FEEDER PILLAR03RD

REV. -0	DRAWN	CHECKED	RECOMMENDED	APPROVED
	JE (MS)	EE (MS-B)	SE (MS)	CE (ST)

SHEET 1 OF 2

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**Legends & Specification for 4 Way LT feeder Pillar with ACB**

LEGENDS	
1.	SLANTING ROOF TOP TO BE BOLTED /WELDED IN SUCH A WAY THAT DOORS CANNOT BE REMOVED AND GAP BETWEEN BODY OF THE PILLAR AND ROOF SHALL BE 12 MM FOR VENTILATION.
2.	LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE.
3.	MAIN PANEL NAME PLATE AT THE TOP OF THE MIDDLE DOOR.
4.	ENAMELLED NAME PLATE WITH M.S.E.D.C.L., LT. 4 WAY PILLAR WITH ACB AND ORDER NO. MARKED ON IT. IT SHOULD BE DISPLAYED ON THE RIGHT-HAND SIDE DOOR SIZE: 200 * 200 MM.
5.	ENAMELLED DANGER BOARD AS PER IS2551 ON FRONT AND BACK MIDDLE DOOR SIZE: 200 * 200 MM.
6.	MS/SMC CUBICLE SHALL BE PROVIDED WITH MS/SMC DOORS.
7.	DOOR HANDLE MADE FROM 12MM M.S./SMC ROUND WITH 100 MM GAP AND 50 MM CLEARANCE WELDED TO THE DOOR.
8.	HANDLE FOR BOTTOM COVER MADE OUT OF 12 MM M.S./SMC SHEET AND WITH BLACK PAINT AND 50 MM CLEARANCE WELDED TO THE DOOR
9.	FOUR SIDE BOTTOM COVERS SHOULD BE PROVIDED OF 10SWG MS/4 MM SMC SHEET AND WITH BLACK PAINT. THE FRONT AND BACK COVERS FIXED BY HEAVY DUTY BRASS HINGES -3 NOS EACH COVER HAVING. LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE BOLTED ARRANGEMENT PROVIDED FOR FIXING BOTH SIDE COVERS.
10.	EARTHING TERMINAL WITH ALU LUG AT BOTH SIDES.
11.	AIR CIRCUIT BREAKER OF RATING 600/800 AMP AS PER REQUIREMENT FOR INCOMING
12.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60 * 10 MM THK. 1 NO. WITH PVC SLEEVES OF RED COLOUR OR DULY PAINTED WITH EPOXY RED COLOUR FOR 'R' PHASE.
13.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60 * 10 MM THK. 1 NO. WITH PVC SLEEVES OF YELLOW COLOUR OR DULY PAINTED WITH EPOXY YELLOW COLOUR FOR 'Y' PHASE.
14.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60*10 MM THK. 1 NO. WITH PVC SLEEVES OF BLUE COLOUR OR DULY PAINTED WITH EPOXY BLUE PAINT FOR 'B' PHASE.
15.	60 * 20 * 3.15 MM THK. M.S./SMC CHANNEL FOR MOUNTING FUSE BASE.
16.	HEAVY DUTY THREE BRASS HINGES FOR EACH DOOR WITH NON-DETACHABLE TYPE BRASS STAINLESS STEEL PIN & SLEEVES.
17.	BAKELITE STRIP FOR SUPPORTING CONDUCTOR TERMINALS 12MM THK.
18.	CONDUCTOR TERMINAL TO SUIT STAGGERED FORMATION OF CABLE CORES.
19.	LUG FOR EARTH ALUMINIUM COMPRESSION TYPE -2 NOS.
20.	SUITABLE LUGS ALUMINIUM COMPRESSION TYPE -2 NOS.
21.	FLANGE TYPE BRASS CABLE GLANDS SUITABLE FOR 3 1/2 C * 240 MM SQ CABLE -2 NOS AND 3 1/2 C * 120 MM SQ CABLE -2 NOS.
22.	FLANGE TYPE BRASS CABLE GLAND SUITABLE FOR 3 1/2 C * 300 MM SQ OR 400 MM SQ CABLE 2 NOS.
23.	50*50*6 MM THK. M.S./SMC ANGLE FRAME FOR PADESTAL ONLY.
24.	40 * 20 * 3.15 MM THK M.S./SMC ANGLE -2 NOS FOR MOUNTING FUSE BASE CHANNEL.
25.	FUSE HOLDER.
26.	ANGLE FOR SUPPORTING ASBESTOS SHEET 6 MM THK. TO FORM TWO SEPARATE COMPARTMENT.
27.	WELDED ANGLE 38 * 38 * 3 MM THK. CLEAT WITH 12 MM HOLE.
28.	GODREJ TYPE LOCKING ARRANGEMENT CENTRALLY OPERATED THREE POSITION ON BOTH DOORS.
29.	NEUTRAL ELECTROLYTIC ALUMINIUM BUSBAR SIZE 50 * 6 MM -1 NO. WITH BLACK PVC SLEEVES OR BLACK EPOXY PAINT.
30.	PORCELAIN BASE SUPPORTS FOR NEUTRAL BUSBAR -3 NOS.
31.	50 * 50 * 5 MM THK. M.S./SMC ANGLE FOR MOUNTING 10SWG MS/ 4 MM THK. SMC CABLE GLAND PLATES.
32.	8 NOS HOLES 14 MM SUITABLE FOR 12.5 MM FOUNDATION BOLTS.
33.	12 MM HOLE FOR EARTH CONNECTION AT BOTH SIDE PLATES.
34.	ALUMINIUM BUSBAR ARE FITTED S.5 HEX BOLTS LOCKED BY RIVETING BRACKETS ON BUSBAR.
35.	AIR CIRCUIT BREAKER 600/800AMP (AS PER REQUIREMENT).
36.	METERING DISPLAY.
37.	NAME PLATE OF AIR CIRCUIT BREAKER.
38.	PUSH BUTTON 'ON'
39.	PUSH BUTTON 'OFF'
40.	ON/OFF INDICATOR.
41.	CHARGING HANDLE

**MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.**

LOA NO.SP/T-

**TITLE : OUTDOOR TYPE 4 WAY LT. DISTRIBUTION PILLAR  
A C B SUITABLE FOR 3 PHASE 80 CIS,440 VOLTS, A.C .**

**DRAWING No : MSEDCL/MM II / MB 01**

REV. -1	DRAWN	CHECKED	RECOMMENDED	AP/D
<b>SHEET 3 OF 4</b>				

NOTE :THESE DRAWINGS ARE INDICATIVE DRAWINGS AND SUPPLIER HAS TO SUBMITT THE DETAIL DRAWINGS FOR APPROVAL.

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

TECHNICAL SPECIFICATION OF 4WAY L.T. DISTRIBUTION FEEDER PILLAR WITH ACB				
1. OUTDOOR TYPE 4 WAY LT. DISTRIBUTION PILLAR WITH ACB SUITABLE FOR 3 PHASE 50 HZ 440 VOLTS A.C SYSTEM.				
2. THE FEEDER PILLAR SHOULD BE FABRICATED OUT OF 10 SWG MS STEEL/ 4 MM SMC SHEET WITH SLANTING ROOF TOP AND ADEQUATELY VENTILATED BY PROVIDING 3 MM GAP USING 3 MM WASHED WELDED TO BODY LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE.				
3. AFTER CARRYING OUT NECESSARY ANTI – CORROSIVE TREATMENT THE MS FEEDER PILLAR SHOULD BE PAINTED BY OVEN BAKED (NOT BY AIR DRY PAINTING) WITH POST OFFICE RED COLOUR AND BOTTOM SKIRT WITH BLACK COLOUR.				
4. THE FRONT AND BACK DOORS SHOULD BE PROVIDED WITH HEAVY DUTY 3 NOS BRASS HINGES WITH STEEL PINS ON EACH DOOR AND M.S./SMC HANDLE FOR OPENING THE DOOR. EACH DOOR SHOULD OPEN BY MINIMUM 135 DEGREE. FULLY GREASED GODREJ TYPE LOCKING ARRANGEMENT CENTRALLY OPERATED THREE POSITION LOCKING ON BOTH THE DOORS. TWO KEYS FOR EACH LOCK SHOULD BE PROVIDED WITH EACH PILLAR. IN ADDITION PROPER LATCHING OF ANGLE CLEAT SHOULD BE PROVIDED ARRANGEMENT SHOULD BE VERMIN PROOF AND ALSO WATER PROOF.				
5. INSIDE THE PILLAR TWO COMPARTMENTS SHOULD BE FORMED BY USING ASBESTOS SHEET OF 6MM. SEPERATED REAR PART WILL BE USED FOR CABLE CONNECTIONS FRONT WILL BE USED FOR FUSE REPLACEMENT.				
6. ELECTROLYTIC ALUMINIUM BUSBAR OF SIZE 60 * 10 MM -1 NO WITH PVC SLEEVES OF RED/YELLOW/BLUE COLOUR FOR R/Y/B PHASE OR DULY PAINTED WITH EPOXY PAINT RED/ YELLOW/ BLUE FOR R/Y/B PHASE SHOULD BE USED. FOR NEUTRAL 1 NO. ALUMINIUM BUSBAR OF SIZE 50 * 6 MM BLACK EPOXY PAINT SHOULD BE USED.				
7. 630 AMPS PORCELAIN FUSE BASE WITH REMOVABLE TYPE ELECTROLYTIC COPPER SILVER PLATED SOLID LINK SHOULD BE USED. COPPER CONTACTS SUITABLE FOR STANDARD LT. HRC FUSES SHOULD BE USED.				
8. ELECTROLYTIC ALUMINIUM STRIPS ARRANGEMENT SUITABLE FOR CONNECTING INCOMING AND OUTGOING CABLE BY MEANS OF COMPRESSION TYPE ALUMINIUM LUGS AS SHOWN IN THE DRAWING SHOULD BE PROVIDED. PROPER SIZE S.S NUT BOLT WITH S.S WASHER SHOULD BE PROVIDED FOR EACH CIRCUIT.				
9. 4 MM THICK S.M.C./10 SWG MS GLAND PLATES OF SAME WIDTH -4 NOS WITH FLANGED TYPE BRASS CABLE GLANDS OF SUITABLE SIZE SHOULD BE PROVIDED THESE M.S./SMC GLAND PLATES SHOULD HAVE THE LOUVERS WITH STAINLESS STEEL WIRE MESH FITTED TO THEM TO PROVIDE PROPER VENTILATION.				
10. ENAMELLED NAME PLATE WITH M.S.E.D.C.L. 4 WAY L.T. -PILLAR WITH ACB AND THE ORDER NUMBER MARKED ON IT. SHOULD BE DISPLAYED ON THE RIGHT HAND SIDE FRONT DOOR. ENAMELLED 'DANGER' BOARD SHOULD BE DISPLAYED ON THE LEFT HAND FRONT AND BACK DOOR RIGIDLY FIXED BY REVETING ETC.				
11. ALL THE NUT-BOLTS IN ELECTRICAL CIRCUITS SHOULD BE OF NON MAGNETIC STINLESS STEEL ONLY.				
12. AIR CIRCUIT BREAKER SHALL BE 3 PHASE 600A/800 AMPS(AS PER ACTUAL REQUIREMENT) , 440 V 50 HZ WITH METERING DISPLAY ARRANGEMENT.				

<b>MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.</b>				
LOA NO.SP/T-				
TITLE : OUTDOOR TYPE 4 WAY LT. DISTRIBUTION PILLAR A C B SUITABLE FOR 3 PHASE 50 C/S,440 VOLTS, A.C .				
DRAWING No : MSEDCL/MM II / MB 01				
REV. -1	DRAWN	CHECKED	RECOMMENDED	AP/D
SHEET 4 OF 4				

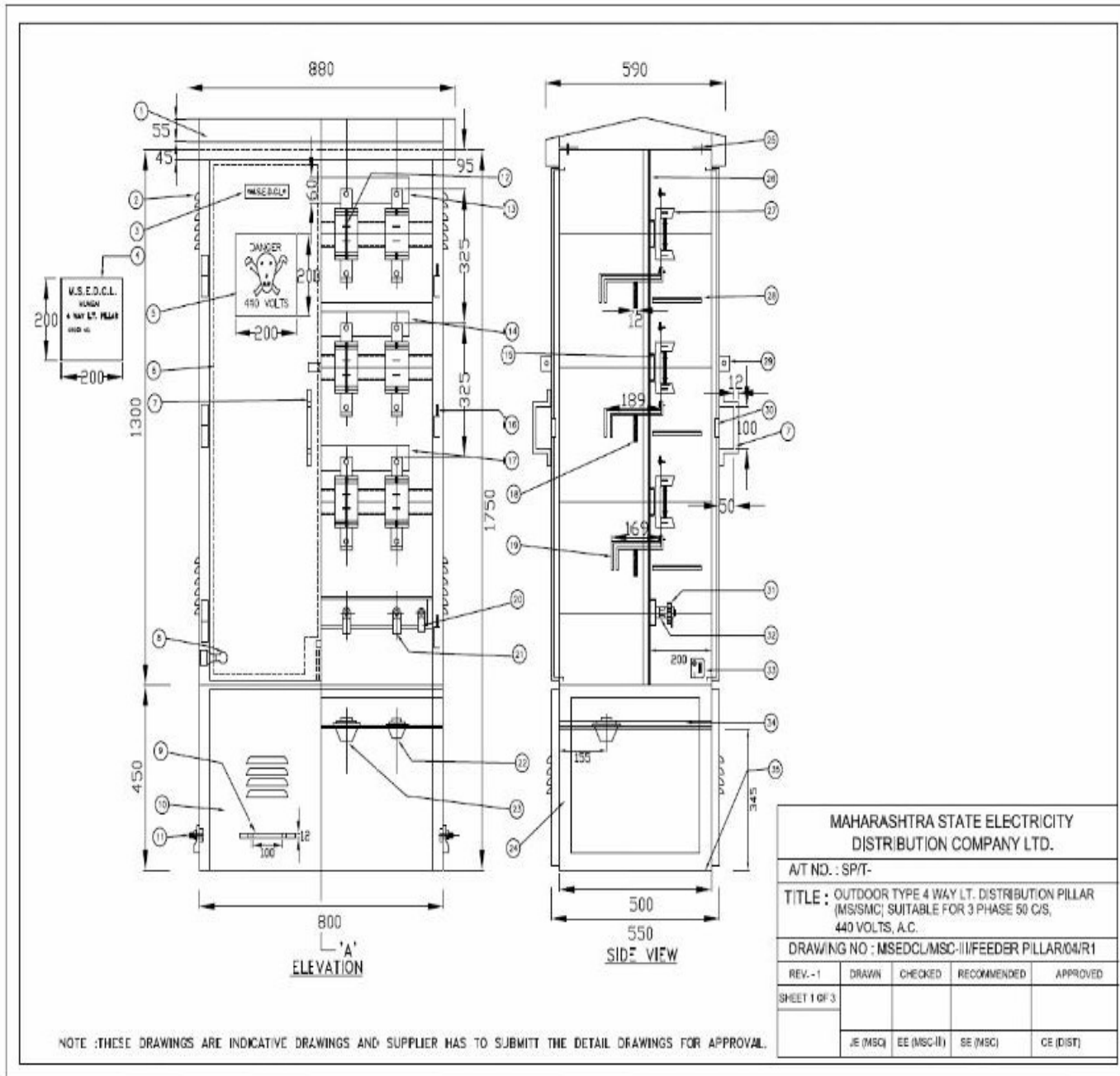
NOTE :THESE DRAWINGS ARE INDICATIVE DRAWINGS AND SUPPLIER HAS TO SUBMITT THE DETAIL DRAWINGS FOR APPROVAL.

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**INDICATIVE DRAWING**

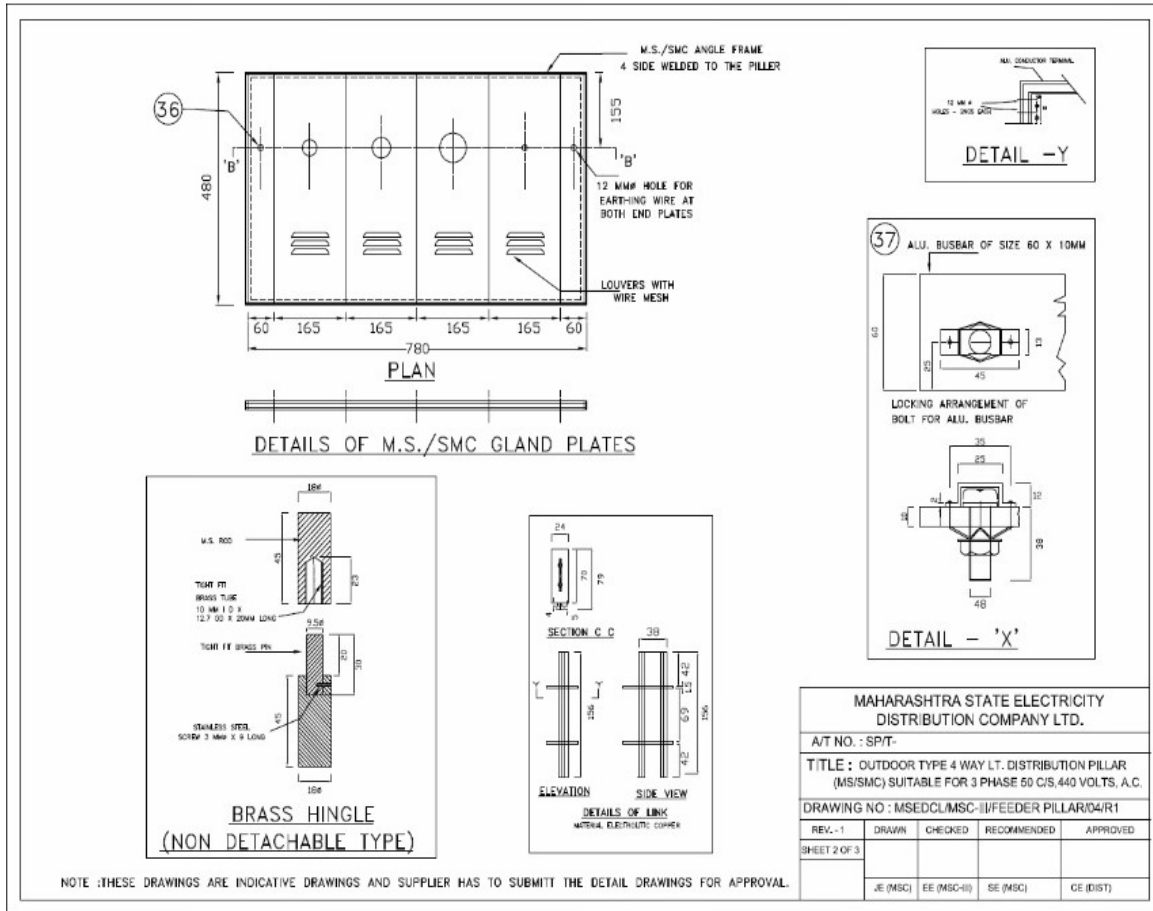
**(C) 4 Way LT feeder Pillar without ACB**

(One door is closed showing danger board location)



<b>MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.</b>				
A/T NO. : SP/T-				
TITLE : OUTDOOR TYPE 4 WAY LT. DISTRIBUTION PILLAR (MS/SMC) SUITABLE FOR 3 PHASE 50 C/S, 440 VOLTS, A.C.				
DRAWING NO : MSEDCL/MS/III/FEEDER PILLAR/04/R1				
REV.-1	DRAWN	CHECKED	RECOMMENDED	APPROVED
SHEET 1 OF 3				
	JE (MSQ)	EE (MSC-II)	SE (MSC)	CE (DIST)

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**



**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

**Legends & Specification for 4 Way LT feeder Pillar without ACB**

LEGENDS:	
1.	SLANTING ROOF TOP TO BE BOLTED/WELDED IN SUCH A WAY THAT DOORS CANNOT BE REMOVED AND GAP BETWEEN BODY OF THE PILLAR AND ROOF SHALL BE 12 MM FOR VENTILATION.
2.	LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE.
3.	MAIN PANEL NAME PLATE AT THE TOP LEFT HAND DOOR.
4.	ENAMELLED NAME PLATE WITH M.S.E.D.C.L. 4 WAY LT. FEEDER PILLAR AND ORDER NO. NAMED ON IT / IT SHOULD BE DISPLAYED ON THE RIGHT-HAND SIDE DOOR SIZE 200 * 200 MM.
5.	ENAMELLED DANGER BOARD ON FRONT AND BACK LEFT HAND SIDE DOOR SIZE 200 * 200 MM.
6.	M.S./SMC CUBICLE SHALL BE PROVIDED WITH MS/SMC DOORS .
7.	DOOR HANDLE MADE FROM 12 MM M.S./SMC ROUND WITH 100 MM GAP AND 50 MM CLEARANCE WELDED TO THE DOOR.
8.	HANDLE FOR BOTTOM COVER MADE OUT OF 12 MM M.S./SMC SHEET AND WITH BLACK PAINT. THE FRONT AND BACK COVERS.
9.	FOUR SIDE BOTTOM COVERS SHOULD BE PROVIDED OF 10SWG MS/ 4 MM SMC M.S./SMC SHEET AND WITH BLACK PAINT. THE FRONT AND BACK COVERS FIXED BY HEAVY DUTY BRASS HINGES -3 NOS. EACH COVER HAVING LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE BOLTED ARRANGEMENT PROVIDED FOR FIXING BOTH SIDE COVERS.
10.	EARTHING TERMINAL WITH ALLU. LUG AT BOTH SIDES.
11.	630 AMPS 600 VOLTS SOLID LINKS REMOVABLE TYPE ELECTROLYTIC COPPER FOR INCOMING -3 NOS (CORRUGATED LINKS)
12.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60 * 10 MM THK. 1 NO. WITH PVC SLEEVES OF RED COLOUR OR DULY PAINTED WITH EPOXY RED PAINTED FOR 'R' PHASE.
13.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60 * 10MM THK. 1 NO. WITH PVC SLEEVES OF YELLOW COLOUR OR DULY PAINTED WITH EPOXY YELLOW PAINTED FOR 'Y' PHASE.
14.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60 * 10 MM THK. 1 NO. WITH PVC SLEEVES OF BLUE COLOUR OR DULY PAINTED WITH EPOXY BLUE PAINTED FOR 'Y' PHASE.
15.	60 * 20 * 3.15 MM THK. M.S./SMC CHANNEL FOR MOUNTING FUSE BASE.
16.	HEAVY DUTY THREE BRASS HINGES FOR EACH DOOR WITH NON DETACHABLE TYPE BRASS STAINLESS STEEL PIN AND SLEEVES.
17.	BAKELITE STRIP FOR SUPPORTING CONDUCTOR TERMINALS 12 MM THK.
18.	CONDUCTOR TERMINAL TO SUIT STAGGERED FORMATION OF CABLE CORES.
19.	LUGS FOR EARTH ALUMINIUM COMPRESSION TYPE -2 NOS.
20.	SUITABLE LUGS ALUMINIUM COMPRESSION 4 NOS.
21.	FLANGED TYPE BRASS CABLE GLANDS SUITABLE FOR 3 1/2 C * 240 MM SQ CABLE -1 NOS AND C 1/2 C * 120 MM SQ CABLE -2 NOS
22.	FLANGED TYPE BRASS CABLE GLANDS SUITABLE FOR 3 1/2 C * 300 MM OR 400 MM SQ CABLE 2 NOS
23.	50 * 50 * 6 MM THK M.S./SMC ANGLE FRAME FOR PEDESTAL ONLY.
24.	40 * 20 * 3.15MM THK. M.S./SMC ANGLE -2 NOS FOR MOUNTING FUSE BASE CHANNEL.
25.	FUSE HOLDER.
26.	ANGLE FOR SUPPORTING ASBESTOS SHEET 6 MM THK. TO FORM TWO SEPERATE COMPARTMENT.
27.	WELDED ANGLE 38 * 38 * 3 MM THK. CLEAT WITH 12 MM HOLE.
28.	GODREJ TYPE LOCKING ARRANGEMENT CENTRALLY OPERATED THREE POSITION ON BOTH DOORS.
29.	NEUTRAL ELECTROLYTIC ALUMINIUM BUSBAR SIZE 50 * 6 MM THK. -1 NO. WITH BLACK COLOUR PVC SLEEVES OR BLACK COLOUR EPOXY PAINT.
30.	PORCELAIN BASE SUPPORTS FOR NEUTRAL BUSBAR -3 NOS.
31.	50 * 50 * 5 MM THK. M.S./SMC ANGLE FOR MOUNTING 10SWG MS/4 MM SMC THK. CABLE GLAND PLATES.
32.	8 NOS HOLES 14 MM SUITABLE FOR 12.5 MM FOUNDATION BOLTS.
33.	12 MM HOLE FOR EARTH CONNECTION BOTH END PLATES.
34.	ALUMINIUM BUSBAR ARE FITTED S.S HEX BOLTS LOCKED BY RIVETING BRACKETS ON BUSBAR.

<b>MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.</b>				
LOA NO.SPT-				
TITLE : OUTDOOR TYPE 4 WAY LT. DISTRIBUTION PILLAR SUITABLE FOR 3 PHASE 50 C/S,440 VOLTS, A.C .				
DRAWING No : MSEDCL/MM II / MB 01				
REV. -1	DRAWN	CHECKED	RECOMMENDED	AP/D
SHEET 3 OF 4				

NOTE :THESE DRAWINGS ARE INDICATIVE DRAWINGS AND SUPPLIER HAS TO SUBMITT THE DETAIL DRAWINGS FOR APPROVAL.

**TECHNICAL SPECIFICATIONS OF MINI PILLER, 2/3WAY LT FEEDER PILLER AND 4 WAY LT FEEDER PILLER WITH & WITHOUT ACB OF MS/SMC BOX**

LEGENDS:				
1.	SLANTING ROOF TOP TO BE BOLTED/WELDED IN SUCH A WAY THAT DOORS CANNOT BE REMOVED AND GAP BETWEEN BODY OF THE PILLAR AND ROOF SHALL BE 12 MM FOR VENTILATION.			
2.	LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE.			
3.	MAIN PANEL NAME PLATE AT THE TOP LEFT HAND DOOR.			
4.	ENAMELLED NAME PLATE WITH M.S.E.D.C.L. 4 WAY LT. FEEDER PILLAR AND ORDER NO. NAMED ON IT / IT SHOULD BE DISPLAYED ON THE RIGHT-HAND SIDE DOOR SIZE 200 * 200 MM.			
5.	ENAMELLED DANGER BOARD ON FRONT AND BACK LEFT HAND SIDE DOOR SIZE 200 * 200 MM.			
6.	M.S./SMC CUBICLE SHALL BE PROVIDED WITH MS/SMC DOORS .			
7.	DOOR HANDLE MADE FROM 12 MM M.S./SMC ROUND WITH 100 MM GAP AND 50 MM CLEARANCE WELDED TO THE DOOR.			
8.	HANDLE FOR BOTTOM COVER MADE OUT OF 12 MM M.S./SMC SHEET AND WITH BLACK PAINT. THE FRONT AND BACK COVERS.			
9.	FOUR SIDE BOTTOM COVERS SHOULD BE PROVIDED OF 10SWG MS/ 4 MM SMC M.S./SMC SHEET AND WITH BLACK PAINT. THE FRONT AND BACK COVERS FIXED BY HEAVY DUTY BRASS HINGES -3 NOS. EACH COVER HAVING LOUVERS WITH STAINLESS STEEL WIRE MESH INSIDE BOLTED ARRANGEMENT PROVIDED FOR FIXING BOTH SIDE COVERS.			
10.	EARTHING TERMINAL WITH ALL. LUG AT BOTH SIDES.			
11.	630 AMPS 600 VOLTS SOLID LINKS REMOVABLE TYPE ELECTROLYTIC COPPER FOR INCOMING -3 NOS (CORRUGATED LINKS)			
12.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60 * 10 MM THK. 1 NO. WITH PVC SLEEVES OF RED COLOUR OR DULY PAINTED WITH EPOXY RED PAINTED FOR 'R' PHASE.			
13.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60 * 10MM THK. 1 NO. WITH PVC SLEEVES OF YELLOW COLOUR OR DULY PAINTED WITH EPOXY YELLOW PAINTED FOR 'Y' PHASE.			
14.	ELECTROLYTIC ALUMINIUM BUSBAR OF 60 * 10 MM THK. 1 NO. WITH PVC SLEEVES OF BLUE COLOUR OR DULY PAINTED WITH EPOXY BLUE PAINTED FOR 'Y' PHASE.			
15.	60 * 20 * 3.15 MM THK. M.S./SMC CHANNEL FOR MOUNTING FUSE BASE.			
16.	HEAVY DUTY THREE BRASS HINGES FOR EACH DOOR WITH NON DETACHABLE TYPE BRASS STAINLESS STEEL PIN AND SLEEVES.			
17.	BAKELITE STRIP FOR SUPPORTING CONDUCTOR TERMINALS 12 MM THK.			
18.	CONDUCTOR TERMINAL TO SUIT STAGGERED FORMATION OF CABLE CORES.			
19.	LUGS FOR EARTH ALUMINIUM COMPRESSION TYPE -2 NOS.			
20.	SUITABLE LUGS ALUMINIUM COMPRESSION 4 NOS.			
21.	FLANGED TYPE BRASS CABLE GLANDS SUITABLE FOR 3 1/2 C * 240 MM SQ CABLE -1 NOS AND C 1/2 C * 120 MM SQ CABLE -2 NOS			
22.	FLANGED TYPE BRASS CABLE GLANDS SUITABLE FOR 3 1/2 C * 300 MM OR 400 MM SQ CABLE 2 NOS			
23.	50 * 50 * 6 MM THK M.S./SMC ANGLE FRAME FOR PEDESTAL ONLY.			
24.	40 * 20 * 3.15MM THK. M.S./SMC ANGLE -2 NOS FOR MOUNTING FUSE BASE CHANNEL.			
25.	FUSE HOLDER.			
26.	ANGLE FOR SUPPORTING ASBESTOS SHEET 6 MM THK. TO FORM TWO SEPERATE COMPARTMENT.			
27.	WELDED ANGLE 38 * 38 * 3 MM THK. CLEAT WITH 12 MM HOLE.			
28.	GODREJ TYPE LOCKING ARRANGEMENT CENTRALLY OPERATED THREE POSITION ON BOTH DOORS.			
29.	NEUTRAL ELECTROLYTIC ALUMINIUM BUSBAR SIZE 50 * 6 MM THK. -1 NO. WITH BLACK COLOUR PVC SLEEVES OR BLACK COLOUR EPOXY PAINT.			
30.	PORCELAIN BASE SUPPORTS FOR NEUTRAL BUSBAR -3 NOS.			
31.	50 * 50 * 5 MM THK. M.S./SMC ANGLE FOR MOUNTING 10SWG MS/4 MM SMC THK. CABLE GLAND PLATES.			
32.	8 NOS HOLES 14 MM SUITABLE FOR 12.5 MM FOUNDATION BOLTS.			
33.	12 MM HOLE FOR EARTH CONNECTION BOTH END PLATES.			
34.	ALUMINIUM BUSBAR ARE FITTED S.S HEX BOLTS LOCKED BY RIVETING BRACKETS ON BUSBAR.			

<b>MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.</b>				
LOA NO.SP/7-				
TITLE : OUTDOOR TYPE 4 WAY LT. DISTRIBUTION PILLAR SUITABLE FOR 3 PHASE 50 C/S,440 VOLTS, A.C .				
DRAWING No : MSEDCL/MM II / MB 01				
REV. -1	DRAWN	CHECKED	RECOMMENDED	AP/D
SHEET 3 OF 4				

NOTE :THESE DRAWINGS ARE INDICATIVE DRAWINGS AND SUPPLIER HAS TO SUBMITT THE DETAIL DRAWINGS FOR APPROVAL.



Technical specification of van mounted modular fault location systems for low and medium voltage cables

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**MATERIAL SPECIFICATIONS CELL**

TECHNICAL SPECIFICATION FOR

Van mounted modular fault location systems for low and medium voltage cables.

# Technical specification of van mounted modular fault location systems for low and medium voltage cables

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# MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

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## 1.0 Scope :

This specification covers Van mounted modular fault location system for low and medium voltage underground cables in MSEDCL distribution network.

- 1.1. It is not the intent to specify, completely here in all the details of design and construction of the modular fault location system shall conform, in all respects to high standards of engineering, design and workmanship with recent editions. It shall be capable of performing in continuous & trouble free operation up to the supplier's guaranteed life of equipment in a manner acceptable to the purchaser who will interpret the meanings of drawings and specifications and shall have power to reject any work or material which, in his judgment, is not in accordance therewith. The modular fault location system offered shall be complete with all components necessary for its effective and trouble free operations. Such components shall be deemed to be within the scope of supplier's supply, irrespective of whether those are specifically brought out in this specification and/or in the commercial order or not.
- 1.3 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.
- 1.4 The system should be compact multifunctional cable fault locator which shall be used for Cable Testing, Fault Pre-Location, Pin-pointing and Fault Conditioning etc. Test system should be versatile to test HT & LT cables of different types, sizes and various voltage levels like 33KV, 22 KV, 11KV, 6.6KV and 415V. The kit shall be used for cable types namely XLPE, PVC, PILC with Al / Cu conductor. Unit should be portable and all the features explained below should be inbuilt into one unit except the pre-locator and pinpointing set. There several runs of cables of different voltage levels are laid on common racks / underground trench and during the cable fault identification process, nearby cables shall be in charged condition; hence the accuracy of the set being offered shall not suffer due to the above. The set shall be capable to identify and locate faults for all types of cable faults including high resistance, low resistance or intermittent / flashing faults using a microcontroller based with latest software single menu driven (Through single knob) operation.
- 1.5 The Technical specification required for comprehensive multifunctional Cable Fault Locator is given below. Point-wise conformity to the specifications shall be submitted along with the offer without which the offer shall be liable for rejection.

## 2.0 Auxiliary Power Supply:

230Volt, 50Hz (Single phase 32Amp connection) Separation transformer 2 kVA (To normalize the fluctuation of Supply) CEE-plug for extended requirements as Burning, Air Condition etc. The system shall monitor input voltage and current during operation and if voltage is exceeding the limits then shall trip and give error message.

## 3.0 SERVICE CONDITIONS:

The Equipment supplied against the specification shall be suitable for satisfactory

Operation under the following tropical conditions:-

## MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

3.1	Max. ambient temperature	: 45 Deg. C
3.2	Min ambient temperature	: -5 °C
3.3	Max daily average ambient temperature	: 40°C
3.4	Min yearly average ambient temperature	: 30°C
3.5	Max. relative humidity	: 100 %
3.6	Max. annual rainfall	: 1450 mm
3.7	Max. wind pressure	: 150 kg/sq.m.
3.8	Max. altitude above mean sea level	: 1000 mtrs.
3.9	Isoceraunic level	: 50
3.10	Seismic level (Horizontal acceleration)	: 0.3 g.
3.11	Climatic Condition:	Moderately hot (exposed to sun) and Humid tropical climate fungus growth The climatic conditions are prone to wide variations in ambient conditions and hence equipment shall be of suitable design to work satisfactorily under these conditions.

#### 4.00 REFERENCE STANDARDS:

4.1 The modular fault location system for low and medium voltage underground cables including the operating devices, accessories and auxiliary equipment forming integral part thereof, shall be designed, manufactured, assembled and tested in accordance with the relevant standards, specification and codes of practices, referred to herein and shall be the latest editions including all applicable official amendments and revisions. The design, manufacture and performance of the equipment shall comply with all currently applicable statutes, regulations and safety codes.

Unless otherwise specified, the equipment offered shall conform to the latest applicable Indian, IEC, British or U.S.A Standards and in particular, to the following:-

IEC 60068	Insulation coordination
IEC 61010	Standard for safety requirements for electrical equipment for measurement, control, and laboratory use
IEC 61000	Standards for measurement techniques
IS 1248/2003	Indicating instruments.
EN 60-950	Product Safety testing standard for "Information Technology Equipment" (known as ITE)
IEC 60529 / EN 60529	Protection against accidental contact, foreign Objects and water

## MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

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- 4.2 The components and devices which are not covered by the above standards shall confirm to and comply with the applicable standards, rules, codes, and regulations of the internationally recognized standardizing bodies and professional societies as may be approved by the Employer and the manufacturer shall list all such applicable standards, codes etc
- 4.3 Equipment conforming to any other internationally accepted standards, will also be considered if they ensure performance and constructional features equivalent or superior to the standards listed above. In such case, two copies of such standards in authentic English translation, if the language of the standard is other than English shall be provided. In case of dispute, the stipulations in the English translation, submitted by the manufacturer shall prevail. Further, in the event of conflict between the stipulations of standard adopted by the manufacturer and the corresponding IEC/Indian Standard Specification, the stipulation of Indian Standard Specification shall prevail.

### **5.00 GENERAL TECHNICAL PARAMETERS:**

The equipment shall be capable to test underground power cables of 11KV, 22KV, and 33KV and 415 LT cable for fault locating.

The cable fault location system shall comprise of –

- (a) HV module for DC testing and surging,
- (b) Microprocessor controlled cable fault pre-locator having the following pre-location methods;
  - 1. Pulse Reflection Method
  - 2. Arc Reflection Method (ARM)/ Secondary impulse method.
  - 3. Impulse Current Method
  - 4. DECAY method
  - 5. Burning Method
- (c) Fault pin-pointing set
- (d) Cable Locator & Cable Identifier

The Cable fault locating system shall be versatile, capable supportive to locate faults in a wide variety of power distribution cable networks. The unit shall be complete in all respect with all the necessary items, accessories and test technique and shall be ideal to ensure its maximum performance to detect faults or conditions for short, medium or long underground distribution cable networks. The equipment should be Van Mounted solution fixed as per good engineering practices. The Van will be supplied by MSEDCL. The required engineering for mounting cable fault locators & additional accessories shall be in scope of supplier.

The cable fault locating system should have centralised control unit i.e a single unit through which all the devices in a cable fault locator van can be operated on single screen. This system shall ensure safety of the operator as well as nearby people & shall ensure safe operation of system. Data export software XLS/XLSX for spreads sheet application & .xml for google map.

## MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

### SPECIFIC TECHNICAL REQUIREMENTS:

#### 5.1) H.V. Thumper /Surge Generator :-

The Surge Generator should be suitable for pinpoint location of cable faults up to 33kV.

The Details shall be as follows.

Sr. No.	Particulars	Technical Specification
1.	Rated Output	0 to 4-8-16-32 kV continuously variable at each range.
2.	Out Put Capacity	Minimum 1750 Joules at each step for 8/16/32KV and minimum 1200 Joules for 4KV range.
3.	Impulse Sequence	Adjustable 3-10 sec. and single shot.
4.	Input Voltage	Single Phase , 230 V +/-10 % @ 50 Hz.
5.	Metering	For Output Voltage. Current surge energy. The Metering shall be digital & shall display actual surge energy, Voltage & current.
6.	Safety Features	Thermal Trip, Zero Interlocks, Tripping fuses for HV/LV controls, Auto safe discharge of surge capacitor after switch off & in the event of drop in mains voltage. Emergency OFF switch. Main Input circuit breaker (MCB) separate system & protection grounding device.
7.	Indications	HV ON, Auxiliary supply ON
8.	Other Accessories	1.HV cable of 60KV class of insulation and 4 Sq.mm, minimum 50 meters long with suitable connecting clamps. 2.Earthing cables of min.50 meters long with minimum size of 16sq.mm, class 1.1 KV suitable connecting clamps. 3.Mains cables of min. 50 meters long with minimum size of 2.5 sq.mm x 3 C. 4.Auxiliary Earthing cable 15 meters long minimum size of 4 sq.mm All cables shall be supplied on rewind able cable Drums mounted on vehicle.
9.	Size & weight	Weight should not be more than 150kg.
10.	Operating Temperature	-10°C to +50°C

## MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

### 5.2 Microprocessors controlled cable fault pre-locator:

The Microprocessors controlled cable fault pre-locator equipment shall be suitable for pre-location of cable faults by following methods-

Modes of operation:

1. **Pulse Reflection Method** - A pulse induced at the starting end of the cable reaches the cable fault with a speed of  $v/2$  and then is reflected back toward the starting end of the cable. The elapsed time multiplied by the diffusion speed  $v/2$  gives the distance to the source of the fault.
2. **Arc Reflection Method** - The arc reflection method of fault pre locating combines the use of a TDR (cable radar) and a surge generator.
3. **Impulse Current Method** - based on impulse current oscillations. When a surge pulse is applied on a faulty core, the breakdown cause high current impulses are generated. They will start oscillating on the cable from fault point to instrument.
4. **Voltage Decay Method** - High dc voltage is applied gradually to the cable under test charging its capacitance until the high resistance fault breaks down.
5. **Burning Method** - Used for high resistance fault upto 20kv ignition Voltage.

Technical details of above system shall be as follows.

Sr. No.	Particulars	Technical specification
i)	Mode of Operation	Pulse Reflection, Arc Reflection Method, Impulse Current Method, Decay Method, Burn mode (32kv, 160 mili Amp)
ii)	Measuring Range	0 to 50Km in suitable steps & HV method with sampling rate up to 400 MHz .
iii)	Resolution	0.1 meters (at $V/2$ 80 m/ $\mu$ sec.)
iv)	Pulse Width	20 ns ....10 $\mu$ sec
v)	Fault Measuring Accuracy	0.1% of measuring range.
vi)	Velocity propagation	10 – 150 $\mu$ sec
vii)	Display	Colour 10.4" full LCD/LED display
viii)	Sampling Rate	Upto 400 MHZ on higher side.
ix)	Memory	Shall have capacity to store minimum 50 memories required.
x)	Power Supply	Shall work on single phase 230 V AC,50 Hz, supply as well as on internal Rechargeable Battery 12 V.
xi)	Weight & size	It should be light in weight & compact in Size.
xii)	Interface	USB & Ethernet Port

## MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

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The Arc reflection filter unit to be used to prelocate the high resistance, intermittent and flashing faults in conjunction with digital fault prelocator HV surge generator in arc reflection method, automatic discharge to be incorporated for discharging the HV leads in case of power breakdown or an interruption.

All necessary units required using the equipment in the above modes such as Arc reflection filter and CT and couplers should be included in the scope of supply.

### 5.3) D.C. H.V. Tester:

H.V. test instrument for testing of dielectric strength and insulation of the cable and cable installation.

Sr. No.	Particulars	Technical specification
1)	Test Voltage	0-32KV(DC) in suitable steps 4/8/16/32KV
2)	Test range	0-4/0-8/0-16/0-32KV (Selectable)
3)	DC-test (kV) / I max (mA)	0 ... 32 KV / 2 mA
4)	Input Power	230 v, 50 Hz
5)	Display	Digital
6)	Protection	The instrument should be operational through control unit and should have protective PCBs for auto discharge, capacitor discharge, earth monitoring etc.
7)	Features	Unit should have latest communication ports like USB and Ethernet ports.

The surge generator and DC tester shall be integrated as one unit and prelocator with all fault location methods as mentioned above to form a complete cable fault locating system and this shall be mounted on a suitable vehicle. In Arc reflection mode, unit should capture multiple fault traces minimum 14 on one single surge pulse. User should be able to select the best out of all the traces using the control Knob. The test report of same feature shall be submitted for verification.



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### 5.4) Cable Fault pinpointing set :

The bidder shall supply a portable, battery operated instrument consisting of a receiver and combined sensor. Which will measure electromagnetic and acoustic signals. The instrument shall pin point the location of faults when used with the surge generator. The strength of the magnetic field provided by the generator shall be indicated on a clear digital display. The measurement of acoustic noise shall be optimized through a switchable filter which has a bandwidth designed to minimize ambient noise i.e. Vehicles, wind, etc. The pin-point equipment should work in TAR road, Cement concrete roads, and the ground microphone supplied should be wind protected. Coincidence measurement shall be possible by receiving and displaying both sensors simultaneously. The instrument shall also indicate the distance between the sensor and fault based on the time taken by the travelling signals.

#### Technical specification for pinpointing set:

Sr. No.	Particulars	Technical specification
1)	Display	3 digit 7 segment LCD Display with backlight-separate channel for Acoustic & Magnetic, overflow display for distance value >100 msec.
2)	Broad band frequency range	Magnetic/ Acoustic –100Hz to 1.5KHz (with filter)
3)	Amplification Gain	Acoustic - > 110 dB Magnetic - > 110 dB
4)	Back Ground noise Reduction	Inclusive
5)	Impedance for ground microphone & Headphone	500 Ohm
6)	Weight & size	It should be light in weight & of small size so that the operator can walk easily & concentrate on the fault easily.(not more than 3.5kg)
7)	Power supply	As per requirement
8)	Accessories	1) Ground Microphone suitable for pinpointing & sensing the acoustic as well as magnetic signals in concrete road, tar road, rocky & sandy soil. It Should be wind protected 2) Special Head Phone suitable for hearing & listening the lowest possible acoustic signal.
9)	Ingress Protection Class	Shall be minimum IP – 54 (For receiver) Shall be minimum IP – 65 (For sensor)

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- 1) It should have an auto ranging facility with a digital readout of relative distance to the fault
- 2) It should have Bar graph-indication of the magnetic field strength for locating the cable path.
- 3) It should have Indication of battery condition.

### 5.5) Cable Locater and Identifier:

The Portable Cable Locator and Identifier should precisely locate and trace underground power cables, should comprise of the following major components -

#### a) Receiver:

1. Receiver should contain LCD display. It should be light weight up to 2Kg
2. Internal alkaline battery holder and Rechargeable Battery Pack having battery back-up of continuous 20 hrs. (Min.) and intermittent 70 hrs. (Min)
3. Receiver should have Transmitter mode, Power Mode, RF mode.
4. Receiver should contain facility to apply minimum 36 active frequencies in the frequency range 512Hz to 200kHz. Frequencies should be user configurable.
5. Guidance : instrument should have :
  - left right arrow function
  - compass for providing orientation /line direction
  - Current signal strength should be visible on receiver display.
6. Receiver should also have current measurement function. There should be option to view the current measurement, live / in real time (when used in transmitter mode) during route tracing process.
7. Depth range measurement capability in transmitter mode: Upto 8m or higher. There should be option to view the depth measurement, live / in real time (when used in transmitter mode) during route tracing process.
8. Depth range in Power / RF mode : Minimum 2m.
9. Temperature Range: Operating -10 to +50 Deg. C .
10. Weatherproof and complying to : IP65
11. Inbuilt GPS & Bluetooth facility.

#### b) Transmitter : (Output: High power transmitter with Lithium ion Rechargeable Battery)

1. Wattage : > 10 Watts/85V/400mA or higher.
2. Frequencies available: frequencies in transmitter should be available upto 200kHz and user configurable including 117.850 kHz, 82.315 kHz, 65.536 kHz, 32.768 kHz, 8.192 kHz, 1.0 kHz, 877 Hz, 815Hz, 640 Hz & 512 Hz;
3. Display type: LCD
4. Internal Battery: Lithium ion rechargeable Battery pack of capacity 10AH.
5. Accessories: Direct Connection Lead and ground rod, signal clamp 4"
6. It should be light weight up to 3Kg.
7. Receiver along with transmitter should work as cable identifier when cable identifier clamp is attached to the receiver.

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### 5.6 Cable Drums:-

The unit shall be supplied with 50 meters cable each required for –

1. H.T. Cable
2. Grounding Cable.
3. Power Supply Cable.

### 6.00 Vehicle

Equipment shall be compact in size and shall be mounted on any compact vehicle like Mahindra Bolero/Maruti EECO or any vehicle with a suitable payload.

### 7.00 Safety Features

- Automatic Discharge and earthing switch.
- Protective Earthing cable min. 16 mm<sup>2</sup> for equity in potential between cable test van and station ground.
- Safety switching device with warning lights and an external Emergency-Off switch.
- Door Interlock- system will not operate if vehicle HV area Door is open.

### 8.0 TYPE TEST :

8.1 The tenderer shall furnish detailed type test reports of the Offered instrument for all the test as per Relevant standards. All the above type testes shall be carried out at laboratories which are accredited by the National Accreditation Board for testing and calibration laboratories (NABL) of Government of India/ International accredited laboratories to prove that the instruments offered meet the requirements of specification.

8.2 The Purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost. For this purpose, the tenderer shall quote unit rates for carrying out each type test. However, such unit rates will not be considered for evaluation of the offer. In case the unit fails in type test, the complete supply shall be rejected.

The Successful tenderer shall take approval / waiver of type test from Material Specification Cell, Prakashgad, Bandra, Mumbai prior to commencement of supply

In addition to type test reports, the tenderer shall furnish detailed Calibration report of the offered instrument carried out at NABL approved Laboratories/ International accredited laboratories on all the equipment of cable fault locating system as per relevant standards to prove that the instrument offered meet the requirements of specification.

The list of type test reports as per applicable standards mentioned in following table shall be submitted with the offer. The offer without type test reports shall not be

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considered & offer will be treated as irresponsible. Type testing should be carried out within 5 years from the date of opening of tender.

Type Test Particular	Standard Applicable
EMC Generic Emmission	DIN EN 61000-6-4
EMC immunity for industrial environments	DIN EN 61000-6-2
Environmental testing – Part 2 : Test A :Cold	DIN EN 60068-2-1
Environmental testing – Part 2 : Test B : Dry Heat	DIN EN 60068-2-2
Environmental testing – Part 2 : Test C : Damp heat, steady State	DIN EN 60068-2-66
Environmental testing – Part 2 : Test For : Vibrations	DIN EN 60068-2-6
Safety Requirements for electrical equipment	DIN EN 61010-1
Degrees of Protection provided by enclosures (IP Code)	EN 60 529

### 9. PRE DESPATCH INSPECTION:

The inspection shall be carried out at all the place of manufacturer unless otherwise. agreed upon by the manufacturer and purchaser at the time of purchases. For imported equipments the supplier/tenderer shall offer the equipment at the authorized service centre /works of the original manufacturer in India or at the supplier's works/Testing centre. The manufacturer shall offer to the inspector representing.

The purchaser all the reasonable facilities, free of charge, for inspection and testing to satisfy him that the material is being supplied in accordance with this specification.

The joint inspection of the equipment will be carried out by inspection wing & the appointed Executive Engineer testing division.

### 10.00 GUARANTEE :

The instrument shall be guaranteed for the period of five years from the date of commissioning or five and half years from the date of Dispatch whichever is earlier. The Instrument found defective within the above guarantee period shall be replaced / repaired by the supplier free of cost within one month of the receipt of intimation, If the defective instruments are not replaced/repaired within the specified period above, the MSEDCL shall recover an equivalent amount plus 10 % supervision charges from any of the bills of the supplier.

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### **11.0 Packing:**

**11.1** The instrument shall be suitably packed in order to avoid damage or disturbance during transit or handling. Each instrument may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the cartoon may be suitably sealed. A suitable number of sealed cartons may be packed in a case adequate strength with extra cushioning if considered necessary. The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents

**11.2** The following information shall be furnished with the consignment :

- Name of consignee
- CE marking
- Details of consignment
- Destination
- Total Weight of consignment
- Sign showing upper / lower side of the crate.
- Sign showing fragility of the material.
- Handling and unpacking instructions
- Materials indicating contents of each package
- Bill material

### **12.00 DEMONSTRATION OF EQUIPMENTS TRAINING OF ENGINEERS :**

The successful supplier contractor shall train Engineers of the Purchaser free of charge on site for familiarization of design, application, operation and maintenance of the instrument at least for one year.

### **13.00 SCHEDULES :**

The tenderer shall fill in the following schedules which are 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 Technical Parameters

Schedule B - Tenderer's experience.

The tenderer shall submit the list of orders for similar type of equipment, executed or under execution during the last three years, with full details in the schedule of tenderer's experience (Schedule 'B') to enable the purchaser to evaluate the tender

## MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

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### **SCHEDULE - B** **SCHEDULES 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 and Description of Item	Value of Order	Period of Supply and commissioning	Name and Address to whom reference may be made
1	2	3	4	5

NAME OF FIRM\_\_\_\_\_

NAME & SIGNATURE OF TENDERER\_\_\_\_\_

DESIGNATION\_\_\_\_\_

DATE\_\_\_\_\_

## MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

### Schedule A Guaranteed Technical Particulars

Sr.No.	Particulars	BIDDERS OFFER
1.	<b>Surge Generator (Thumper)</b>	
2.	Reference Standard - IEC or Equivalent	
3.	Manufacturers Name and Address	
4.	Manufacturers Type	
5.	Manufacturers Authorization	
6.	Voltage Range in KV - in steps i) 0-4 KV ii) 0-8 KV iii) 0-16 KV iv) 0-32 KV	
7.	Discharge Energy in Joules -1750 J (Min.) for each voltage range & 1200 Joules at 4kV	
8.	Voltage – Adjustable	
9.	Display -Analogue	
10.	Cycle time- 3 to 10 seconds and single shot	
11.	Input Voltage - 230 V $\pm$ 10% at 50 Hz	
12.	Operating Temperature Range - Upto -10°C To 50°C	
13.	Weight : not more than 150 kg.	
14.	<b>Microprocessor controlled cable fault pre-locator -</b>	
15.	Measuring Range - 0 - 50 km.	
16.	Resolution – 0.1Mtr	
17.	Pulse Width - 20 ns ... 10 $\mu$ s	
18.	Sampling rate – more than 400 MHz (real sampling rate)	
19.	Accuracy- $\pm$ 0.1% of range	
20.	Display Colour – 10.4" color LCD/LED	
21.	Modes - Pulse Reflection, Impulse Current Method, Arc Reflection Method, Decay Method, Burn mode	
22.	Memory & Communication port - Min. 50 memories & USB Port with Ethernet port.	
23.	Input Voltage - 230 V $\pm$ 10% at 50 Hz	
24.	Operating Temperature Range -Upto -10 °C to 50 °C	
25.	Current coupler/voltage coupler. Tenderer should supply accessories suitable for their prelocator	

## MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

Sr.No.	Particulars	BIDDERS OFFER
26	Arc Reflection Filter	
27.	Operating Temperature Range - up to 10 °To 50°C	
28.	Accessories to be supplied - To be supplied with all the necessary and standard accessories with instruction manual.	
29.	<b>D.C. H.V Tester -</b>	
30.	Test voltage -0-32KV in suitable steps 4/8/16/32KV	
31.	DC-test (kV) / I max (mA) : 0 ... 32 / 1,8	
32.	I/P Power -230V, ± 10%, 50 Hz	
33.	Metering-Analogue	
34.	Safety features - The instrument should be operational through separate control unit and should have protective PCBs for auto discharge, capacitor discharge, earth monitoring etc	
35.	<b>Fault pin-pointing set</b>	
36.	Reference Standard - IEC or Equivalent	
37.	Manufacturers Name and Address	
38.	Manufacturers Type	
39.	Manufacturers Authorization	
40.	Amplification Adjustment range -Acoustic channel > 110 dB Magnetic channel > 110 dB	
41.	Display - LCD 3 digit / 7 segment display	
42.	Frequency range with filter -Generally with in 100 Hz to1.5 kHz for (Acoustic), & 100 Hz to 1,5 kHz with filter. Automatic Mute function for headset	
43.	Power supply – As per requirement	
44.	Weight – (not more than 3.5kg)	
45.	Operating Temperature Range - upto -10 °C To 50°C	
46.	Accessories to be supplied - To be supplied with all the necessary and standard accessories, i.e. receiver, sensor, headphones, batteries carrying pouch along with instruction manual	
47.	<b>Cable Locator -</b>	
48.	Reference Standard -IEC or Equivalent	
49.	Manufacturers Name and Address	
50.	Manufacturers Type	
51.	Manufacturers Authorization	



## MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

S.N.	Particulars	Bidders Offer
52.	<b>Audio Frequency generator -</b>	
53.	Out put Power -0-10 W with suitable selectable steps.	
54.	Output frequency.	
55.	Should consist of background noise reduction feature	
56.	Power supply - 230V,±10%, 50 Hz	
57.	Dimensions & Wt – (not more than 5 kg & portable in size)	
58.	Operating Temperature Range – Upto (-10 °C to 50 °C)	
59.	Accessories to be supplied -To be supplied with all the necessary and standard accessories and instruction Manual	
60.	Indication - Analogue indication.	
61.	<b>Audio frequency receiver -</b>	
62.	Reference Standard - IEC or Equivalent	
63.	Receiving frequency - 50 Hz, & output frequency of the Generator	
64.	Gain – Auto & Manual Control.	
65.	Indications- LCD indication of signal & battery check	
66.	power supply : Lithium Ion	
67.	Power output 0-10 watts	
68.	frequency 480Hz,1450Hz & 9820Hz	
69.	Dimension & weight ( not more than 3kg & portable in size)	
70.	Operating temp. range - 10°C to 50°C	
71.	Accessories to be supplied with all the standard accessories like search coil special type of headphone connecting leads along with instruction manual etc.	
72.	<b>Cable Identification Instrument</b>	
73.	<b>Transmitter-</b>	
74.	i)Wattage : >=10 Watts	
75.	ii)Frequencies : 200kHz and user configurable including 117.850 kHz, 82.315 kHz, 65.536 kHz, 32.768 kHz, 8.192 kHz, 1.0 kHz, 877 Hz, 815Hz, 640 Hz & 512 Hz	
76.	iii) Power supply - 230V,±10%, 50 Hz & battery (Lithium Ion)	
77.	iv)Accessories: Signal Clamp & carrying case	
78.	<b>Identification Receiver</b>	
79.	LCD Display	
80.	Internal Antennas: 2 x Horizontal; and 1 x Null Antenna	

## MSEDCL Technical Specification of van mounted modular fault location systems for low and medium voltage cable

Sr No	Particulars	BIDDERS OFFER
81.	Guidance : Left & Right arrows along ; Compass for providing orientation / Line directions	
82.	Current Measurement Function	
83.	Depth Range : upto 8Mtr. Or higher	
84.	Depth range in Power / RF mode : minimum 2 meter	
85.	GPS : instrument should have built in GPS	
86.	Cable, Cable drums and vehicle and other accessories -	
87.	HV Output cable of insulation 40kv.	
88.	Mains cable 50 Mtr Long.	
89.	Earthing cable 50 Mtr Long	
90.	Cable Discharge Rods	
91.	Cable Drums - Hand operated drum Suitable for Rewinding of HV cable, mains cable& Earthing cable.	
92.	Vehicle - The Surge generator, digital cable fault prelocator, D.C testing set up ,arc reflection filters and cable drum forming a compact portable fault locating System shall be mounted on suitable vehicle with all necessary accessories.	
93.	<b>Guarantee and training</b>	
94.	Guarantee - All the supplied equipments accessories shall be guaranteed for 5 years with free replacement in case of any manufacturing defects.	
95.	Training -Successful bidder shall impart theoretical as well as practical training/demonstration to testing engineers and staff at site, at various locations	

## MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION FOR STRAIGHT THROUGH/TERMINATIONS/TRANSITION  
JOINTING KITS FOR HT LT ARMoured PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABLES

STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMoured  
PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABLES

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TECH. SPEC NO. CE/T&QC/MSC/HT LT STRAIGHT THROUGH , TREMINATIONAND TRANSTION  
JOINTS /2021, Date: 15.02.2021

## 1.00 SCOPE

This specification covers design, manufacturing, testing, supply of IS Mark (IS-13573:2011) HT/LT Cable accessories i.e Joints/Termination (straight through, stop ends and transition joints for dissimilar cables etc.) suitable for armoured, PVC/XLPE, Aluminum/Copper conductor cables.

The cable accessories shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and or the commercial order or not.

## 2.00 APPLICATION

The cable accessories shall be use on armoured, PVC/XLPE, LT/HT, Aluminum/Copper conductors cables installed in sub-stations for power distribution system and LT/HT consumers.

## 3.00 SERVICE CONDITIONS

The cable accessories to be supplied against this specification shall be suitable for continuous operation under the following tropical conditions.

### Environmental Conditions

- |   |                       |
|---|-----------------------|
| a) Maximum ambient temperature  | 50 <sup>0</sup> C     |
| b) Maximum ambient temperature in shade   | 45 <sup>0</sup> C     |
| c) Minimum temperature of air in shade  | 35 <sup>0</sup> C     |
| d) Maximum daily average temperature  | 40 <sup>0</sup> C     |
| e) Maximum yearly weighted average temperature  | 32 <sup>0</sup> C     |
| f) Relative Humidity  | 10 to 95 %            |
| g) Maximum Annual rainfall  | 1450 mm               |
| h) Maximum wind pressure  | 150 Kg/m <sup>2</sup> |
| i) Maximum altitude above mean sea level  | 1000 meters           |
| j) Isoceraunic level  | 50 days/years         |
| k) Seismic level (Horizontal acceleration)  | 0.3 g                 |
| l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth and polluted with industrial pollution. |                       |

#### **4.00 APPLICABLE STANDARDS**

IS-13573 (Part -I):2011 – for working voltage from 1.1kV upto and including 3.3kV (E) - Test methods and requirements.(for Type Test Only)

IS-13573 (Part-II):2011 - for working voltage from 3.3kV (UE) upto and including 33kV (E) – Test requirements. (for Type Test Only)

IS-13573(Part-III):2011 – for working voltage from 3.3kV (UE) upto and including 33kV (E) – Test methods. (for Type Test Only)

IEC: 60502-04:2010/ 2005, VDE 0278 – Standard for cable accessories. IEEE48 –for terminations of cable. (forType Test Only)

ENA-09-13 standards – for components used in the Kit (From 1kV (E) to 36 kV (E))

ENA-09-11 standards – for components used in the Kit (From 600V (E) to 1 kV (E))

The specification given in this documents supersedes the relevant clauses of IS-13573:2011 (Part-I/II/III) wherever applicable.

#### **5.00 GENERAL TECHNICAL REQUIREMENT**

Material used for construction of a joint/termination shall perfectly match with the di-electric, chemical and physical characteristics of the associated cable. The material and design concepts shall incorporate a high degree of operating compatibility between the cable and joints.

The Straight through joint kit or termination shall be complete with all accessories, jointing material, insulating stress control and sealing material, lugs, etc. as well as an instruction booklet explaining the method of using the kit. In case of heat shrinkable type kit, the joint shall include a heat shrinkable dual wall tubing which shall be insulating from inside and semi conductive from outside. Detailed sectional views of the assemblies shall be submitted along with the offer.

The straight through joints should be absolutely impervious to the entry of water. The manufacturer shall use the proven technologies and design to ensure a construction which will prevent entry of water or any other liquid inside the straight through joint and cable.

The cable termination kit shall be suitable for terminating the cable on indoor or outdoor installation as per requirement. The type of cable will be armoured, PVC / XLPE insulated H.T/L.T. Cables

The Straight - through joints shall be suitable for Buried / Over Head application.

The heat shrinkable component shall be light in weight and shall be made of specially formulated cross linked polymeric material with excellent

**STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMOURED  
PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABLES**

tracking & erosion resistance characteristic. Environmentally sealed system for splicing dielectric shielded power cables.

The design of joint and termination shall be such that on completion of work, the cable can be charged immediately.

The joint/termination shall have range taking feature. The Connector/ferrule used shall be range taking, Moisture entry into conductor shall be protected by providing special mastic.

The termination kit offered shall provide for total environmental sealing of the cable crutch and at the lug end. The details of the same shall be submitted along with the offer

**Indoor Termination:** HT/LT Jointing kit should be designed to withstand high humidity and surface contamination under electrical stress caused due to condensation and dust in indoor conditions.

**Outdoor Terminations:** LT/HT Terminations should be designed to withstand exposure to extreme climatic variations & surface contamination, UV rays from sunlight and electrical stress caused due to heavy pollution & dust in external conditions.

The following HT/LT Armoured PVC /XLPE Aluminum/Copper conductor cables of sizes/ rating are generally used in MSEDCL network and suitable to these cables, straight through joints & cable termination kits shall be supplied.

Sr. No	3.5 Core L.T Cable	1 Core L.T. Cable	3 Core H.T Cable
1	35 SQMM,	35 SQMM,	95 SQMM
2	50 SQMM	50 SQMM	120 SQMM
3	70 SQMM	70 SQMM	150 SQMM
4	95 SQMM	95 SQMM	185 SQMM
5	120 SQMM	120 SQMM	240 SQMM
6	150 SQMM	150 SQMM	300 SQMM
7	185 SQMM	185 SQMM	400 SQMM
8	240 SQMM	240 SQMM	500 SQMM
9	300 SQMM	300 SQMM	630 SQMM
10	400 SQMM	400 SQMM	-

**5.01 Heat Shrinkable Straight through joints for MV Cable.**

The heat shrinkable straight through joints shall have following function abilities .

- a) For encapsulation and environmental sealing, heat shrink wraparound sleeves with hot melt adhesive coating are required to be provided along with 304 grade Stainless Steel channels for locking the sleeve. The bidder should submit certificate to confirm grade for stainless steel channels.

STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMoured  
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b) To Reduce stress over conductor, heat shrinkable stress control tube to be provided. The stress control tube has to be in electrical contact with the outer insulation screen of the cable. Impedance of the tube shall be constant up to an operating temperature and shall be within the range  $1 \times 10^8$  ohm-cm to  $8 \times 10^8$  ohm-cm and with relative permittivity shall be minimum 15. Voids filling and stress relief over crimped connector and cut point of the insulation screen to be provided with void filling and moisture sealing high permittivity stress grading mastic and lubricant. The nested ends of the heat shrinkable tubing shall be provided with environmental sealing red mastic. Continuity of copper metallic screen of cable to be provided by Tinned copper mesh with 50% overlap. Mechanical protection of joint to be provided by Rollable Metallic Strip Canister or GI Wire mesh of suitable size and length for 3 core and by tinned copper mesh for 1 core cable.

c) For jointing of main conductor cores suitable size of crimp type ferrules/mechanical connectors with range taking feature should be provided. The cross-sectional area(CSA)of the ferrule/mechanical connector shall not be less than CSA of the conductor of the cable. Length of the ferrule/connector shall be sufficient to allow adequate number of crimps/shear head type bolts, to limit temperature rise at the joint. For providing insulation over the conductor area maximum three layers of heat shrinkable insulating tube are to be provided (including stress control tube, Insulating tube and Dual Wall tube).The thickness of the heat shrinkable tubes after installation should not be less than 1.2 times the insulation thickness of the cable. For outer semi conductor screening of the joint suitable heat shrinkable dual wall tubes which are co-extruded are to be provided

d)Earth Continuity between armour to be provided by tinned copper braid of adequate cross section. This is required for proper earthing of the joint. Also, to support armour wire support ring is to be provided. The material of support ring to be steel (G.I.) for 3 core Cable and Aluminium for 1 core cable  
- Worm drive clip(jubilee/hose clips) for tightly securing the earthing braid is required to be provided in suitable size & quantity.

e)For cleaning of cores, removing burrs on ferrules & rough insulation. Sufficient quantity of cleaning solvent & aluminium oxide cloth is required to be provided.

### 5.02 Heat Shrinkable Termination for MV Cables

- (a) The cable termination (Indoor & Outdoor) shall be of class-I type which consist of following point.
- i) stress control layer
  - ii) non-tracking tubing Resistant to UV light and which provides environmental protection.
  - iii) moisture seal-for environmental sealing against ingress of moisture & aggressive gases.
- (b) for crutch portion sealing of cables trifurcating Heat shrinkable break out is required.
- (c) To protect the cable breakout mono plast tape/non-adhesive PVC tape/black mastic is required to be applied over earthing arrangement(worm drive clip installed over copper braid and armour) for suitable length of the termination part.



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- (d) for proper sealing of Lugs at end of the termination suitable size & length of Heat Shrinkable tube is to be provided. No tape is to be provided for sealing purpose. For earthing tinned copper braid of adequate cross section is to be provided. To support armour wire GI support ring is to be provided. Worm drive clip (jubilee clips) for tightly securing the earthing braid is required to be provided in suitable size & quantity.
- (e) Suitable size of heat shrinkable stress control tubes is to be provided to reduce stress at cut back of screen. Void filling stress grading mastic is to be provided at semi-conducting screen. Heat shrinkable anti tracking tubes are to be provided to cover bare XLPE insulation and to provide UV resistance & environmental sealing. Anti tracking tubes shall have non-tracking adhesive coating inside, for a length of 50-60 mm on both ends.
- (f) for cleaning of cores, removing burrs on ferrules & rough insulation, sufficient quantity of cleaning solvent & aluminium oxide cloth is required to be provided. Adhesive tapes to be provided in sufficient length for marking on cables.
- g) For Indoor terminations, non-tracking tube of length 450 mm to be provided. For Outdoor terminations, non-tracking tube of length 650 mm to be provided. Suitable size and number of heat shrinkable rain sheds are to be provided to increase the creepage distance and to prevent water collection over termination end portion.
- i. Following is the recommended selection chart for Minimum Creepage distance (in mm) for rain water sheds:

Cable cross section	Voltage Level		
	11 kV	22 kV	33 kV
25 – 50 sq mm	70 mm	70 mm	85 mm
70 – 120 sq mm	70 mm	85 mm	105 mm
150 – 185 sq mm	70 mm	85 mm	105 mm
240 – 400 sq mm	85 mm	105 mm	115 mm
500 – 630 sq mm	85 mm	105 mm	115 mm

*Note: 'Creepage distance' is defined as the length along the surface of the Creepage Extension Sheds.*

- ii. Number of Creepage extension sheds per core as per IS 13573 (part I,II&III) :

Voltage Level	11 kV	22 kV	33 kV
No. of Sheds	2 Nos	3 Nos	4 Nos

**5.03 Cold Shrinkable Straight through Joints for LV Cable:**

The cold shrink straight through joint shall consist of following functional abilities:

- a) for encapsulation, environmental sealing & mechanical protection application of mastic coated vinyl tape and armor cast material is required.

- b) for joining of main conductor cores suitable size of ferrules/mechanical connectors are required also for shielding over connector semiconducting tape is required to be provided in suitable size & length.

STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMoured  
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c) to reduce stress over conductor & moisture sealing over entire joint portion one piece body (splice assembly) made of silicon rubber is to be provided which has stress control, insulation and screen continuity property.

d) suitable size of copper braid is required for proper earthing for the joint. Also, to support armour GI solid collect & worm drive (jubilee clips) to tighten the earthing braid is required to be provided.

e) for rebuilding the insulation & making joint cold shrink splice bodies of suitable size (diameter & length) is required to be provided. The material of the joint (splice) body shall be of silicone which is factory expanded and placed on a removable core. The removing of the core causes the cold shrink joint body shall maintain a compressive force continuously throughout the life of product. This pressure will ensure a complete moisture seal.

f) for cleaning of cores, removing burns on ferrules & rough insulation sufficient quantity of cleaning liquid & aluminium oxide cloth is required to be provided.

#### 5.04 Cold Shrinkable Termination.

(a) The cable termination (Indoor & Outdoor) shall be of class-I type which consist of following point

- i) stress control layer
- ii) Resistance against UV light environmental protection.
- iii) moisture seal-for environmental sealing against ingress of moisture & aggressive gases

b) for cruch portion sealing of ends trifurcating break out boot is required

c) To protect the boot mono plast tape/pvc tape is required to apply over armour for suitable length of the termination part.

d) for proper sealing of end termination suitable size & length silicon tape is required. Also to support armour GI solid collect & worm drive clips (jubilee clips) of suitable size to tighten earthing braid is required to be provided with semiconducting tape.

e) cold shrink termination bodies with stress control material is required to be provided to reduce the stress at cut back of screen & protect XLPE insulation against UV & environment. Also to feel the void parts at cut back portion suitable size & length semi conducting tape is required.

f) for cleaning of cores, removing burrs on ferrules & rough the insulations, sufficient quantity of cleaning liquid & aluminium oxide cloth is required to be provided. Also some pvc adhesive tapes to be provided in sufficient length for marking on cables.

g) sufficient quantity of suitable size rain sheds are to be provided to increase the creepage distance & prevent water collection over termination end portion.

### **5.05 1.1kV Joints for Armour, XLPE, Aluminium/Copper Conductor cable:**

This specification covers design and manufacturing of heat shrinkable cable joints suitable for 1.1kV Armoured PVC/XLPE Al/Cu Conductor Cables.

1. The accessories shall be supplied in kit form. Each component of the kit shall carry the manufacturer's mark of origin.
2. The supplied joint shall have a range taking feature.
3. The kits must have unlimited shelf life.
4. For outer sealing of the joint, a suitable size of Heat Shrinkable wraparound sleeve with 304 grade Stainless Steel Channel shall be provided. The bidder should submit certificate to confirm grade for stainless steel channels.
5. Suitable size of Heat Shrinkable tubings are to be provided for shrinking over individual cores for protection against moisture and dust ingress.
6. Type tests should have been carried out to prove the general qualities and design of a given type of jointing system. This type of joint should have been tested as per IS 13573 Part I at CPRI, ERDA or any such NABL accredited lab. Type Test Report for the same shall be submitted along with offer.
7. For conductor connection, either crimp type ferrules or sheer head bolt mechanical connectors should be provided.
8. The connector should be range taking which can be used for both copper & Aluminium cables.
9. Armour Connectivity and mechanical protection shall be maintained by using sufficient quantity of GI Wire mesh
10. Sufficient cross section qty of Aluminum braid shall be provided for earthing purposes.
11. The design of joint shall be such that on completion of joint the cable can be charged immediately.

### **6.0 MARKING AND LABELING**

As per the IS 13573 (Part-I&II):2011 all kits shall be marked and labeled suitably for identification.

- a. Manufacturer's name or logo and the name of components wherever feasible;
- b. Type of jointing materials, the application;
- c. Batch number(s), where relevant;
- d. Product reference;
- e. Defined storage conditions and expiry date, if any;

- f. If relevant, the manufacturing date;
- g. Health and safety marking and handling instructions, where relevant; and
- h. Reference to compliance with this standard.

## **7.0 TYPE TESTS**

The Jointing Kit offered, shall be fully type tested at NABL Lab as per the relevant standards. The applicable standards are indicated in Clause No.4.00. The tenderer shall furnish the type test reports alongwith the offer. Offer without Type test reports will not be considered. The Type test reports not pertaining to the size/ratings cables mentioned in clause no 5 shall not be considered. For any change in the design/type, already type tested and the design/type offered against this specification the purchaser reserved the right to demand repetition of type tests without any extra cost in presence of purchaser' representative.

## **8.00 TYPE TEST SEQUENCE**

The type test shall be carried out as per the test sequence given in IS 13573/2011(Part – I,II & III)

### **A. Acceptance & Routine Tests:**

All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the supplier in presence of purchaser's representative. The purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought out items.

### **B. Additional Tests:**

Additional test to be carried out in M.S.E.D.C.L'S Lab are Volume Resistivity, B.D.V., Tensile & Elongation etc. Supplier may depute his representative for witnessing the test conforming the date from relevant M.S.E.D.C.L'S Lab.

## **9.00 PRE DESPATCH INSPECTION**

All acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon the manufacturer and purchase at the time purchase. Manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing to satisfy him that the material is being supplied in accordance with this specification. The MSEDCL

## STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMoured PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABLES

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representative/Engineer attending the above test will carried out testing for suitable number of cable joints/terminations as per sampling procedure laid down in IS:13573(Part-I,II,III):2011 (amended up to date) and issue test certificate approval to the manufacturer and give clearance for dispatch. The cable jointing/termination kit shall be sealed after the inspection.

### **10.00 INSPECTION AFTER RECEIPT AT STORES**

For Random sample testing (RST) the sample Cable Termination/jointing kit will be drawn from any one of the store.

### **11.00 DEMONSTRATION & TRAINING :**

The purchaser reserves the right to ask for demonstration of the equipment offered at the purchasers place. The Tenderer shall arrange for demonstration of installation of jointing/termination kits free of cost for giving training to purchasers representative to get acquainted with the jointing method. The jointing/termination kit along with required length of the kits to be used for demonstration purpose shall be specified the cable will be provided by the Purchaser.

### **12.00 GUARANTEE**

The Kits shall be suitable for storage without deteriorating at a temperature upto 50°C under normal conditions of storage and shall have unlimited shelf storage life. The tenderer shall guarantee the installed cable accessories for a minimum period of not less than 5 years from the date of installation. The stores/materials found defective within the above guarantee period, shall be replaced by the supplier free of cost within one month of receipt of intimation.

If the defective stores/materials are not replaced as per the above guarantee clause, the Company shall recover an equivalent amount plus 15% supervision charges from any of the supplier's bills.

### **13.00 QUALITY CONTROL**

The purchaser has a right to send team of experienced Engineers for assessing the capability of the firm for manufacturing and testing of Cable jointing kit as per this specification. The purchaser representative should be given all assistances and cooperation for inspection and testing at the bidder's work.

#### **13.01 QUALITY ASSURANCE PLAN**

The tendered shall invariably furnish QAP along with his offer, The QAP adopted by him in the process of manufacturing shall consist of

- a. List of Plant and Machinery available at the manufacturers premises.
- b. List of Testing equipment available at the manufacturers premises with their calibration schedule.
- c. Organizational chart.

#### **14.00 PACKING:**

The Cable jointing kits shall be suitably packed to avoid damage or disturbance during transit or handling. Each Cable jointing kits may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning if considered necessary. The cases may then be properly sealed against accidental opening in transit.

The following information shall be furnished with the consignment :

Name of consignee

Details of consignment

Destination

Total Weight of consignment.

Sign showing upper / lower side of the crate

Sign showing fragility of the material.

Handling and unpacking instructions.

Bill of Materials indicating contents of each component and spare materials.

Installation instructions including drawing or other information specific to the accessories.

#### **15.00 TENDER SAMPLE**

Tenderers are required to submit one number of cable joint/termination sample of each offered type/item as per Technical Specification of tender documents, from any one of the factories on before the time and date stipulated for submission of offer, for evaluations. The sample shall be clearly mark with each type / item for each sample submitted a name of bidder.

#### **16.00 SCHEDULES**

The tenderer shall fill in the following schedules which are 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 – Tenderer's experience.

The discrepancies if any between the specification and the catalogs and / or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard will not be entertained.

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**SCHEDULE-A1**  
**GTP FOR HT CABLE ACCESSORIES ie JOINTS & TERMINATIONS**  
**(Heat Shrinkable)**

Sr. No.	Particulars	MSEDCL Requirement	Bidder Offer.
1	Manufacturer' Name& Address		
2	Brand Name &Country of Origin		
3	Kit Storage Temperature	50°C max	
4	Voltage Grade(Kv)	12, 24 & 36	
5	Applicable Standards	Indicated in Cl.No.4 of Technical Spec.	
6	Material to be used	cross link Polymeric	
7	Type Of Kit Offered	1)Straight through Joint. 2)Transition joint. 3)Termination joint.	
8	Shelf life of components in the kit	Unlimited	
9	Time Required for energization after completion of termination/joint	Immediate.	
10	Conductor resistance test (As per cable cross section area)	Conductor resistance shall not vary more than 10% of initial value	
11	A.C. withstand voltage ph/ground) @ 4.5 U <sub>o</sub>	4.5 U <sub>o</sub> for 5 min #	
12	Heat Cycle in air 8 hours total with > 2hours steady heating and >3 hours cooling	30 Cycles at 2.5U <sub>o</sub> #	
13	Heat Cycle in water 8 hours total with >2 hours steady heating and >3 hours cooling	30 Cycles at 2.5U <sub>o</sub> #	
14	Partial discharge test @ 1.73 U <sub>o</sub> 10 pC max at max temp as well as room Temperature	Max 10 pC #	
15	Humidity test (Only for Indoor termination)	300hours @ 1.25U <sub>o</sub> #	
16	Salt fog test (Only for Outdoor termination)	1000hours @ 1.25U <sub>o</sub> #	

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Sr.no	Particulars	MSEDCL requirement	Bidder offer
17	Dielectric Strength for 1)insulating Tube. 2)Anti tracking Tube 3)Dual wall tube	1)10(min) 2)10(min) 3)10(min)	
18	Dielectric constant for 1) stress control tube 2)insulating tube 3)anti tracking Tube 4)dual wall Tube 5) stress control mastic	1)15(min) 2)3.5(min) 3)3.5(min) 4) 3.5(min) 5)9.0(min)	
19	Tensile strength for 1)stress control tube 2)insulating tube 3)anti tracking tube 4)dual wall tube 5) stress control mastic	1)10 N/sq.mm(min) 2) 10 N/sq.mm(min) 3) 8 N/ sq.mm(min) 4) 10 N/sq.mm(min) 5) 8 N/sq.mm (min)	
20	Ultimate Elongation for 1)stress control tube 2)insulating tube 3)anti tracking tube 4)dual wall tube 5) stress control mastic	1)200% 2)200% 3)200% 4)200% 5)200%	
21	Water Absorption for 1)Stress Control Tube 2)Insulating Tube 3)Anti Tracking Tube 4)Dual wall Tube 5) Stress control mastic	1)0.5% 2) 0.5% 3) 0.5% 4) 0.5% 5)0.5%	
22	Longitudinal Change for 1)stress control tube/ 2)insulating tube 3)anti tracking tube 4)dual wall tube	1) max 10% 2) max 10% 3) max 10% 4) max 10%	
23	Heat Shock for 1) stress control Tube 2)insulating tube 3)anti tracking tube 4)dual wall tube	1)30min@250 <sup>o</sup> c, 2)30min@250 <sup>o</sup> c, 3)30min@250 <sup>o</sup> c, 4)30min@250 <sup>o</sup> c	
24	Flammability for insulating tube/anti tracking tube/dual wall tube	Pass	
25	Tracking Resistance for anti tracking tube	Non tracking	
26	Dissipation factor for stress control mastic	0.15(max)	



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S No	Particulars	MSEDCL Requirement	Bidder Offer
27	Service Temperature for stress control mastic	90° C	
28	Heat shrink wraparound sleeves with SS Channels	As per specification (clause no.5.01)	
29	Canister/GI Wire Mesh	As per cable size	
30	Red mastic	As per cable size	
31	G.I. Solid Collet	As per cable size	
32	Copper Braid	As per requirement	
33	Co-extruded Heat shrink Dual wall tube	As per specification (clause no.5.01)	
34	Heat shrink insulating tube	As per specification (clause no.5.01)	
35	Heat shrink stress control tube	As per specification (clause no.5.01)	
36	Stress Grading mastic	As per specification (clause no.5.01)	
37	Ferrule/Connector	As per specification (clause no.5.01& 5.02)	
38	PVC NA Tape	As per requirement	
39	PVC Adhesive Tape	As per requirement	
40	Cleaning Liquid	As per requirement	
41	Aluminum Oxide cloth	As per requirement	
42	Heat shrink break boot(Termination)	As per specification (clause no.5.02)	
43	Heat stress control tube	As per specification (clause no.5.02)	
44	Heat shrink Anti tracking tube	As per specification (clause no.5.02)	
45	Rain sheds (Termination)	As per specification (clause no.5.02)	
46	List Of Contents Of Kit (To Be Furnished Separately)	Detailed component list with Quantity etc.	

# These values are indicated in IS-13575 part –I at clause no.6.1,7.2.

IS-13573 part-II at clause no.4.4.2,4.5.2&5.1,

IS-13573 part-III at clause no.4.1 (in accordance with IS -10810) 7.1,9&13

**STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMoured  
PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABLES**

**SCHEDULE-A2  
GTP FOR HT CABLE ACCESSORIES ie JOINTS & TERMINATIONS  
(Cold Shrinkable)**

Sr. No.	Particulars	MSEDCL Requirement	Bidder Offer.
1	Manufacturer' Name & Address		
2	Brand Name & Country of Origin		
3	Kit Storage Temperature	50° C max	
4	Voltage Grade	12kv, 24kv & 36kv	
5	Applicable Standards	Indicated in Cl.No.4 of Technical Spec.	
6	Material to be used	Polyurethane Polymeric	
7	Type of Kit offered	1) Straight through Joint. 2) Transition joint. 3) Termination joint.	
8	Shelf life of components in the kit except compound	Unlimited	
9	Time required for energisation after completion of termination/joint.	Immediate.	
10	Conductor resistance test (As per cable cross section area)	Conductor resistance shall not vary more than 10% of initial value. #	
11	A.C. withstand voltage ph/ground) @ 4.5 U <sub>o</sub>	4.5 U <sub>o</sub> for 5 min #	
12	Heat Cycle in air 8 hours total with > 2 hours steady heating and > 3 hours cooling	30 Cycles at 2.5U <sub>o</sub> #	
13	Heat Cycle in water 8 hours total with > 2 hours steady heating and > 3 hours cooling	30 Cycles at 2.5U <sub>o</sub> #	
14	Partial discharge test @ 1.73 U <sub>o</sub> 10 pC max at max temp as well as room temperature	Max 10 pC #	
15	Humidity test (only for indoor termination)	300 hours @ 1.25U <sub>o</sub> #	
16	Ultra violet test	No cracking #	
17	Dielectric Strength for 1) stress control tube 2) insulating material (body insulation)	1) 8 kv/mm, 2) 20 kv/mm	
18	Dielectric constant for 1) stress control tube 2) insulating material (body insulation), 3) Silicon rubber	1) 18, 2) 3.5 3) 3.5	
19	Volume Resistivity for 1) stress control tube 2) insulating material (body insulation)	1) 1x10 <sup>2</sup> ohm.cm, 2) 1x10 <sup>15</sup> ohm.cm,	

**STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMoured  
PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABLES**

<b>S N</b>	<b>Particulars</b>	<b>MSEDCL Requirement</b>	<b>Bidder Offer</b>
20	Ultimate Elongation for 1)stress control tube 2) insulating material(body insulation)	1)700%, 2)700%,	
21	Hardness for 1) stress control tube 2)insulating material(body insulation)	1)35±5 shoreA, 2)40±5 shoreA	
22	Dielectric loss factor tan delta for 1)stress control tube/ 2)insulating material(body insulation), 3)silicon rubber	1)0.08, 2)0.005 3)0.004	
23	Service temperature range		
	1)stress control tube 2) insulating material(body insulation)	1) -50 up to 130°C 2)-50 up to 130°C	
24	Installation temperature range for 1)stress control tube 2) insulating material(body insulation)	-20 up to 50°C	
25	Tear Resistance for insulating material(body insulation)	26 N/mm	
26	Silicon rubber (Permanent set 22hours 100°C 100% elongation 5min)	8%	
27	Tracking Resistance for Silicon rubber	10 Hrs Non tracking	
28	Armour cast material	As per specification (clause no.5.03)	
29	Mastic Tape 2229i	As per requirement	
30	Mastic	As per requirement	
31	Worn drive clip	As per cable size	
32	G.I. solid collect	As per cable size	
33	Copper braid	As per requirement	
34	Cold shrink splice body	As per specification (clause no 5.03)	
35	Ferrule/mechanical connector	As per specification (clause no 5.03&5.04)	
36	Semiconducting tape	As per requirement	
37	Pvc NA tape	As per requirement	
38	Pvc adhesive tape	As per requirement	
39	Aluminum Oxide cloth	As per requirement	
40	Pvc cleaning liquid	As per requirement	
41	Triferating break out boot(Termination)	As per specification(clause no 5.03)	
42	Mono plast tape/pvc tape	As per cable size requirement	
43	Silicone tape	As per cable size requirement	
44	Cold shrink termination Body with stress control material	As per specification(clause no 5.03)	

STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMoured  
PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABLES

SN	Particulars	MSEDCL Requirement	Bidder Offer
45	Rain sheds(Termination)	As per requirement	
46	List Of Contents Of Kit (To Be Furnished Separately)	Detailed component list with Quantity etc.	

# These values are indicated in IS-13575 part –I at clause no.6.1,7.2.

IS-13573 part-II at clause no.4.4.2,4.5.2&5.1,

IS-13573 part-III at clause no.4.1 (in accordance with IS -10810) 7.1,9&13

**SCHEDULE-A3**  
**GTP FOR LT CABLE ACCESSORIES ie JOINTS & TERMINATIONS**  
**(Heat Shrinkable)**

Sr. No.	Particulars	MSEDCL Requirement	Bidder Offer.
1	Manufacturer' Name& Address		
2	Brand Name &Country of Origin		
3	Kit Storage Temperature	50°C max	
4	Voltage Grade	1.1kv	
5	Applicable Standards	Indicated in Cl.No.4 of Technical Spec.	
6	Material to be used	Polymeric Heat shrinkable material	
7	Type Of Kit Offered	1)Straight through Joint. 2)Transition joint. 3)Termination joint.	
8	Shelf life of components in the kit	Unlimited.	
9	Time Required for energisation after completion of termination/joint.	Immediate.	
10	Impulse withstand on Low voltage kits.	As per IS 13573 joints classification.for cable size less than50sqmm.it will be 8kv & for cable size more than 50sqmm.it will be 20kv	
11	Heating cycle in Air	As per IS-13573 part-I See 8.3	
12	Heat Cycle in Water(Over sheath damage)	As per IS-13573 part-I See 8.3	
13	Insulation resistance(Immersed)	As per IS-13573 part-I See 8.4	
14	Insulation resistance(Air)	As per IS-13573 part-I See 8.4	

**STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMoured  
PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABLES**

Sr.No.	Particulars	MSEDCL requirement	Bidder offer
15	Impact at ambient temp.	As per IS-13573 part-I See 8.5	
16	AC High voltage withstand(in Air)	As per IS-13573 part-I See 8.6	
17	AC High voltage withstand(immersed)	As per IS-13573 part-I See 8.6	
18	Examination of joint.	As per IS-13573 part-I See 8.8	
19	Dielectric Strength for insulating Tube.	9kv/mm	
20	Dielectric constant for insulating tube	3.5(min)	
21	Tensile strength for insulating tube	12.5 N/mm <sup>2</sup>	
22	Ultimate Elongation for insulating tube	200%	
23	Water Absorption for Insulating Tube	0.3%	
24	Longitudinal Change for insulating tube	±10%	
25	Heat Shock for insulating tube	30min@250 <sup>o</sup> c,	
26	Flammability for insulating tube	Pass	
27	Heat Shrinkable Wraparound sleeves with SS Channels	As per specification (clause no.5.01& 5.02)	
28	G.I. Wire mesh / Canister	As per cable size	
29	Red mastic	As per cable size	
30	G.I. Solid Collet	As per cable size	
31	Earthing Conductor	As per requirement	
32	Ferrule	As per specification (clause no.5.01&5.02)	
33	PVC NA Tape	As per requirement	
34	PVC Adhesive Tape	As per requirement	
35	Cleaning Liquid	As per requirement	
36	Aluminum Oxide cloth	As per requirement	
37	Heat shrink break boot(Termination)	As per specification (clause no.5.02)	
38	List Of Contents Of Kit (To Be Furnished Separately)	Detailed component list with Quantity etc.	

STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMoured  
PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABLES

**SCHEDULE-A4**  
**GTP FOR LT CABLE ACCESSORIES ie JOINTS & TERMINATIONS**  
**(Cold Shrinkable/Mechanical types)**

Sr. No.	Particulars	MSEDCL Requirement	Bidder Offer.
1	Manufacturer' Name& Address		
2	Brand Name &Country of Origin		
3	Kit Storage Temperature	50°C max	
4	Voltage Grade	1.1kv	
5	Applicable Standards	Indicated in Cl.No.4 of Technical Spec.	
6	Material to be used	Rubber tubes for Cold shrink tubes..	
7	Type Of Kit Offered	1)Straight through Joint. 2)Termination joint.	
8	Shelf life of components in the kit	Unlimited.	
9	Time Required for energisation after completion of termination/joint.	Immediate.	
10	Impulse withstand on Low voltage kits.	As per IS 13573 joints classification.for cable size less than50sqmm.it will be 8kv & for cable size more than 50sqmm.it will be 20kv	
11	Heating cycle in Air	As per IS-13573 part-I See 8.3	
12	Heat Cycle in Water(Over sheath damage)	As per IS-13573 part-I See 8.3	
13	Insulation resistance(Immersed)	As per IS-13573 part-I See 8.4	
14	Insulation resistance(Air)	As per IS-13573 part-I See 8.4	
15	Impact at ambient temp.	As per IS-13573 part-I See 8.5	
16	AC High voltage withstand(In Air)	As per IS-13573 part-I See 8.6	

STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMoured  
PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABLES

SN	Particulars	MSEDCL Requirement	Bidder Offer
17	AC High voltage withstand(immersed)	As per IS-13573 part-I See 8.6	
18	Examination of joint.	As per IS-13573 part-I See 8.8	
19	Dielectric Strength for insulating Tube.	20 kv/mm	
20	Dielectric constant for insulating tube	3.5(min)	
21	Tensile strength for insulating tube	8N/mm <sup>2</sup>	
22	Ultimate Elongation for insulating tube	700 %	
23	Water Absorption for Insulating Tube	0.5%	
24	Longitudinal Change for insulating tube	±10%	
25	Mastic2229i+ Vinyl tape and Armour cast for encapsulation.	To be used after completion of joint for encapsulation.	
26	G.I. Solid Collet	As per cable size	
27	Earthing Conductor	As per requirement	
28	Ferrule/Connector	As per specification (clause no.5.03&5.05)	
29	No. of shearing type bolts/special studs provided on connectorbarrel.	4 to 6 nos. to have secured connection.	
30	Material for armour connectivity.	Suitable tinned copper braiding required.	
31	Insulating tubing over the connector.	Dual wall design sleeve with entrapped lubricant with sufficient length to cover connector.	
32	Mechanical protection to joint body.	Suitable armour wrapping required.	
33	PVC NA Tape	As per requirement	
34	PVC Adhesive Tape	As per requirement	
35	Cleaning Liquid	As per requirement	
36	Aluminum Oxide cloth	As per requirement	
37	Side on Break out/Molds with compound.	As per specification (clause no.5.02)	
38	List Of Contents Of Kit (To Be Furnished Separately)	Detailed component list with Quantity etc.	



**SCHEDULE - "B"**

**TENDERER'S EXPERIENCE**

Tenderer shall furnish here list of similar orders executed / under execution for supplying HT/LT Cable Accessories by him to whom a reference may be made by purchaser in case he considers such a reference necessary.

Sr. No.	Name of client	Order No. & date	Qty. ordered	Qty. supplied
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**STRAIGHT THROUGH JOINTS/TERMINATIONS /TRANSITION JOINTS  
FOR HT / LT ARMoured PVC / XLPE, ALUMINIUM /COPPER  
CONDUCTOR CABLES**

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**“INDEMNITY BOND FORMAT”**

UNDERTAKING TO BE SUBMITTED BY THE PARENT COMPANY SITUATED ABROAD IN  
CASE OF THE PARTICIPANT BIDDER WHO IS AN INDIAN  
BASED SUBSIDIARY ON GENERAL STAMP OF Rs. 200.00.

The Chief Engineer,  
Maharashtra State Electricity Distribution Co. Ltd.,  
Material Management Cell,  
1<sup>st</sup> Floor, Prakashgad, Bandra (E),  
Mumbai – 400 056

Dear Sir:

**Sub:** Undertaking against Tender No \_\_\_\_\_ for procurement of \_\_\_\_\_

We, M/s. \_\_\_\_\_ having registered office at \_\_\_\_\_ are the Parent Company of M/s. \_\_\_\_\_ who have participated against your tender no. \_\_\_\_\_ for procurement of \_\_\_\_\_.

We have carefully read and have thoroughly understood and agree to the terms and conditions of the subject tender.

We hereby undertake that in case of placement of order against the subject tender on our subsidiary company, M/s. \_\_\_\_\_, in the event of we accept all the responsibilities and liabilities for supply of quality equipments as per specification of the tender and execution of the contract. We further hereby undertake that we shall be responsible for any liability arising out of the contract placed on M/s \_\_\_\_\_ and pay to MSEDCL the sum of rupees \_\_\_\_\_ as per agreement in the event of any breach of condition of the purchase order, loss and damage of the material till expiry of guarantee period as stipulated in the order.

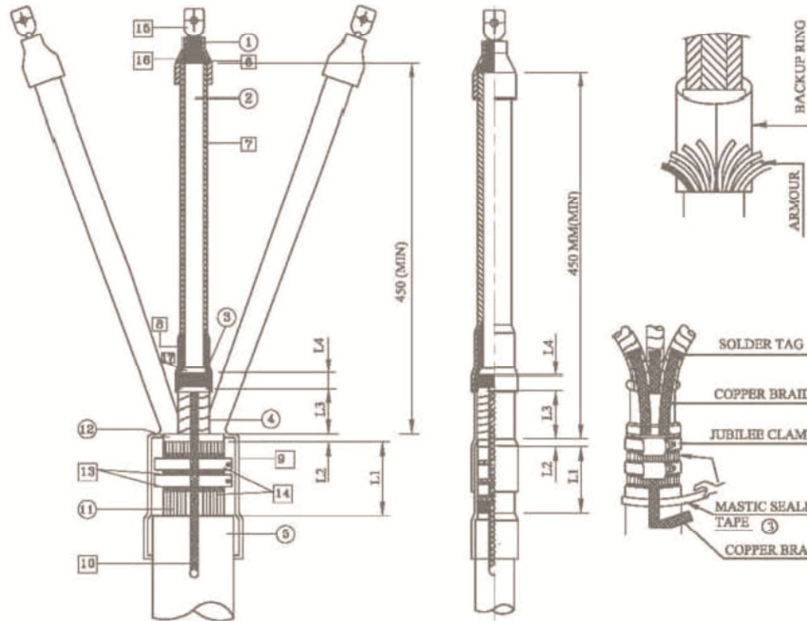
Our liability here under shall not be impaired or discharged by extension of time or variation or alteration made with or without our knowledge or consent by or between the parties to the said contract. This undertaking shall be valid and binding on us upto and including the execution and guarantee period of the order and shall not be terminable by notice or change in the constitution of any of the companies. In case of any dispute arising out of or in connection with this tender or contract, if concluded, the same shall be subject to the exclusive jurisdiction of the **“Court in Mumbai(India).”**

Yours faithfully,  
(Authorised Signatory)

For \_\_\_\_\_

# STRAIGHT THROUGH JOINTS/TERMINATIONS /TRANSITION JOINTS FOR HT / LT ARMoured PVC / XLPE, ALUMINIUM /COPPER CONDUCTOR CABLES

**Maharashtra State Electricity Distribution Company Limited**  
**MSEDCL11KVIDT - Indicative**



**3 Core XLPE Cable**

**1 Core XLPE / AB Cable**

Ref. Document No. :- 103

CABLE SIZE (Sq.mm)	CABLE CUTTING DIMENSIONS FOR 3 CORE CABLES				CABLE SIZE (Sq.mm)	CABLE CUTTING DIMENSIONS FOR 1 CORE CABLES			
	L1	L2	L3	L4		L1	L2	L3	L4
240-400	65	10	150	30	800-1000	65	10	150	30
150-185	50	10	150	30	400-630	65	10	150	30
70-120	40	10	150	30	185-300	65	10	150	30
16-50	40	10	150	30	70-150	40	10	150	30
					16-50	40	10	150	30

○	CABLE COMPONENTS
□	KIT CONTENTS (MAJOR PARTS)
△	KIT CONTENTS (INSTALLATION AIDS)
L4	LENGTH OF SEMI CONDUCTING SCREEN OF CORE
L3	LENGTH OF METALLIC SHIELDING OF CORE
L2	LENGTH OF INNER SHEATH
L1	LENGTH OF ARMOUR
<b>LEGENDS</b>	

▲	MOPPING CLOTH
▲	ALOXITE EMERY TAPE
▲	NYLON STRING
▲	SILICON GREASE
▲	STRESS CONTROL MASTIC
▲	LUG SEALING MASTIC RED
▲	TERMINAL LUG
▲	MASTIC SEALING TAPE
▲	JUBILEE CLAMPS
▲	INNER SHEATH
▲	ARMOUR
▲	TINNED COPPER EARTH BRAID (MAIN EARTH)
▲	ANTI TRACKING CABLE BREAK OUT
▲	STRESS CONTROL TUBING
▲	ANTI TRACKING WEATHER RESISTANT TUBING
▲	TERMINAL SLEEVE
▲	OUTER SHEATH
▲	METAL SHIELD
▲	SEMI CONDUCTING SCREEN
▲	INSULATION
▲	CONDUCTOR
S.No	DESCRIPTION



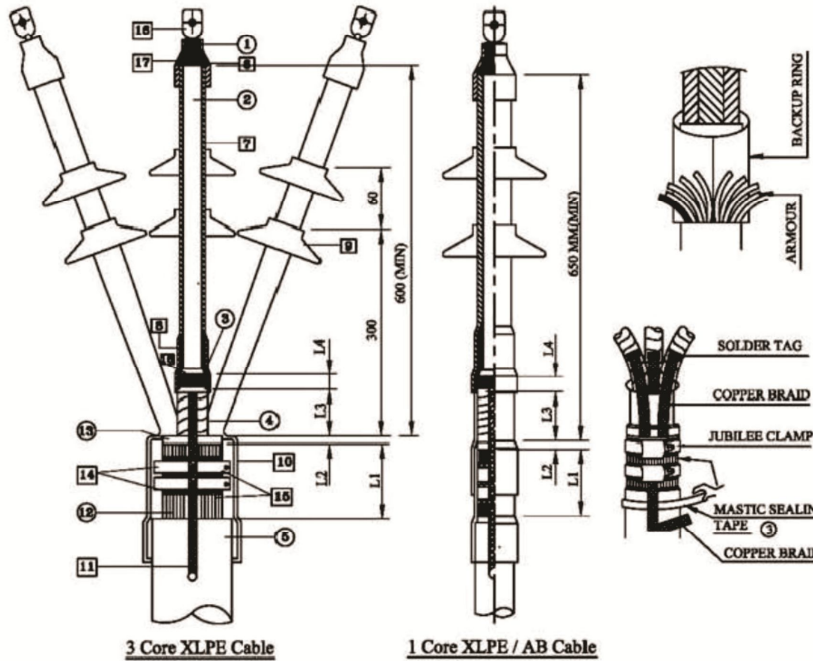
Title :-  
Heat Shrinkable Indoor Termination  
for 6.6/11.0KV, 6.35/11.0KV (U max:  
12KV) 3&1 Core XLPE & AB Cable

SCALE : NTS
ESTION No. : 00
DRG. No.
MSEDCL11KVIDT

Drawn By	CHK. BY	APPD. BY	DATE
MSEDCL Technical			10/05/17

# STRAIGHT THROUGH JOINTS/TERMINATIONS /TRANSITION JOINTS FOR HT / LT ARMOURED PVC / XLPE, ALUMINIUM /COPPER CONDUCTOR CABLES

**Maharashtra State Electricity Distribution Company Limited**  
**MSEDCL11KVODT - Indicative**



CABLE CUTTING DIMENSIONS FOR 3 CORE CABLES					CABLE CUTTING DIMENSIONS FOR 1 CORE CABLES				
CABLE SIZE (Sq.mm)	L1	L2	L3	L4	CABLE SIZE (Sq.mm)	L1	L2	L3	L4
240-400	65	10	150	30	800-1000	65	10	150	30
150-185	50	10	150	30	400-630	65	10	150	30
70-120	40	10	150	30	185-300	65	10	150	30
16-50	40	10	150	30	70-150	40	10	150	30
					16-50	40	10	150	30

○	CABLE COMPONENTS
□	KIT CONTENTS (MAJOR PARTS)
△	KIT CONTENTS (INSTALLATION AIDS)
L4	LENGTH OF SEMI CONDUCTING SCREEN OF CORE
L3	LENGTH OF METALLIC SHIELDING OF CORE
L2	LENGTH OF INNER SHEATH
L1	LENGTH OF ARMOUR
<b>LEGENDS</b>	

△	MOPPING CLOTH
△	ALOXITE EMERY TAPE
△	NYLON STRING
△	SILICON GREASE
⑬	STRESS CONTROL MASTIC
⑰	LUG SEALING MASTIC RED
⑱	TERMINAL LUG
⑮	MASTIC SEALING TAPE
④	JUBILEE CLAMPS
③	INNER SHEATH
⑫	ARMOUR
⑪	TINNED COPPER EARTH BRAID (MAIN EARTH)
⑩	ANTI TRACKING CABLE BREAK OUT
⑨	RAIN SHED
⑧	STRESS CONTRL TUBING
⑦	ANTI TRACKING WEATHER RESISTANT TUBING
⑥	TERMINAL SLEEVE
⑤	OUTER SHEATH
④	METAL SHIELD
③	SEMI CONDUCTN SCREEN
②	INSULATION
①	CONDUCTOR

S.No.	DESCRIPTION
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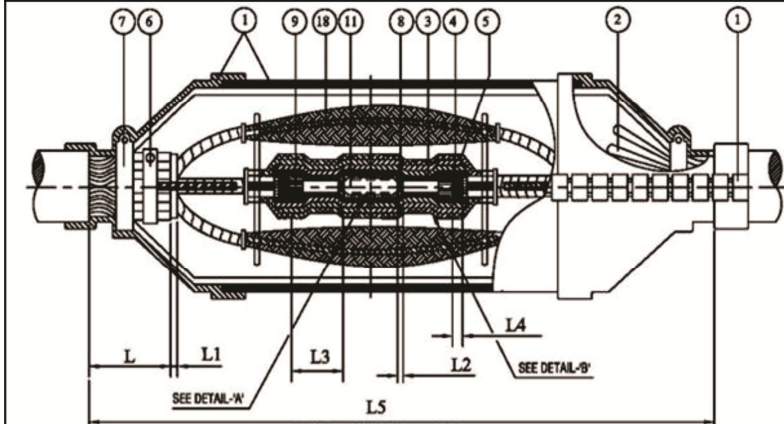
**MAHAVITARAN**  
Maharashtra State Electricity Distribution Co. Ltd.

Title :-  
**Heat Shrinkable Outdoor Termination**  
For 6.6/8.8KV, 6.35/11.0KV(U max: 12 KV)  
**3&1 Core XLPE & AB Cables**

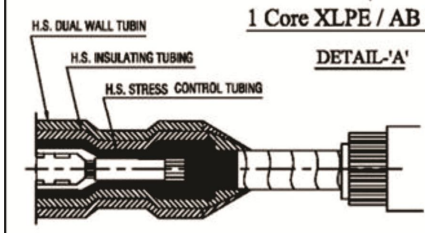
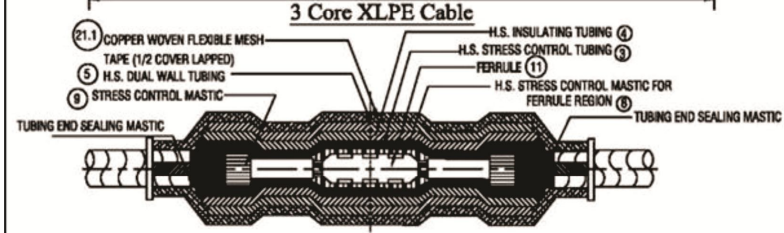
Drawn By: MSEDCL Technical	CHK. BY:	APPD. BY:	DATE 10/05/17	SCALE : NTS EMITION No. : 00
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# STRAIGHT THROUGH JOINTS/TERMINATIONS /TRANSITION JOINTS FOR HT / LT ARMoured PVC / XLPE, ALUMINIUM /COPPER CONDUCTOR CABLES

**Maharashtra State Electricity Distribution Company Limited**  
MSEDCL11KVSTJ - Indicative



400-500	80	10	10	75	60	1475
240-300	80	10	10	75	60	1425
120-185	80	10	10	75	60	1300
70-95	80	10	10	75	60	1250
16-50	80	10	10	75	60	1250
Cable size sq. mm	L	L1	L2	L3	L4	L5
Cable Cutting Dimensions for 3 Core XLPE Cables						
800-1000	60	10	10	75	55	1220
400-630	60	10	10	75	55	1200
150-300	60	10	10	75	55	1100
70-120	60	10	10	75	55	1050
25-50	60	10	10	75	55	1000
Cable size sq. mm	L	L1	L2	L3	L4	L5
Cable Cutting Dimensions for 1 Core XLPE Cables						



L4	LENGTH OF SEMI CONDUCTING SCREEN
L3	LENGTH OF XLPE INSULATION
L2	LENGTH OF BARE CONDUCTOR BETWEEN FERRULE AND XLPE INSULATION
L1	LENGTH OF INNER SHEATH
L	LENGTH OF ARMOUR
LEGEND	

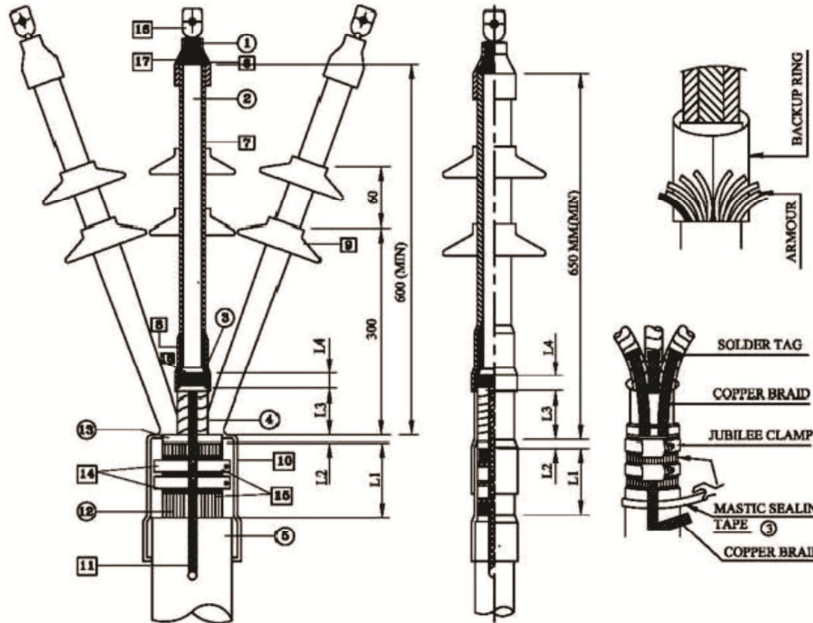
19	DETAILED INSTRUCTION MANUAL
18	METAL SCREEN CONTINUITY SYSTEM CONSISTING OF COPPER WOVEN FLEXIBLE MESH TAPE + SMALL COPPER BRAID+ SOLDER + FLUX+COPPER BENDING WIRE
17	CLEANING TISSUES
16	MOPPING CLOTH
15	PVC ADHESIVE TAPE
14	ALOXIDE EMERY TAPE
13	NYLON STRING
12	MASTIC SEALING TAPES
11	INLINE CONNECTORS (FERRULE)
10	SILICON GREASE
9	STRESS CONTROL MASTIC FOR CUT END
8	STRESS CONTROL MASTIC FOR FERRULE REGION
7	JUBILEE CLAMPS FOR FIXING OVER THE PROTECTIVE COVER (CANNISTER)
6	ARMOUR EARTHING MATERIAL (BACKUP RING -2 NOS.+ TINNED COPPER BRAID + JUBILEE CLAMP - 2 NOS.)
5	HEAT SHRINKABLE DUAL WALL TUBINGS (RED + BLACK)
4	HEAT SHRINKABLE INSULATION TUBINGS (RED)
3	HEAT SHRINKABLE STRESS CONTROL TUBINGS (BLACK)
2	GALVANISED WRAP AROUND JOINT CASE (CANNISTER)
1	HEAT SHRINKABLE OUTER JACKETING SLEEVE
S.No.	DESCRIPTION OF KIT CONTENTS



<b>TITLE :-</b> HEAT SHRINKABLE STRAIGHT THROUGH JOINT SUITABLE FOR 6.6/6.6KV, 6.35/11.0KV (U max: 12KV) 3 & 1 CORE XLPE & AB CABLES				
Drawn. By MSEDCL Technical	CRD. BY	APPD. BY	DATE 08/13/18	
			SCALE : NTS	
			ESTION No. : 00	
			ORG. No. MSEDCL11KVSTJ	

# STRAIGHT THROUGH JOINTS/TERMINATIONS /TRANSITION JOINTS FOR HT / LT ARMoured PVC / XLPE, ALUMINIUM /COPPER CONDUCTOR CABLES

**Maharashtra State Electricity Distribution Company Limited**  
**MSEDCL11KVODT - Indicative**



**3 Core XLPE Cable**

**1 Core XLPE / AB Cable**

CABLE SIZE (Sq.mm)	CABLE CUTTING DIMENSIONS FOR 3 CORE CABLES				CABLE CUTTING DIMENSIONS FOR 1 CORE CABLES				
	L1	L2	L3	L4	CABLE SIZE (Sq.mm)	L1	L2	L3	L4
240-400	65	10	150	30	800-1000	65	10	150	30
150-185	50	10	150	30	400-630	65	10	150	30
70-120	40	10	150	30	185-300	65	10	150	30
16-50	40	10	150	30	70-150	40	10	150	30
					16-50	40	10	150	30

○	CABLE COMPONENTS
□	KIT CONTENTS (MAJOR PARTS)
△	KIT CONTENTS (INSTALLATION AIDS)
L4	LENGTH OF SEMI CONDUCTING SCREEN OF CORE
L3	LENGTH OF METALLIC SHIELDING OF CORE
L2	LENGTH OF INNER SHEATH
L1	LENGTH OF ARMOUR
<b>LEGENDS</b>	

▲	MOPPING CLOTH
▲	ALOXITE EMERY TAPE
▲	NYLON STRING
▲	SILICON GREASE
■	STRESS CONTROL MASTIC
■	LUG SEALING MASTIC RED
■	TERMINAL LUG
■	MASTIC SEALING TAPE
■	JUBILEE CLAMPS
■	INNER SHEATH
■	ARMOUR
■	TINNED COPPER EARTH BRAID (MAIN EARTH)
■	ANTI TRACKING CABLE BREAK OUT
■	RAIN SHED
■	STRESS CONTRL TUBING
■	ANTI TRACKING WEATHER RESISTANT TUBING
■	TERMINAL SLEEVE
■	OUTER SHEATH
■	METAL SHIELD
■	SEMI CONDUCTN SCREEN
■	INSULATION
■	CONDUCTOR

S.No.	DESCRIPTION
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Title :- Heat Shrinkable Outdoor Termination For 6.6/8.8KV, 6.35/11.0KV(U max: 12 KV) 3&1 Core XLPE & AB Cables		 SCALE : NTS EDITION No. : 00
Drawn By: MSEDCL Technical	CHK. BY: APPD. BY: DATE: 10/05/17	

**TECHNICAL SPECIFICATION FOR 11 KV 4 WAY H. T. PILLERS**

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## **TECHNICAL SPECIFICATION FOR OUTDOOR TYPE 11KV HT FEEDER PILLAR**

### **1.0 SCOPE:**

1.1 This specification covers design manufacture testing and inspection at manufacturer's works packing and delivery at purchaser's stores/sites of 11 KV HT feeder pillar of 4 way type, suitable for 11kV,3 PH, 50 Hz, 630 Amps, AC system. 11 KV HT feeder pillar shall be floor mounted type suitable for outdoor type installation,.

1.2 It is not the intent to specify herein complete details of design and construction. The equipment offered shall conform to relevant standard and high quality and workmanship capable to perform continuous and satisfactory operations in the actual service conditions at site.

### **2.0 SERVICE CONDITIONS:**

2.1 Maximum ambient temperature (deg C)	50
2.2 Minimum ambient temperature (deg C)	3.5
2.3 Relative humidity (%)	10 to 100
2.4 Maximum rainfall (mm)	1450
2.5 Maximum wind pressure (kg/sq m)	150
2.6 Maximum altitude above mean sea level (Meters)	1000
2.7 Isoceraunic level (days/year)	50
2.8 Seismic level (Horizontal acceleration) (g)	0.3
2.9 Climate Moderately hot and humid tropical climate, conducive to rust and fungus growth.	

### **3.0 STANDARDS:**

All components used in the manufacture of the pillars shall confirm to the relevant Indian standard specification and especially to the followings:

a	IS: 12063/1987	classification for Degrees of Protection provided by enclosures of electrical Equipments (IP-54 Out door type Construction)
b	IS: 5082/1998	Wrought aluminium and aluminium alloy bars, rods, tubes and sections for electrical purposes.
c	IS:613/2000	Copper Rods and Bars for Electrical Purposes - Specification
d	IS:1897/1983	Copper strip for electrical purposes
e	IS: 6005/1998	Code of practice for phosphating iron and steel
f	IS: 5/2004	Colour for ready mixed paints and enamel
g	IS: 732/1989	Code of Practice for Electrical Wiring Installations
h	IS: 8588: Part-1/1977	Thermostatic bimetals: General requirements and methods of tests
i		Clearances as per Indian Electricity Act 2003



#### **4.0 PRINCIPAL TECHNICAL PARAMETERS:**

- 4.1 Rated voltage : 3 ph 11 KV 50 Hz
- 4.2 Current rating : 630 Amps continuous type.
- 4.3 Insulation level : 11KV AC 50 Hz
  - Phase to phase : 18KV AC 5 Hz (1 Min withstand )
  - Phase to earth : 19KV DC
- 4.4 Temperature rise : Shall not exceed delivery operating temperature of components conforming to relevant standards limited to 30°C above ambient.

#### **5.0 GENERAL TECHNICAL REQUIREMENTS:**

##### 5.1 CUBICLE :

5.1.1 The cubicle of HT feeder pillars shall be made out of 10 SWG (3.25 mm thick) cold rolled M.S sheet steel, plates and shaped sections. All panel edges and door edges shall be reinforced against distortion by rolling, bending etc. The complete cubical shall be rigid self supporting and free standing and shall have following dimensions in mm.:

Dimensions	Over all Width	: 1400 MM
	Overall Height	: 1800 MM
	Overall Depth	: 850 MM

The above dimensions shall be without rain hood and are subject to maximum of – 2%to + 2% tolerances.

5.1.2 The HT feeder pillars shall have front and rear compartments. Front compartment shall be suitable for connecting the terminals of cables, and the rear for cable terminations. Bakelite sheet 12mm thick shall be provided for separation cable termination at front side .

5.1.3 The cubicles shall have centre lift up type slanting roof rain hood made up of 10 SWG MS sheets plates. The depth and width of the rain hood shall be at least 120% of the depth and width pillars.

5.1.4 The cubicles shall be provided with waterproof non-detachable hinged doors with suitable grip for opening and closing .as below:

Two nos of doors for front and for back side along with 3 Nos of Hinges on each door

5.1.5 The hinges shall be made up of heavy-duty M.S. rod with male having at least 45mm long head and 25 mm long 9.5 mm OD pin and female at least 45mm long with 10mm dia. ID brass bush. The hinges shall be welded on both sides to the pillar and grease lubricated for life. The doors shall not be detachable after fixing the rain hood.

5.1.6 A centrally operated three position locking arrangement (Godrej type) shall be provided for the doors. Two keys shall be supplied for each pillar. In addition, angle cleats shall be provided for putting two Nos. of padlocks for each size of doors.

5.1.7 Adequate ventilation by means of louvers with wire mesh shall be provided on both sides of the pillars and also at the top and bottom of pillars.

5.1.8 Asbestos sheets of at least 6 mm thick shall be provided on all doors inside.

5.1.9 The cubicles shall be provided with rigid M.S. foundation & bottom holes for grouting bolts on all four corners. The pedestal shall be covered from all sides with 10 SWG MS sheets.

5.1.10 Detachable gland plates made up of 10 SWG M.S. sheets. Size of the glands will be intimated to the successful tenderer along with approval of drawings.

5.1.12 Enameled name plate of the suppliers and M.S.E.D.C.L. mentioning Tender Number & date shall be displayed on front door.

5.1.13 Enameled danger board with “DANGER 11000 VOLTS” mark shall be displayed on the left hand side of front and back doors.

5.1.14 Earthing Bolt:

Two nos of earthing bolts shall be provided with the cubical . One each at front and rear side of Pillar. The same shall be easily accessible.

5.1.15 Cable Entry:

The cable entry shall be from rear side of the pillar. Removable gland plate of 10 SWG. M.S. sheet shall be provided. Cable chamber shall be provided with perforated metal sheet separate for each chamber.

5.1.16. Additional Inner Door:

Additional door on front side, with 14 swg G.I wire, shall be provided. Also the detachable frame with 14 swg GI wire mesh shall be provided at rear side. There shall be firm stop for these wire mesh doors and frame that it shall not move towards inside of Pillar/Live connections.

5.2 PAINTING:

5.2.1 The cubicles shall be provided with anti corrosive high quality post office red colour paint conforming to shade No 538 of IS.5 from inside and outside to withstand the corrosive and humid atmosphere.

5.2.2 All interiors and exteriors of the cubicle shall be degreased in 5% solution at 75°C for 15 minutes. They shall then be washed in hot water bath at 65°C to remove all rust, scale corrosion, grease and other adhering foreign material and shall be rinsed in cold running water.

5.2.3 The cubicles shall then be pickled in 25% hot sulphuric acid at 65°C for 5 minutes. Care shall be taken to avoid over pickling by addition of adequate quantities of inhibitor and avoid loss of tensile strength. The cubicle shall then be rinsed in cold running water and put in alkaline solution at 65°C for 1 to 2 minutes. The cubicle shall then be immersed in cold water (swill agitated) to remove all traces of alkali and unreacted salt. The cubicle shall then be dipped in deoxidize chamber to ensure complete removal of moisture.

5.2.4 Zinc oxide primer shall be applied and the cubicle stoved at 150°C for 10 to 12 minutes. It shall then be cooled, filled with putty to get smooth and flawless surface. Enameled paint shall then be sprayed and towed at 150°C for about 12 minutes.

### 5.3 BUS BAR:

5.3.1 The bus bars shall be made up of electrolytic grade copper conforming to latest grade of IS

5.3.2 The contacts shall be made up of electrolytic grade copper alloy with corrugated terminal pad and spring action to yield high contact pressure. G. I. spring ring shall be made out of at least 6 mm dia. Spring steel round. The spring action shall not get affected by operations and variations in operating temperatures in service.

5.3.3 Thermostatic bimetal device shall be provided between terminal pad and bus bars and between terminal pad and cable terminals to prevent bimetallic deterioration.

5.3.4 The complete assembly shall be so fixed and secured that there shall be no turn, fall out displacement and vibration of any part during any fault feeding conditions.

#### 5.3.5 Maximum rated current

Maximum rated current shall be 630 Amps continuous rating. The current rating adopted shall generally not exceed the current density limit of 1.6 Amps/sqmm. And shall be subject to successful temperature rise tests carried out in reputed laboratory.

### 5.4 INSULATING MATERIAL:

5.4.1 The insulating material used shall be Epoxy type Insulator, with uniform equally spaced rings, suitable for 18 KV Class insulation.

5.4.2 Mounting of these insulators, with 4 Nos of threaded holes on the central vertical, 10 SWG M.S. plate.

5.5 DISCHARGE ROD:

5.5.1 The Insulated discharge rods shall be with 11 KV Post Insulator and with zinc passivated chain of 2 met Length. One end shall be connected with the earthing terminal on front side.

**6.0 TESTS:**

**A. TYPE TESTS:**

The type tests mentioned below should be carried out on H. T. Pillar offered by the tenderer.

1. Verification of the Degree of protection (IP- 54) of H.T. Pillar as per IS:13947/1993 or the latest version thereof.
2. Verification of dielectric properties.
3. Verification of clearance and creepage distances.
4. Verification of short circuits strength.

**B. ROUTINE TEST:**

Test for verification of dielectric properties shall be carried out as routine test.

**C. TEST CERTIFICATE:**

The tenderer shall furnish detailed type test reports of the offered H.T. Pillar as per clause of the Technical Specifications at the NABL approved laboratories to prove that the H.T. Pillar offered meet the requirements of the specification. These Type Tests should have been carried out within five years prior to the date of opening of this tender. However, the tenderers who have supplied the H.T. Pillars to the Board against order from Central Purchase Agency of M.S.E.D.C.L. shall be exempted from submission of Type Test Report against this tender provided.

- i) The offered H.T. Pillars are already fully type tested at approved Laboratory within five years prior to the date of opening of this tender.
- ii) There is no change in the design of type-tested H.T. Pillar and those offered against this tender.

Following test certificates and documents shall be furnished at the time of inspection.

- a) Chemical analysis certificate and documents showing genuine source of procurement of electrolytic grade conductivity Copper Sections.

- b) Document showing genuine source of procurement of steel sheet and sections.
- c) Certificate of temperature rise test.
- d) Certificate of painting with degreasing, pickling phosphate, and painting and oven treatment by seven-tank oven process.

The supplier shall conduct voltage withstand test and operations tests at the time of inspection.

## **7.0 INSPECTION:**

- 7.1 The supplier shall prepare a prototype and offer the same for inspection and approval before taking up mass production
- 7.2 The supplier shall offer inspection of the material at his works before dispatch. If required the supplier shall also offer inspection of manufacturing painting and assembly processes and quality control system. If any material is not found in line with relevant specification the supplier shall carry out the modification and offer for re-inspection.
- 7.3 Inspection and acceptance shall not absolve the supplier of his responsibility to supply the material in accordance with the specifications. The purchaser reserves the right to reject the material not confirming the relevant specifications.

## **8.0 DRAWINGS AND DOCUMENTATION:**

- 8.1 The following information shall be clearly and indelibly be marked on all the pillars or on a label permanently attached to it.
  - a) 'M.S.E.D.C.L.' marking.
  - b) Rated Voltage of pillar.
  - c) Manufacturer's name or Trademark
  - d) MSEDCL's Order No.
  - e) Year of Manufacture.
  - f) Short circuit strength.
  - g) Degree of protection.
- 8.2 The tenderer shall furnish all details and clarifications required if any for scrutiny and evaluation of the offer.
- 8.3 Manufacture of material to be supplied shall be done strictly as per approved drawing.
- 8.4 Approval of drawing shall not absolve the supplier of his liability for ensuring

correctness according to applicable standards & regulations.

8.5 The tenderer shall fill-in the following schedules which form part of the specification if any schedule is not filled or incompletely filled the offer is liable to be treated as incomplete and rejected.

Schedule-A: Guaranteed technical particulars

Schedule-B: Deviations from specifications

Schedule-C: Tenderer's Experience

**9.0 DESPATCH:**

9.1 The material to be supplied shall be packed and dispatched only after inspection and approval.

9.2 Supplier shall be responsible for packing, transporting and delivery to the consignee.

9.3 Copies of packing list and inspection report duly approved shall be sent along with each consignment.

**SCHEDULE – A**

**GUARANTEED TECHNICAL PARTICULARS OF 11KV 4 WAY H.T. PILLER**

<b>Sr. No.</b>	<b>Parameter Name</b>	<b>Parameter type</b>
1.	Name of Manufacturer.	Text
2.	Type of H.T. Pillar	Text
3.	Rated normal voltage	Text
4.	One Minute P. F. withstand voltage	Text
5	Rated normal current of Busbars	Text
6	Rated short time current	Text
7	Rated temperature rise	Text
8	Rated safe temperature of Busbars	Text
9	Dimensions of busbars	Text
10(a)	Grade and specification of material of Busbars	Text
10(b)	Grade and specification of material of -spring steel round	Text
11	IACS conductivity of bus bars	Text
12	Dimensions of spring steel round	Text
13(a)	Dimensions of cubicle without rain hood -Width	Text
13(b)	Dimensions of cubicle without rain hood – Depth	Text
13(c )	Dimensions of cubicle without rain hood – Height	Text
14(a)	Dimensions of rain hood – Width	Text
14(b)	Dimensions of rain hood -Depth	Text
14(c )	Dimensions of rain hood -Height of centre lift	Text
15(a)	Hinges : Male - OD head	Text
15(b)	Hinges : -Length of head	Text
15 (c )	Hinges : Male - OD of pin	Text
15 (d)	Hinges : -Length of pin	Text
16 (a)	Female - OD	Text
16 (b)	Female - ID of brass bush	Text
17	Number of hinges per door	Text
18	Thickness of sheet steel	Text
19	Type of locking arrangements	Text
20	Number of padlocking arrangements	Text
21	Number and size of ventilating louvers with wire mesh	Text
22	Details of painting	Text
23	Dimensions and details of asbestos sheets	Text
24	Dimensions and details of bakelite sheets	Text
25	List of test conducted on similar equipments	Text
26	List of copies of test certificate enclosed	Text
27	Marking on the pillar is as per specification	Text
28	Type test reports and any other details	Text

NAME & SIGNATURE OF TENDERER

**SCHEDULE -B**

**DEVIATIONS FROM SPECIFICATION**

All deviations from this specification shall be set out by the tenderer clause by clause in this schedule. Unless mentioned in this schedule the tender shall be deemed to confirm to the specification.

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Clause Number	Details of deviations	Justification
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NAME OF FIRM\_\_\_\_\_

NAME & SIGNATURE OF TENDERER\_\_\_\_\_

DESIGNATION\_\_\_\_\_

DATE\_\_\_\_\_



**SCHEDULE – C**

**SCHEDULE OF TENDERERS' EXPERIENCE**

The tenderer shall furnish a list of similar orders executed under execution by him and name of persons to whom reference may be made by the purchaser in case such a reference is considered necessary.

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Sr. No.	Name and Description of work executed	Month and year of Commissioning	Client	Name of person
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NAME OF FIRM\_\_\_\_\_

NAME & SIGNATURE OF TENDERER\_\_\_\_\_

DESIGNATION\_\_\_\_\_

DATE\_\_\_\_\_