



ODISHA POWER TRANSMISSION CORPORATION LIMITED

VOL-II (PART-II)

PACKAGE: 11/2013-14 - “CONSTRUCTION OF 1 NO. 220 KV TRANSFORMER BAY WITH INSTALLATION OF ONE NO. 20MVA 220/33 KV TRANSFORMER ALONGWITH 3 NOS 33 KV FEEDER BAY AT 220/33 KV GRID SUB-STATION, LAXMIPUR ON TURNKEY BASIS”.

GUARANTEED TECHNICAL PARTICULARS

**NOTICE INVITING TENDER-NIT NO. 11 / 2013-14
TENDER SPECIFICATION NO Sr.GM-CPC-TENDER-LAXMIPUR PACKAGE-11 / 2013-14.**

GUARANTEED TECHNICAL PARTICULARS

**(TO BE FILLED AND SUBMITTED BY BIDDERS WITH
THE TECHNICAL BID)**

GUARANTEED TECHNICAL PARTICULARS
IVT AND CVT

GUARANTEED TECHNICAL PARTICULARS.

Sl. No	Description.	220KV IVT	132KV IVT	33KV IVT	400 KV / 220KV CVT	132KV CVT
		3P/0.2 Accuracy Class	3P/0.2 Accuracy Class	0.2 Accuracy Class	3P/3P/0.2 Accuracy Class.	3P/3P/0.2 Accuracy Class.
1	Bidder's name and address.					
2	Name and address of the Manufacturer.					
3	Manufacturer's type and designation.					
4	Standards applicable.					
5	Type of IVT/CVT					
6	Rated primary voltage (kv).					
7	Rated secondary voltage (volts).					
7.1	Winding-I.					
7.2	Winding-II.					
7.3	Winding-III.					
8	Rated frequency [HZ].					
9	Rated burden:- Protection Winding Protection Winding Metering Winding					
10	Number of secondary windings.					
11	Accuracy class.					
[I]	[protection] Winding					
[II]	[metering] Winding					
12	Rated voltage factor for continuous operation at rated frequency.					
13	Rated voltage factor for 30 seconds at rated frequency.					
14	One minute dry and wet power frequency withstand voltage for primary side [kv] rms.					
15	One minute power frequency withstand voltage for secondary winding [kv] rms.					
16	1.2/50 micro- second impulse withstand test voltage for primary side					
17	Temperature rise over an ambient temperature of 50°C					

Sl. No	Description.	220KV IVT	132KV IVT	33KV IVT	400 KV / 220KV CVT	132KV CVT
		3P/0.2 Accuracy Class	3P/0.2 Accuracy Class	0.2 Accuracy Class	3P/3P/0.2 Accuracy Class.	3P/3P/0.2 Accuracy Class.
[a]	With 1.2 times rated primary voltage at rated frequency and at rated burdens. [I] Winding [°C] [II] Oil [°C] [III] Other parts [°C]					
[b]	With 1.5 times rated primary voltage for 30 seconds at rated frequency and at rated burdens. [I] Winding [°C] [II] Oil [°C] [III] Other parts [°C]					
18	Class of insulation.					
19	Total creepage distance in (mm)					
20	Maximum radio interference voltage at 1.1 times maximum line to ground voltage (micro volts)					
21	Corona inception and extinction voltage (kv) rms					
22	Partial discharge level (picocoulombs)					
23	Primary.[For 220KV, 132KV & 33KV IVT] (a) No. of primary turns (b) Material of primary (c) Size of the primary conductor bare/insulated. (d) Cross sectional area of primary conductor (sq.mm) (e) Current density adopted for primary winding(A/sq.mm) (f) Type of primary winding. (g) Name of the insulating materials used for primary conductor. (h) Weight of primary winding.					
24	Secondary. [For 220KV,					

Sl. No	Description.	220KV IVT	132KV IVT	33KV IVT	400 KV / 220KV CVT	132KV CVT
		3P/0.2 Accuracy Class	3P/0.2 Accuracy Class	0.2 Accuracy Class	3P/3P/0.2 Accuracy Class.	3P/3P/0.2 Accuracy Class.
	132KV & 33KV IVT] (a)No. of secondary turns (b) Material of secondary (c) Size of the secondary conductor bare /insulated. (d)Cross sectional area of secondary conductor (mm ²) (e)Current density adopted for secondary winding(A/mm ²) (f)Type of secondary winding (g)Name of the insulating materials used for secondary conductor. (h)Weight of secondary winding.					
25.	Core. [For 220KV, 132KV & 33KV IVT] (a)Shape of the core (b)Material and grade of the core laminations (c)Thickness of the core lamination (mm) (d)Maximum flux density adopted (Tesla) (e)Net iron area of the core (f)Watt loss/kg. for the core materials at the operating flux density(W/kg) (g) Total weight of the core(kg) (h)Whether B-H curve for core material enclosed? (i)Whether specific loss vrs. Flux density curve enclosed ?					
26	INSULATION. [For 220KV, 132KV & 33KV IVT] (a) Insulation between core and secondaries. (b) Insulation between secondaries. (c) Insulation between secondary and primary.					

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		3P/0.2 Accuracy Class	3P/0.2 Accuracy Class	0.2 Accuracy Class	3P/3P/0.2 Accuracy Class.	3P/3P/0.2 Accuracy Class.
	(d) Insulation between primary .and core.					
27	DIMENSIONS OF CORE AND WINDINGS. [For 220KV, 132KV & 33KV IVT] (a)Diameter of the core (mm) (b)Inner diameter of the secondary windings(mm) (c) Outer diameter of the secondary windings (mm) (d) Inner diameter of the primary winding(mm) (e) Outer diameter of the primary winding(mm) (f) Minimum clearance from primary winding to tank(mm) (g) Minimum clearance from secondary winding to tank(mm)					
28.	Percentage voltage ratio (error)/phase displacement (min.)at 100% rated burden at 0.8PF lagging for measuring winding. (a) 80% of rated voltage at frequency:- (b) 120% of rated voltage at frequency:- (c) Accuracy of standard PT to be used. during determination of errors (0.05 or better.					
29.	Percentage Voltage ratio /phase displacement (min.)at 25% rated burden at 0.8PF lagging for measuring winding. (a) 80% of rated voltage at rated frequency:- (b) 120% of rated voltage at rated frequency:-					
30.	Percentage voltage (ratio)error /phase					

Sl. No	Description.	220KV IVT	132KV IVT	33KV IVT	400 KV / 220KV CVT	132KV CVT
		3P/0.2 Accuracy Class	3P/0.2 Accuracy Class	0.2 Accuracy Class	3P/3P/0.2 Accuracy Class.	3P/3P/0.2 Accuracy Class.
	displacement (min.) at 100% rated burden at 0.8PF lagging for protection winding (a)5% of rated voltage. (b)1.2 times rated voltage (c)1.5 times rated voltage (d) 2% of rated voltage..					
31.	Percentage voltage (ratio) error /phase displacement (min) at 25% of rated burden at 0.8PF lagging for protection winding (a)5% of rated voltage (b)1.2 times rated voltage. (c)1.5 times rated voltage. (d) 2% of rated voltage.					
32.	Whether IVT/CVT is suitable for horizontal transportation.					
33.	Quantity of oil per IVT/ CVT (Ltrs/kg)					
34.	Standard to which oil conforms.					
35.	Characteristic of oil(Prior to filling)					
35.1.	Breakdown voltage (kv-rms)					
35.2.	Dielectric dissipation constant tan delta)					
35.3	Water content(PPM)					
35.4	Gas content(PPM)					
35.5	Interfacial tension at 27 degree C(N/m)					
35.6	Specific resistance.					
35.6.1	At 90 deg.C(ohm-cm)					
35.6.2	At 27 deg.C(ohm-cm)					
36.	Whether IVTS are hermetically sealed ? If so how ?					
37.	Total Weight (kg)					
38.	Transport weight (kg)					
39.	Dimensional details.					
40	Whether IVT characteristic					

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		3P/0.2 Accuracy Class	3P/0.2 Accuracy Class	0.2 Accuracy Class	3P/3P/0.2 Accuracy Class.	3P/3P/0.2 Accuracy Class.
	curves enclosed?					
41.	TANK AND SECONDARY TERMINAL BOX.					
41.1	Material of the IVT/ CVT tank					
41.2	Material of the secondary terminal box.					
41.3	Thickness of the IVT/ CVT tank material.					
41.4	Thickness of the secondary terminal box material.					
41.5	Zinc coating of IVT/ CVT tank(g/sq.m)					
41.6	Zinc coating of the secondary terminal box (g/sq.m)					
41.7	Weather proof rating of secondary terminal box.					
41.8	Weight of tank fitting and other accessories.					
	TERMINAL CONNECTORS					
01.	Manufacturer's name					
02.	Applicable standards.,					
03.	Type.					
04.	Material of connector. (a)Clamp body. (b)Bolts and Nuts. (c) Spring Washers					
05.	Rated current.					
06.	(a) Rated terminal load(kg) (b) Factor of safety.					
07.	Minimum thickness of any part(mm)					
08.	Weight of connector complete with hardware.					
09.	Type test reports as per IS enclosed.					
10.	OGA drawing enclosed.					
	BUSHING/SUPPORT INSULATOR					
01	Manufacturer's name					
02.	Type.					
03.	Applicable standards.					

Sl. No	Description.	220KV IVT	132KV IVT	33KV IVT	400 KV / 220KV CVT	132KV CVT
		3P/0.2 Accuracy Class	3P/0.2 Accuracy Class	0.2 Accuracy Class	3P/3P/0.2 Accuracy Class.	3P/3P/0.2 Accuracy Class.
04	Dimensions: (i)Height(mm) (ii)Diameter(top)(mm) (iii)Diameter(bottom)(mm)					
05	Total creepage distance (mm).					
06.	Rated voltage(KV)(rms)					
07.	Power frequency withstand voltage for (1 minute dry and wet(KV/rms)					
08.	1.2/50 micro-second Impulse withstand voltage (KVP)					
09.	Corona Extinction voltage(kv)					
10.	Weight(kg)					
11.	Maximum allowable span (mm)					
12.	Cantilever strength(kg)					
13.	OGA drawing enclosed.					

ADDITIONAL TECHNICAL REQUIREMENT FOR 400 KV,220KV & 132KV CVT

1. Rated capacitance of the CVT
2. High frequency capacitance for entire carrier frequency range.
3. Equivalent series resistance over the entire frequency.
4. Stray capacitance and stray conductance of the LV terminal over entire carrier frequency range.
5. Capacitance (PF) /Tan delta between:-
 - a) HV-HF point
 - b) HF point-Ground point of International Transformer.
 - c) HV-Ground point of Intermediate

Transformer winding.

6. Capacitive reactance of the two parts of the divider i.e. High voltage capacitor, and Intermediate voltage capacitor, connected in parallel.
7. Total Inductive reactance, offered by CVT.
8. Voltage ratio of the capacitor divider.
9. Open circuit Intermediate voltage.
10. Rated open circuit Intermediate voltage.
11. Reference range of temperatures within which the CVT complies with the relevant accuracy requirements.
12. Protective device, in-corporate in the CVT for limiting over voltages and/or to prevent sustained Ferro resonance.
13. Rated voltage of Surge Arrester, connected at the secondary of CVT.
14. Natural frequency of coupling (KHZ).
15. Self tuning frequency of CVT (KHZ).
16. Bandwidth (KHZ).
17. Temperature rise over ambient.
18. One minute power frequency test voltage of secondary winding (KV).
19. One minute power frequency test voltage of H.F. terminal (KV).
20. One minute power frequency test voltage of capacitor (dry & wet) (KV).
21. 1.2/50/micro second Impulse withstand test voltage of capacitor (KVP).
22. 250/2500 micro second switching surge withstand voltage of capacitor (dry & wet).
23. Literature

Whether the followings are enclosed?
23.1 Type Test reports as per IEC 186.

23.2 OGA drawing of CVT and terminal connector.

23.3 Characteristic curves.

23.4 Drawing showing clearance from earthed object.

23.5 Details of Surge Arrester, connected at secondary winding of CVT.

24. ELECTROMAGNETIC UNIT:-

24.1 **CORE:-**

- a) Core diameter (mm)
- b) Window Weight (mm)
- c) Leg centre (mm)
- d) Net cross sectional area of iron In the core (mm²)
- e) Core lamination thickness (mm)
- f) Type & grade of core.
- g) Design flux density at rated voltage. And rated frequency (Tesla)
- h) Design flux density at highest system voltage & lowest system frequency (Tesla).
- i) Minimum knee point voltage (volts).

24.2 **PRIMARY WINDING:-**

- a) No. of turns.
- b) Bare size of conductor
- c) Insulated size of conductor.
- d) Area of cross section.
- e) Current density (A/ mm²).
- f) Conductor material.
- g) Class of insulation.
- h) Power frequency withstand level. (KV-rms).
- i) Impulse withstand level (KVP).

24.3 **Secondary Winding**

- a) No.of turns
- b) Bare conductor size (mm)
- c) Insulated conductor size (mm)
- d) Cross-sectional area (sq.mm)
- e) Current density (A/ mm²)
- f) Conductor material.
- g) Class of Insulation.
- h) Power frequency withstand Level (KV-rms).

Protection Winding

Protection Winding

Metering Winding.

Signature of the Tenderer
with seal and date.

ANNEXURE –B.

CALIBRATION STATUS OF TESTING EQUIPMENTS AND INSTRUMENTS/METERS.

Name of the test.	Meters and equipments required for the corresponding test with range, accuracy, make and Sl. No.	Date of Calibration.	Due date of Calibration.	Name of the Calibrating Agency.	Whether Calibrating Agency is Govt. Approved.	Whether documents relating to Govt. Approval of the calibrating Agency furnished ?	Whether the meters/equipment fulfill the accuracy class as per calibration report	Whether the calibrating agency has put any limitation towards the use of the particular meter/equipment. If yes, state the limitations.	Whether green sticker or blue sticker or yellow sticker has been affixed on the body of the particular equipment/meter. State the colour of the affixed sticker.	Inspite of imposed limitations,, whether the particular meter/equipment can still be used ? Justify its use for corresponding test(s).	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

Signature of the tenderer with seal and date.

ANNEXURE-C

CHECK LIST TOWARDS TYPE TEST REPORTS.

Name of the Type Test.	Date of Test.	Name of the Laboratory where the Test has been conducted.	Whether the Laboratory is Government Approved.	Whether the Test reports are valid as per Clause No.8.1 of T.S.	Whether the copy of Test Report in complete shape alongwith drawings etc. furnished or not ?	Whether the Tested I.V.T. fulfills the technical requirements as per TS.	If the type tested I.V.T does not fulfill the technical requirements as per this specification, whether the bidder agrees to conduct the particular test(s) again at their own cost without any financial liability to OPTCL in the presence of OPTCL's representative within the specified delivery period.	Remark
1	2	3	4	5	6	7	8	9

Signature of the Tenderer with
seal and date.

GUARANTEED TECHNICAL PARTICULARS

BATTERY AND BATTERY CHARGER

ANNEXURE – I

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR 220V LEAD ACID PLANTE STORAGE BATTERY.

[To be filled in by the bidder]

350AH/550AH
Values/Others

1.	Manufacturer's Name and address alongwith Fax No. & Tele phone No.	
2.	Conforming to standards	
3.	Type and designation as per ISS	
4.	Manufacturer's type and designation	
5.	AH capacity and voltage of the battery at 27 deg.C.	
[a]	At 10 hour rate of discharge.	

[b]	At 5 hours rate of discharge.	
[c]	At 1 hour rate of discharge	
[d]	At 1 minute rate of discharge.	
[e]	At ½ hour rate of discharge.	
6.	Open circuit voltage of each battery cell.	
[a]	Fully charged	
[b]	Floating condition.	
[c]	When completely discharged at.	
[i].	10hr. rate.	
[ii].	5 hour rate	
[iii]	1 hour rate	
[iv]	½ hr. rate	
[v].	1 minute rate	
[vi]	1-second rate.	
7.	Recommended float charging voltage [volts] across the battery terminals.	
8.	Recommended boost charging voltage [volts].	
9.	Time required for boost charging from discharged conditions [in hours]	
10.	Trickle charging Current range/cell	
11.	AH capacity at 10 hour rate at 10 hour rate at room temperatures of :	
[a]	15 deg C.	
[b]	27 deg C.	
[c]	50 deg C.	
12.	CELL DETAILS	
[i].	No. of cells per battery	
[ii].	Total nos. of plates per cell.	
[iii]	No. of positive plates per cell.	

(iv)	Type of positive plate	
(v)	No. of negative plates per cell	
(vi)	Type of negative plate	
(vii)	Surface area of plates in sq. mm.	
(viii)	CONSTRUCTIONAL DETAILS AND DIMENSIONS OF	
)		
(a)	Positive plate	
(b)	Negative plate	
(c)	Material of the container	
(d)	Thickness of the container	
(e)	Overall dimensions of each cell (LxBxH)	
ix.	Weight per Cell (Kg)	

(a)	Active elements-positive	
(b)	Active elements-Negative	
(c)	Container	
(d)	Net dry weight	
(e)	Weight with electrolyte	
x.	Distance between centre of cells where erected.	
xi.	Nominal cell voltage.	
xii.	Internal resistance of each cell at	
(a)	Fully charged condition	
(b)	Fully discharged condition	
(c)	Floating condition	
13.	Type, Thickness and materials of the separators	
14.	Containers	
(a)	Type	
(b)	Material	
(c)	Outside dimensions (LxBxH)	
15.	Cover and its type and material	
16.	Clearance in mm between	
(a)	Top of plates and top of container	
(b)	Bottom of plates and bottom of container	
(c)	Edges of plates and inner surface of container.	
17.	Sediment space (depth) in mm	
18.	ELECTROLYTE	
(a)	Amount of electrolyte and specific gravity at 27 deg. C for first filling.	
(b)	First filling per set with 10% of extra furnished.	
(c)	Electrolyte conforms to standard	
(d)	Rated specific gravity of electrolyte when fully charged at room's temperature of	
(i)	15 deg. C	
(ii)	27 deg. C	
(iii)	50 deg C.	
(e)	Specific gravity of electrolyte at the end of discharge at 10 hour discharge rate.	
(f)	Maximum electrolyte temp. that the	

	cells can withstand without injurious effect.	
(i)	Continuously	
(ii)	For short period	
19.	INTER CELL CONNECTOR	
(a)	Whether Inter-cell connector to be furnished ? (Yes / No)	
(b)	Type of inter-cell connector (bolted or others)	
(c)	Materials of inter cell connector	
20.	Inter row, inter-tier connectors and end take-off furnished ? (Yes / No)	
(a)	Inter row, inter-tier connectors and end take-off furnished ? (Yes / No)	
(b)	Description, size, current rating, type and material.	
21.	RACKS	
(a)	No. of racks per battery	
(b)	No. of cells per rack	
(c)	Type of racks (rows and tiers)	
(d)	Material of the rack	
(e)	Racks provided with	
(i)	Numbering tags for cell	
(ii)	Teak wood clamps for cables	
(f)	Whether anti-acid coating provided ?	
(g)	Description of rack insulators	
(h)	Outline dimensions of racks	
(i)	Net weight of racks	
(j)	Shipping weight	
22.	Recommended rate for charging the battery in 8 hours.	Start Finish
(a)	Current	
(b)	Voltage	
23.	Recommended float charge rate	
24.	Resistance of the battery including inter-connector between the cells in ohms.	
25.	Maximum short circuit current per battery	
(a)	Maximum short circuit current per battery	
(b)	Allowable duration of short circuit	
26.	Short circuit current for a dead short across the battery terminals when	
(a)	Float at 2.1 volts per cell.	
(b)	Boost charge to 2.75 volts per cell.	

27.	Time to full charge at finishing rate only	
(a)		
(b)	Time to full charge at higher starting rate	
(c)	Time for full charge to charge by two step charging at starting up and finishing rates	
28.	Guaranteed AH efficiency at 10 hour rate of discharge in percent.	
29.	Guaranteed WH efficiency at 10 hour rate of discharge in percent.	
30.	Instructions for filling and initial charging of the battery with finishing and two step charging rates.	
31.	Recommended interval at which battery should be discharged at 10 hour rate and quick charged.	
32.	Recommended floating voltage per cell and the minimum variation.	
33.	Recommended maximum period of storage before the first charge.	
34.	Average life in years	
35.	Guaranteed life of battery in years.	
36.	Estimated life of battery in years.	
37.	Total shipping weight of battery units	
38.	Dimensioned lay-out drawings of the rack and battery to be attached with the tender. (Whether furnished ? Yes / No)	
39.	The following characteristic curves, to be furnished alongwith the tender (whether furnished)	
(a)	Battery discharge curves at various rates between one minute and 10 hour rate. (Yes / No.)	
(b)	Curves showing the relation between the specific gravity and amount of charge in the battery for both charging and discharging conditions. (Yes / No)	
(c)	Curves showing the relation between cell voltage and charging current	

	when charged at	
(i)	Finishing rate (Yes/ No)	
(ii)	High starting rate (Yes/ No)	
(iii)	Two step charging by starting and finishing rate (Yes / No)	
(d)	Curve of internal resistance at the end of various discharge rates (Whether furnished (Yes / No)	

ANNEXURE – II

GUARANTEED TECHNICAL PARTICULARS FOR BATTERY CHARGER (220 V D.C. SYSTEM) SUITABLE FOR SPECIFIED LEAD ACID PLANTE STORAGE BATTERY

(To be filled in by the Bidder)

Values/ Others

1. Manufacturer's Name
2. Rated output of the charger
 - 2.1 Voltage (volts)
 - 2.2 Current (amps)
 - 2.3 Power factor
3. Short time rating
4. Type of cooling

- 10.14 Material of primary winding conductor
- 10.15 Material of secondary winding conductor
- 10.16 Size, Cross-sectional area and current density of primary winding conductor.
- 10.17 Size, cross-sectional area and current density of secondary winding conductor
- 10.18 No. of turns of primary / phase
- 10.19 No. of turns of secondary / phase
- 10.20 Name of the insulating materials used and class
- 10.21 Core
 - 10.21.I Name of the core material
 - 10.21.II Grade of the core
 - 10.21.III Thickness of core material (mm)
- 10.22 Maximum temperature rise over an ambient temperature of 50°C
 - (a) Primary Winding (°C)
 - (b) Secondary Winding (°C)
 - (c) Core (°C)
- 10.23 standards applicable
- 11.0 RECTIFIER ASSEMBLY :
 - 11.1 Make
 - 11.2 Type of semi conductor material
 - 11.3 Rated direct current per cell (A)
 - 11.4 Rated direct voltage (V)
 - 11.5 Rated input voltage (V)
 - 11.6 Type of connections of rectifier elements.
 - 11.7 Forward power loss and reverse power loss (watts).
 - 11.8 Forward voltage drop and reverse voltage drop (volts)
 - 11.9 Conversion efficiency (%)
 - 11.10 Rated DC output voltage (V)
 - 11.11 Rated AC input voltage (V)
 - 11.12 Rated output current (A)
 - 11.13 Ripple factor

- 11.14 Voltage factor
- 11.15 Current factor
- 11.16 Maximum temperature rise over an ambient temperature of 50⁰C (°C)
- 11.17 Maximum permissible ambient temperature for guaranteed rating (°C)
- 11.18 Maximum and minimum permissible humidity rating (%)
- 11.19 Life expectancy (years)
- 11.20 Standard(s) applicable
- 11.21 Characteristic curve of DC output plotted against output current (Whether submitted ?) Yes / No.
- 12.0 AUTOMATIC VOLTAGE REGULATOR
 - 12.1 manufacturer's name
 - 12.2 Manufacturer's type
 - 12.3 Percentage stabilisation of the rectifier with the help of AVR when
 - (a) Input voltage changes with \pm of its nominal value.
 - (b) DC output of the rectifier varies from no-load to full load.
 - 12.4 Rated output voltage
 - 12.5 Allowable AC frequency fluctuations
 - 12.6 Voltage setting range
 - 12.7 Response time of automatic voltage regulator
- 13.0 Manual voltage regular (float mode)
 - 13.1 Type
 - 13.2 Voltage setting range
- 14.0 Boost charging current setting range
- 15.0 Boost charging limit setting range
- 16.0 DIODES
 - 16.1 Manufacturer's name
 - 16.2 Type of circuit
 - 16.3 Method of construction
 - 16.4 Continuous current rating (Amps.)

- 16.5 Short time current rating (Amps)
- 16.6 Type of cooling
- 16.7 Forward power loss and reverse power loss (W)
- 16.8 Life expectancy
- 16.9 Forward voltage drop on rated current
- 16.10 Resistance offered for reverse current flow
- 16.11 Maximum temperature rise over an ambient temperature of 50⁰ C.

17.0 CONTACTORS / MOULDED CASE CIRCUIT BREAKERS

- 17.1 Type
- 17.2 Make
- 17.3 Rated voltage (V)
- 17.4 Rated continuous currents (A)
- 17.5 Contact material
- 17.6 Operating coil
 - 17.6.1 Voltage (V)
 - 17.6.2 Voltage range and power for closing and holding
 - 17.6.3 Voltage range and power for drop off.
- 17.7 Thermal trip rating
- 17.8 Thermal trip time
- 17.9 Details of CT if any
- 17.10 Auxiliary contacts
 - 17.10.1 Number
 - 17.10.2 Current rating
- 17.11 Characteristics of back-up HRC fuse

18.0 RELAYS :

- 18.1 Make and type of protective and alarm relays
 - (a) Thermal overload relay
 - (b) Input under voltage relay
 - (c) Single phasing alarm relay

- (d) Phase reversal relay
- (e) D.C. output over-voltage relay
- (f) D.C. output under voltage relay
- (g) Charger failure relay
- (h) Battery earth fault relay
- (i) A.C. input failure relay (for connecting the D.C. load)
- (j) Fuse failure relay
- (k) Alarm accept relay

18.2 Rated voltage of each of the above

- (a) AC/DC
- (b) Permissible variation
- (c) Frequency

18.3 VA burden of each of the above

18.4 Operating time of each of the above

18.5 Time vs current curves of each of the above.

(to be enclosed alongwith the offer)

18.6 Reset time

18.7 Accuracy

18.8 Setting range

18.9 Reset factor

18.10 Number of contacts

- (a) Normally open
- (b) Normally closed

18.11 Rating of contacts

- (a) Rated Voltage (V)
- (b) Rated making and breaking
- (c) Continuous rating

18.12 No. of operations

18.13 Operation indicator

19.0 INDICATING LAMPS

19.1 Manufacturer's name

19.2 Type and designation

19.3 Permissible voltage variation

19.4 Rated power consumption (watts).

19.5 Series resistance, if any

20.0 SWITCHES:

20.1 Manufacturer's name

20.2 Ratings

(a) Continuous current

(b) Short circuit – making capacity

(c) Breaking capacity

(d) Voltage

20.3 Operating mechanism details

20.4 Type of visual indication

(a) OFF and ON position

(b) Fuse blow out

21.0 FUSES

(a) Make

(b) Type

(c) Rating (Amps)

(d) Interrupting rating (KA)

22.0 INSTRUMENTS

22.1 Manufacturer's Name

(a) Ammeter

(b) Voltmeter

22.2 Type

(a) Ammeter

(b) Voltmeter

22.3 Standard

- (a) Ammeter
- (b) Voltmeter

22.4 Scale range

22.4.1 Ammeter

- (a) Float charger
- (b) Boost charger
- (c) Battery float
- (d) Battery boost

22.4.2 Volt meter

- (a) Input supply
- (b) Charger output
- (c) Load

22.5 Size of dial

- (a) Volt meter
- (b) Ammeter

22.6 Accuracy class

- (a) Volt meter
- (b) Ammeter

22.7 Temperature at which calibrated

22.8 Limit of errors

22.9 Out line dimensions

22.10 Type of mounting

22.11 Selector switch for volt meter (AC & DC)

- (a) Make
- (b) Rating

23.0 CAPACITOR

23.1 Manufacturer's name

23.2 Type

23.3 Capacitance (Farad)

23.4 Maximum temperature rise over an ambient temperature of 50°C.

24. Reference float voltage at ambient temperature of 27°C

25. Whether protection is given for float voltage to Avoid low battery voltage due to sensor or circuit Malfunction. (Yes/ No).

ANNEXURE – IV-A
(For Testing of Battery)
(To be filled in by the bidder)

CALIBRATION STATUS OF TESTING EQUIPMENTS AND INSTRUMENTS/ METERS

Name of the Test	Meters & Equipments required for the corresponding test with range, accuracy, make & Sl. No.	Date of Calibration	Due date of Calibration	Name of the Calibrating Agency	Whether Calibrating Agency is Govt. approved	Whether documents relating to Govt. approval of the calibrating Agency furnished	Whether the meters/ equipments fulfil the accuracy class as per calibration report.	Whether the calibrating agency has put any limitation towards the use of the particular meter/ equipment. If yes, state the limitations	Whether the calibrating agency has put any limitation towards the use of the particular meter/equipment/ meter. State the colour of the affixed sticker	Inspite of imposed limitations. Whether the particular meter / equipment can still be used ? Justify its use for corresponding test(s)	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

Signature of the tenderer with seal & date

ANNEXURE – IV-B
(For Testing of Battery Charger)

CALIBRATION STATUS OF TESTING EQUIPMENTS AND INSTRUMENTS/ METERS

Name of the Test	Meters & Equipments required for the corresponding test with range, accuracy, make & Sl. No.	Date of Calibration	Due date of Calibration	Name of the Calibrating Agency	Whether Calibrating Agency is Govt. approved	Whether documents relating to Govt. approval of the calibrating Agency furnished	Whether the meters/ equipments fulfil the accuracy class as per calibration report.	Whether the calibrating agency has put any limitation towards the use of the particular meter/ equipment. If yes state the limitations	Whether the calibrating agency has put any limitation towards the use of the particular meter/equipment/ meter. State the colour of the affixed sticker	In spite of imposed limitations. Whether the particular meter / equipment can still be used ? Justify its use for corresponding test(s)	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

Signature of the tenderer with seal & date

ANNEXURE V – A
CHECK LIST TOWARDS TYPE TEST REPORTS FOR BATTERY

Name of the Type Test	Date of Test	Name of the Laboratory where the Test has been conducted	Whether the Laboratory is Government approved	Whether the Test report is valid as per Spn.	Whether the Test report in complete shape alongwith drawings etc. furnished or not ?	Whether the type tested Plante lead acid battery fulfills the technical requirements as per TS	If the type tested battery does not fulfill the technical requirements as per this specification, whether the bidder agrees to conduct the particular type test again at their own cost without any financial liability to OPTCL in the presence of OPTCL's representative within the specified	Remarks
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							delivery period	
1	2	3	4	5	6	7	8	9

Signature of the tenderer with seal & date

ANNEXURE V – B
CHECK LIST TOWARDS TYPE TEST REPORTS FOR BATTERY CHARGER

Name of the Type Test	Date of Test	Name of the Laboratory where the Test has been conducted	Whether the Laboratory is Government approved	Whether the Test report is valid as per Spn.	Whether the Test report in complete shape alongwith drawings etc. furnished or not ?	Whether the type tested battery charger fulfills the technical requirements as per TS	If the type tested battery charger does not fulfill the technical requirements as per this specification, whether the bidder agrees to conduct he particular type test again at their own cost without any financial liability to OPTCL in the presence of OPTCL's representative within the specified delivery period	Remarks
1	2	3	4	5	6	7	8	9

Signature of the tenderer with seal & date.

GUARANTEED TECHNICAL PARTICULARS

FOR

SF6 AND VACUUM CIRCUIT BREAKERS

GUARANTEED TECHNICAL PARTICULARS FOR CIRCUIT BREAKERS

For **420 KV,245 KV & 145 KV SF6 CB**

1. (a) Maker's name and country of manufacture
(b) Manufacturer's type Designation

1. Applicable technical standards
2. (a) Rated voltage(kV)
 - (b) Rated frequency(Hz)
4. Number of Poles
5. Class
6. Rated normal current
 - (a) Under site conditions(Amps)
 - (b) Rated (Amps)
7. (a) Rated short circuit breaking current
 - (i) Rms value of AC component of rated short circuit current (KA)
 - (ii) Percentage DC component
 - (iii) Assymetrical Breaking Current at Highest System Voltage
 - (iv) Certificate or report no
 - (iii)** Oscillogram no.
- (b) Rated short circuit making current (KA peak)
 - (i) At Higher rated Voltage
 - (ii) At Lower rated Voltage
- (c) (i) Maximum Breaking capacity Under Phase Opposition(KAP)
 - (iii) Max Pole discrepancy(ms)
 - (iv) Max arc duration & Corresponding current under lockout pressure
8. First pole to clear factor
9. Rated transient recovery voltage for terminal faults (kV peak)
10. Rated characteristics for short line faults.
11. Rated operating sequence

12. Rated duration of short circuit(Sec.)
 13. Rated out of phase making & breaking current (kA)
 14. (a) Opening time (ms)
 - (i) Maximum Opening time under any condition
 - (ii) With limiting Voltage & Pressure.
 - (b) Arcing time (ms)
 - (i) At 100% rated breaking current (ms)
 - (ii) At 50% rated breaking current (ms)
 - (iii) At 25% rated breaking current (ms)
 - (iv) At 10% rated breaking current (ms)
 - (v) Maximum arcing time at lowest fault current (ms).
 - (c) Break Time (ms)
 - (i) At 100% rated breaking current (ms)
 - (ii) At 50% rated breaking current (ms)
 - (iii) At 25% rated breaking current (ms)
 - (iv) At 10% rated breaking current (ms)
 - (v) Maximum break time at lowest fault current (ms).
 - (v) Maximum Total Break Time under any duty condition
For any current up to rated breaking current with limiting condition of Voltage & Pressure(ms)
 - (d) Closing time (ms)
 - (e) Minimum dead time for 3 phase reclosing
 - (f) Maximum Close Open Time under any condition
With limiting Voltage & Pressure.
 - (g) Minimum Time Interval between each make/ Break Operation.
-
15. Rated line charging breaking current (kA)

16. Rated small inductive breaking current (kA)
17. (i)Max. rise of temperature over ambient for current rating under sl. 6.
(ii)Max. rise of temperature for Main contacts over design ambient temperature of 50deg C.
18. Interrupting capacity based on duty cycle as per sl. 11.
 - (a) AC ;component (kA)
 - (b) Percentage DC component.
19. Latching current (kA)
20. No. of breaks in series per pole.
21. Length of contact travel (mm)
22. Total length of break per pole (mm)
23. Rate of contact travel:
 - (a) At tripping (metres/sec.)
 - (b) At closing (metres/sec.)
24. Type of devices, if any, used to obtain uniform voltage distribution between breaks.
25. Recovery voltage distribution between breaks in percent of rated voltage.
 - (a) Single line to ground fault
 - (b) Interruption on short lines.

- (c) Switching off an unloaded, transformer
26. (i) Type of main contact.
(ii) Number of auxiliary contacts per pole for normal operation(NO & NC)
(iii) Number of auxiliary contacts per pole provided for Owner's use(NO & NC)
(iv) Current rating of Auxiliary contacts
27. Type of arcing-contacts and/or arc control device
28. Material of contacts:
- i. Main
 - ii. Arcing
 - iii. Whether contacts are silver plated
 - iv. Thickness of silver coating mm
 - v. Contact pressure, kg/sq. mm.
29. Insulation level of the breaker:
- (a) 1 minute power frequency withstand voltage kV rms(Dry & Wet)
 - (i) Between live terminals & Ground
 - (ii) Between terminals with Breaker contacts open
 - (b) Switching surge withstand test Voltage kV (peak)
 - To earth
 - Across open contacts
 - (c) Lightning impulse withstand test voltage, kV(peak)
 - To earth
 - Across open contacts
 - (d) Max. dynamic power frequency over voltage withstand kV (peak)

30. i) RIV level (Max)
 ii) Corona inception voltage (kV rms)
 iii) Corona extinction voltage (kV rms)
31. Minimum clearances
 (a) Between phases (live parts)(mm)
 (b) Between live parts and earth (mm)
 (c) Total Creepage Distance (i) To ground
 (ii) Between Terminals
32. Whether the circuit breaker is fixed trip or trip free
33. Method of closing
 (a) Normal
 (b) Emergency
34. Type of closing mechanism
35. (a) Normal voltage of closing
 (b) Pick up range (volts DC)
36. (a) Power at normal voltage of closing mechanism (watts)
 (b) Power at 85% of normal voltage of closing mechanism(watts)
 (c) No of closing coils in operation
37. Type of tripping mechanism
 Number of Tripping Coil
38. (A) Normal voltage of tripping coils(volts)
 (a) Power at normal voltage for Tripping coils (watts)
 (b) Power at 70% normal voltage for Tripping coils (watts).

- (c) No. of tripping coils in operation
 - (d) Pick up range (V DC)
 - (B) Number of close open operation
 - (i) possible after failure of AC supply to motor
 - (ii) Time required for motor to charge the closing spring(Sec)
 - (iii) Wheather indication of spring charged condition will be provided in control cabinet.
39. Arc duration at 100% (ms)
40. Interruption capacity:
- a) Opening
 - Arcing time no. of loops and time including resistor current duration (cycle)

 - Resistor current duration (cycle)

 - Total length of the arc (mm)

 - Max. length of the arc (mm)

 - Total interrupting time measured from instant of trip coil energisation to arc extinction of resistor current (cycles)
 - b) Closing time measured from instant of application of power to closing device upto arcing contacts touchings (cycles)
41. Critical current (current giving the longest arc when a break takes place) (kA)
- a) Recovery voltage when circuit breaker tested at 100% rated breaking capacity (kV inst.)

- b) Rate of rise of restriking voltage at breaking
 - i) for 30% breaking capacity (kV/microsecs.)
 - ii) for 100% breaking capacity (kV/microsecs.)

- c) Maximum over-voltage factor of the circuit breaker when switching off.

- i) Unloaded transformers
 - ii) Loaded transformer
 - iii) Open circuited lines

42. When switching of synchronous systems:

- (a) Max. current (kA)
- (b) Max. contacts of 1 pole (kV)

43. No. of openings the circuit breaker is capable of performing without inspection, replacement of contacts or other main parts.

- (a) at 50% rated current
- (b) at 100% rated current
- (c) at current corresponding to 50% rated breaking capacity.
- (d) at current corresponding to 100% rated breaking capacity.

44. (A)a) Weight of complete circuit breaker (Kg).

- b) Impact loading for foundation design, to include dead load plus impact value on opening at maximum interrupting ratings, in terms of equivalent static load (Kg.)

- c) Overall dimensions:

- Height (mm)

Width (mm)

Length (mm)

(B)- Type & Material of Gasket used to ensure gas tight joints for

(i) Metal to Metal Joint

(ii) Metal to Porcelain Joints

(C) Type & Make of

a) Density Monitor

b) Pressure Gauge

(D) Density Monitor Setting

a) Lock Out

b) Alarm

45. Porcelain:

a) Make

b) Type

c) Descriptive pamphlet no.

d) Weight (kg.)

e) Transport dimensions (mm)

f) Height above floor, required to remove porcelain (mm).

g) Insulation class

h) One minute power frequency withstand, kV (rms) (dry & wet)

i) Flash over voltage (kV)

j) Lightning impulse withstand voltage kV (peak) (dry & wet)

k) Switching surge withstand voltage kV (peak) (wet)

l) Corona discharge voltage (kV rms)

m) Creepage distance, total protected (mm)

n) Permissible safe cantilever loading on installed porcelain (Kg.m)

46. (i) Rated pressure of SF₆ gas in the circuit breaker (Kg/sq.cm)

(ii) Rated Pressure of SF₆ in operating Chamber(kg/cm²) at 20deg C

(iii) Limits of Pressure of extinguishing medium

47. Rated pressure of SF₆ gas in the gas cylinders
(Kg/sq.cm)
48. (i)Quantity of SF₆ gas required per single pole unit
(Kg.) at rated Pressure & at 20 deg C
(ii) Guaranteed Maximum Leakage rate per Year.
49. Quantity of SF₆ gas per cylinder (Kg.)
Standard to which SF₆ Gas Complies.
50. (i) Weight of empty cylinder (Kg.)
(ii) Wheather Breakers are dispatched filled with SF₆
Gas or filled at site.
51. Quantity of absorbent required per pole (Kg.)
52. Recommended interval for renewal of absorbent
in case of outdoor circuit breakers operating in tropical
conditions.
53. Chemical composition of absorbent
54. Quantity of absorbent covered in the scope of supply
(including spare quantities)
55. Limits of gas pressure for pressure operation of circuit breaker – (Kg/sq.cm)
56. Pressure and temperature at which the temperature compensated gas pressure
switch will
- give alarm (Kg/sq.cm., deg. C)
 - cut off (Kg/sq.cm. deg. C)
57. Name of SF₆ supplier and country of origin.
58. Quantity of SF₆ gas supplied for
- Actual use in breakers (Kg.)
 - As spare (Kg.)
59. Chemical composition of gas:
- Qty. of air by weight (ppm)
 - Qty. of H₂O by weight (ppm)
 - Qty. of CF₄ by weight (ppm)
 - Qty. of free acid by weight (ppm)
 - Density
 - Oil Content
 - Resistivity
60. Motor For Circuit Breaker
- Manufacture's name & address
 - Equipment driven by motor or not.
 - Motor Type
 - Country of Origin
 - Type of Duty

- f) Type of Enclosure & Method of Cooling
 - g) Applicable Standard to which motor confirms
 - h) Type of mounting
 - i) Direction of rotations as viewed from non driving end.
 - j) Standard Continuous rating at 50deg C
 - k) Rated Voltage
 - l) Rated Speed at rated Voltage & Frequency(rpm).
 - m) Full Load current at rated voltage & frequency.
 - n) Power Factor at rated load.
 - o) Rating of the Motor.
 - p) Time for fully charging the closing spring
61. Control Cabinet
- (a) Material of enclosure
 - (b) Thickness of sheet steel
 - (c) Painting for control cubicle
 - (d) Paint shade
 - (e) Degree of protection
 - (f) Dimension
 - (g) Material of gasket

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR 36 KV

CIRCUIT BREAKERS

1. Name of Manufacturer.
2. Manufacturer's type designation.
3. Rated Voltage. - KV
4. Maximum (continuous) service rated Voltage
- KV
5. Normal current rating.
 - a) Under normal conditions.
 - b) Under site conditions.
6. Short time current rating for seconds (rms)
7. Maximum temperature rise over ambient. -°C
8. Breaking capacity.
 - a) Symmetrical. KVA
 - b) Assymmetrical. MVA
9. Making capacity. KA
10. Total break time in ms.
 - a) at 10% rated interrupting capacity - MS
 - b) at rated interrupting capacity - MS
11. Arcing time. - M.S.
12. Make time. - M.S.
13. Minimum reclosing time at full rated - M.S.
Interrupting MVA from the instant of Trip coil energisation.
14. Minimum dead time for 3 phase reclosing.- M.S.

15. Whether restricting free. - Yes/No
16. One minute dry power frequency
Withstanding test voltage (KV rms)
Between line terminal and ground objects. - KV rms.
Between terminal with breaker contacts open. -KV rms.
17. 1.2/50micros full wave impulse withstand test voltage for the two cases
above.
- i) Between line terminal & grounded objects. -KV(Peak)
- ii) Between terminal with breaker Contacts open. -
18. **Busing or Insulators :**
- i) Type of bushing. -
- ii) Dry 1 minute power frequency - KV rms
withstand test voltage.
- iii) Dry flashover value. - KV rms.
- iv) Wet flashover value. - KV rms.
- v) 1.2/50 impulse withstand - KV(Peak)
- vi) Creepage distance. - mm
- vii) Puncture value of bushing. - KV
- viii) Weight of bushing. - Kg.
19. Minimum clearance in air.
- i) Between phases. - mm
- ii) Live parts to earth. - mm
- iii) Live parts to ground level - mm
- iv) Between live parts & grounded object. - mm
20. Number of poles of circuit breaker.
21. Number of breaks per phase.
22. Total length of break per phase.
23. Type of main contacts.
24. Type of Aux. Contacts.
25. Materials of auxiliary contacts.

26. Contacts silver plated or not.
27. Thickness of silver plating.
28. Contact pressure.
29. Voltage distribution between breaker.
30. Type of device if any, used to limit
the rate of rise or restricting voltage.
31. Voltage grading device if any used.
32. Number of auxiliary contacts provided.
 - i) Those closed when breaker is closed.
 - ii) These open when breaker is closed.
 - iii) Those adjustable with respect to
the position of main contacts.
33. Type of operating mechanism.
 - i) Opening
 - ii) Closing.
34. Control circuit voltage.
35. Power required for trip coil - Watts
at 220V D.C.
36. Power required for close coil
At 220V D.C. - Watts
37. Frequency at which contacts are
To be replaced.
38. Nos. of terminal connector.
39. Steel support structure galvanized - Whether
With foundation – Nuts & Bolts to be provided yes or no
40. Type test certificate Furnished - Yes/No
41. Circuit Breaker weight. - Kg.
42. Quantity. - Nos.

GUARANTEED TECHNICAL PARTICULARS

FOR

CURRENT TRANSFORMER

**GUARANTEED TECHNICAL PARTICULARS FOR CURRENT TRANSFORMER TO BE FILLED BY THE
BIDDER.**

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
1.	Bidder's name and address								
2.	Name and address of the Manufacturer								
3.	Manufacture's type designation								
4.	Standards applicable								
5.	Rated frequency (HZ)								
6.	Rated Voltage (KV)								
7.0	Rated current (A)								
7.1	Rated continuous current (A)								
7.2	Rated extended primary current (A)								
8.	Short time thermal current withstand for stipulated time duration (KA)								
9.	Dynamic current withstand (KAP)								
10.	1.2/50 μ s impulse withstand voltage (KVP)								
11.	One minute dry and wet power frequency withstand voltage (KV-rms)								
12.	No. of cores per CT								
13.	Transformation Ratio								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
14.	No. of secondary turns								
15.	Rated output at all ratios for metering core (VA)								
16.	Accuracy class								
17.	Minimum Knee point voltage at different taps for all 'PS' class cores (V)								
18.	Secondary winding resistance at different taps for all cores (Ω) (75°C)								
19.0	Maximum exciting current at all ratios (for all PS class cores)								
19.1	100% KPV (Knee point voltage) (mA)								
19.2	25% KPV (Knee point voltage) (mA)								
19.3	20% KPV (Knee point voltage) (mA)								
19.4	10% KPV (Knee point voltage) (mA)								
20.	Instrument security factor at different ratios.								
21.	Radio interference voltage at 1.1 V _r /3 ^{1/2} at 1.0 MHZ (Micro volts)								
22.	Whether auxiliary CT provided for metering winding								
23.	Corona extinction voltage (KV rms)								
24.	Partial discharge level (PC)								
25.	Total creepage distance (mm)								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
26.	Primary								
26.1	No. of primary turns								
26.2	Material and cross-section of primary (mm ²)								
26.3	Type of primary								
27.	Whether CT is suitable for transportation horizontally.								
28.	Percentage current (ratio) error and phase displacement in minutes at rated burden and at								
28.1	5% rated current								
28.2	10% rated current								
28.3	20% rated current								
28.4	120% rated current								
29.	Percentage current (ratio) error and phase displacement in minutes at 25% rated burden and								
29.1	At 5% rated current								
29.2	At 10% rated current								
29.3	At 20% rated current								
29.4	At 120% rated current								
30.	Quantity of oil per CT (Litres)								
31.	Standard to which oil conforms generally.								
32.	Characteristics of oil (prior to filling)								
32.1	Breakdown voltage (KVrms)								
32.2	Dielectric dissipation constant								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
	(tan delta)								
32.3	Water content (ppm)								
32.4	Gas content								
32.5	Interfacial tension at 27°C (N/m)								
32.6	Specific resistance								
32.6.1	At 90°C (Ωcm)								
32.6.2	At 27° C (Ωcm)								
33.	Whether current transformers are hermetically sealed. If so, how ?								
34.	Total weight (Kg)								
35.	Transport weight (Kg)								
36.1	Temperature rise over an ambient temperature of 50°C for continuous operation at rated continuous thermal current.								
36.1	Winding								
36.2	Oil								
36.3	External surface of the core, metallic parts in contact with or adjacent to insulation.								
37	Whether CT characteristic curves enclosed.								
37.1	Ratio and phase angle curve								
37.2	Magnetisation curves								
37.3	Ratio correction factor curves.								
38.	DATA ON PRIMARY WINDING								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
38.1	Rated primary current (A)								
38.2	No. of conductors in one turn								
38.3	No. of turns of primary								
38.4	Material of the primary conductors								
38.5	Size of the primary conductor (Bare/ Insulated (mm x mm)								
38.6	Cross-sectional area of each conductor (mm ²)								
38.7	Total cross-sectional area of primary winding (mm ²) conductors								
38.8	Current density(A/mm ²)								
	(i) At highest ratio								
	(ii) At intermediate ratio								
	(iii) At lowest ratio								
38.9	Short circuit current density (A/mm ²)								
	(i) At highest ratio								
	(ii) At intermediate ratio								
	(iii) At lowest ratio								
38.10	Ampere-turn of Primary (AT)								
	(i) At highest ratio								
	(ii)At intermediate ratio								
	(iii) At lowest ratio								
38.11	Length of primary conductor (m)								
38.12	Weight of primary winding (kg.)								
39.	CORE								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
39.1	Material and grade of the core								
39.2	Thickness of core (mm)								
39.3	Net Iron cross-sectional area of core (mm ²)								
39.3.1	Core-1								
39.3.2	Core – 2								
39.3.3	Core – 3								
39.3.4	Core – 4								
39.3.5	Core – 5								
39.4	Mean magnetic path length (cm)								
39.4.1	Core – 1								
39.4.2	Core – 2								
39.4.3	Core – 3								
39.4.4	Core – 4								
39.4.5	Core – 5								
39.5	Whether B-H curve for the core material, used, furnished ? (B-wb/m ² , H-AT/cm)								
39.6	Whether specific loss vs. flux density graph for the core material used furnished ?								
39.7	Axial length of core (mm)								
39.7.1	Core – 1								
39.7.2	Core – 2								
39.7.3	Core – 3								
39.7.4	Core – 4								
39.7.5	Core – 5								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
39.8	Inside diameter / outside diameter of the cores (mm)								
39.8.1	Core – 1								
39.8.2	Core – 2								
39.8.3	Core – 3								
39.8.4	Core – 4								
39.8.5	Core – 5								
39.9	Weight of the core (kg)								
39.9.1	Core – 1								
39.9.2	Core – 2								
39.9.3	Core – 3								
39.9.4	Core – 4								
39.9.5	Core – 5								
40.	SECONDARY WINDINGS								
40.1	Rated secondary current (A)								
40.2	Material of the secondary windings								
40.3.	Size of the secondary conductor [Bare / Insulated] [mm]								
40.3.1	Core – 1								
40.3.2	Core – 2								
40.3.3	Core – 3								
40.3.4	Core – 4								
40.3.5	Core – 5								
40.4	Cross sectional area of the secondary conductor (mm ²)								
40.4.1	Core – 1								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
40.4.2	Core – 2								
40.4.3	Core –3								
40.4.4	Core – 4								
40.4.5	Core – 5								
40.5	Current density of secondary windings (A/mm ²)								
40.5.1	Core – 1								
40.5.2	Core – 2								
40.5.3	Core – 3								
40.5.4	Core – 4								
40.5.5	Core – 5								
40.6	No. of secondary turns								
40.6.1	Core – 1								
40.6.2	Core – 2								
40.6.3	Core – 3								
40.6.4	Core – 4								
40.6.5	Core – 5								
40.7	No. of layers								
40.7.1	Core – 1								
40.7.2	Core – 2								
40.7.3	Core – 3								
40.7.4	Core – 4								
40.7.5	Core – 5								
40.8	No. of turns / layer								
40.8.1	Core – 1								
40.8.2	Core – 2								
40.8.3	Core – 3								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
40.8.4	Core – 4								
40.8.5	Core – 5								
40.9	Average length / turn of secondary windings (mm)								
40.9.1	Core – 1								
40.9.2	Core – 2								
40.9.3	Core – 3								
40.9.4	Core – 4								
40.9.5	Core – 5								
40.10	Resistance of the conductor used for secondary winding per meter length at 75°C (Ω/M)								
40.11	Weight of secondary windings (kg)								
40.11.1	Core – 1								
40.11.2	Core – 2								
40.11.3	Core – 3								
40.11.4	Core – 4								
40.11.5	Core – 5								
41	INSULATION								
41.1	Name and class of insulating material between core and secondary winding.								
41.2	Name/s of Insulating materials between secondary winding and primary windings.								
41.3	Insulating materials used to achieve grading of capacitance.								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
42.	DIAMETER OF WINDINGS								
42.1	Inside / outside diameter of secondary windings (mm)								
42.1.1	Inside / outside diameter of secondary windings (mm)								
42.1.1	Core – 1								
42.1.2	Core – 2								
42.1.3	Core – 3								
42.1.4	Core – 4								
42.1.5	Core – 5								
42.2	Inside / outside diameters of primary winding (mm)								
42.3	Minimum clearance from tank (mm)								
42.4	Minimum clearance from secondary to tank (mm)								
43.	TANK AND SECONDARY TERMINAL BOX								
43.1	Material of the CT tank								
43.2	Material of the CT secondary terminal box								
43.3	Thickness of CT tank material (mm)								
43.4	Thickness of CT secondary terminal box material (mm)								
43.5	Zinc coating of the CT tank (gm/m ²) as per relevant upto date ISS								
43.6	Zinc coating of the CT secondary terminal box								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
	(gm/m ²) as per the relevant upto date ISS.								
43.7	Ingress protection rating of the secondary terminal box.								
43.8	Weight of the tank, fittings and other accessories (kg)								
44.	TERMINAL CONNECTOR								
44.1	Manufacturer's name								
44.2	Applicable standard								
44.3	Type								
44.4	Material of connector								
44.4.1	Clamp body								
44.4.2	Bolts and Nuts								
44.4.3	Spring washers								
44.5	Rated current (Amp)								
44.6	Rated terminal load (Kg)								
44.7	Factor of safety								
44.8	Minimum thickness of any part (mm)								
44.9	Weight of clamp complete with hardwares (kg)								
44.10	Type test reports as per IS enclosed								
44.11	OGA drawing enclosed								
45.	INSULATOR								
45.1	Manufacturer's name								
45.2	Type								
45.3	Applicable standards								

Sl. No.	Description	33KV		132KV				220 KV	400 KV
		a)400-200-100A /1-1-1A	b) 800-400-200A/ 1-1-1A	a) 800-400-200A/ 1-1-1-1A	b)600-300-150A/ 1-1-1-1A	c) 400-200-100A / 1-1-1-1A	d)400-200A/ 1-1-1-1A	1200-600-300A/ 1-1-1-1-1A	2000-1000-500A/ 1-1-1-1-1 A
45.4	Height (mm)								
45.5	Diameter (top) (mm)								
45.7	Total creepage distance (mm)								
45.8.	Rated voltage (KV)								
45.9	Power frequency withstand voltage for 1 min. dry and wet. (KV – rms)								
45.10	1.2/50 micro-sec impulse withstand voltage (KVP)								
45.11	Corona extinction voltage (KV)								
45.12	Weight (Kg)								
45.13	Maximum allowable span (mm)								
45.14	Cantilever strength (Kg)								
45.15	The drawing enclosed.								
46.	Dielectric dissipation factor at 245/1.732KV (for 220KV C.T) and 145/1.732 KV (for 132 kv C.T.) at ambient temperature.								
47.	Accuracy class of standard C.T. to be used towards determination of ratio errors and phase angle errors for metering cores.								

GUARANTEED TECHNICAL PARTICULARS

FOR

CONTROL CABLE & POWER CABLE

1100V Cable (PVC & XLPE CONTROL & POWER CABLE)

The Contractor must complete a schedule for each size of cable supplied

ITEM NO.	DESCRIPTION	UNITS	BIDDERS OFFER
1	Standards to which the cable conforms	IS-1554/IEC 502	
2	Catalogue Number	-	

3	Conductor Material	-	
4	Conductor Strands	Number	
5	Conductor Shape	-	
6	Conductor cross sectional area	mm ²	
7	Outer Diameter of Conductor	mm	
8	Number of Cores	—	
9	Reduced neutral conductor cross sectional area	mm ²	
10	Insulation Material	-	
11	Minimum thickness of insulation	mm	
12	Nominal thickness of insulation	mm	
13	Outer Diameter over insulation	mm	
14	Nominal thickness of inner sheathing	mm	
15	Sheath Material	-	
16	Type of armouring	—	
17	Number and diameter/size of armour wires/strips	No/mm	
18	Minimum outersheath thickness	mm	
19	Nominal outersheath thickness	mm	
20	Overall diameter of cable	mm	
21	Minimum Bending Radius	mm	

ITEM NO.	DESCRIPTION	UNITS	BIDDERS OFFER
22	Cable identification per Clause 9	-	
23	Rated Voltage per IEC 502/IS - 1554	kV	
24	Conductor DC resistance per km at 20°C	ohm/km	

25	Conductor AC resistance per km at 20°C and 50Hz	ohm/km	
26	Maximum continuous rating of cable in the conditions outlined in Clause 4: System Conditions	A	
27	Minimum insulation resistance per km at 90°C	Mohm/km	
28	Maximum permissible continuous conductor temperature	°C	
29	Maximum permissible continuous outersheath temperature	°C	
30	DC test voltage for 15 mins. after installation	kV	
31	Delivery length per drum	m	
32	Weight of conductor per km	kg/km	
33	Weight of cable per km	kg/km	
34	Gross weight of full cable drum	kg	
35	Outer diameter of the cable drum	mm	
36	Width of cable drum	mm	
37	Maximum permissible cable pulling tension	kg	
38	Maximum permissible cable side wall pressure	kg	
39	Manufacturers Name	-	
40	Country of Origin	-	

GUARANTEED TECHNICAL PARTICULARS

FOR

CONDUCTOR, EARTH WIRE, INSULATORS

GUARANTEED TECHNICAL PARTICULARS OF CONDUCTOR

ACSR CONDUCTOR: MOOSE ZEBRA PANTHOR

Sl. No. Description

1. Code Word

2. Maker's name address and Country.
 - a) Aluminum rods
 - b) Steel Wire/rods
 - c) Complete conductor
3. Stranding and wire diameter
 - a) Aluminum.
 - b) Steel.
4. Standard nominal copper area in sq. mm
5. Calculated equivalent aluminum area in sq. mm
6. Actual aluminum area in sq. mm.
7. Standard area of cross section in sq. mm.
 - a) Aluminum strand
 - b) Steel strand
 - c) Conductor
8. Diameter of complete conductor in mm.
9. Minimum ultimate tensile stress of strand, in Kg/sq. mm. Before stranding and after stranding for
 - a) Aluminum strand.
 - b) Steel strand
10. Guaranteed ultimate tensile strength of conductor in Kg.
11. Minimum breaking load in Kg. Before stranding and after stranding for
 - a) Aluminum strand.
 - b) Steel strand.

12. Purity of aluminum rods.
13. Zinc coating of steel strand.
 - a) Uniformity of coating number and/duration of dips.
 - b) Minimum weight of coating gm/sq. mm.
14. Weight in Kg. per K.M.
 - a) Aluminum.
 - b) Steel.
 - c) Conductor.
15. Resistance in ohms per Km. at 20° c.
16. Continuous maximum current rating of conductor in still air at 45° C ambient temperature, considering temp. rise of 50°C.
17. Modulus of elasticity of :
Conductor.
18. Co-efficient of linear expansion per degree centigrade of.
 - a) Aluminum strand.
 - b) Steel Strand.
 - c) Conductor.
19. Percentage of carbon in steel wire.
20. Standard length of each piece in Km.
21. Initial and final sags and tension and stringing charts, whether furnished.
22. Tolerance, if any on standard length.
23. Number of standard length in one reel.

24. Dimensions of the reel in cms.
25. Weight of the Conductor
in one reel in Kg.
26. Weight of the reel in Kg.
27. Gross weight of the reel
including weight of the conductor.
28. Whether the conductor will be manufactured
as per the relevant Indian Standard Specification
& as per Section-IV 'Technical specification' of this specification.
29. Whether the conductor will be Tested
as per the relevant Indian Standard Specification
& as per Section-IV 'Technical specification' of this specification.
(Cause-12 of Section –IV of Technical Specification)
29. Other particulars, if any.

GUARANTEED TECHNICAL PARTICULARS OF THE GALVANIZED STEEL G.I. EARTH WIRE

SL No.	DESCRIPTION	'7/3.15 mm	'7/3.66 mm
1.	Maker's name, address and country		
2.	Percentage of carbon content of the steel wire.		
3.	Particular of steel strands		
	a) Number of strands.		
	b) Diameter	Mm	
	c) Standard sectional area	Sq.mm	
	d) Minimum ultimate tensile strength.	N/mm ²	
	e) Minimum breaking land		
	f) Final stress in steel wires	N/mm ² KN/mm ²	
4.	(a) Uniformity of coating of number and duration of dips.	Minutes Number of dips.	
	1.		
	2.		
	b) Minimum weight of coating	GM/m ²	
5.	Standard overall diameter of ground wire.	Sq.mm	
6.	Area of cross section of ground wire.	Mm	
7.	Guaranteed ultimate tensile strength of ground wire.	N/mm ²	
8.	Maximum working tension	N/mm ²	
9.	Resistance in ohms per KM at 20°C.		
10.	Standard length of ground wire.	Km.	
11.	Modulus of elasticity of ground wire.	Kg / cm ² Final Initial	
12.	Co-efficient of linear expansion.		
13.	Zinc coating :-		
	a) Number of one minute dip		
	b) Number of half minute dip.		
	c) Quality of zinc		
14.	Weight of coating on wire		
15.	Process of galvanising		

GUARANTEED TECHNICAL PARTICULARS FOR INSULATORS
(SEPARATE SHEETS MAY BE FILLED IN FOR EACH VOLTAGE RATING & DIFFERENT KN RATING)

Sl. No.	Description.	Single Suspension	Double suspension	Single Tension	Double Tension.
1.	2.	3.	4.	5.	6.
1.	Makers name and address and country.				
2.	Size and designation of Ball and socket and standard to which it will conform mm.				
3.	No. of insulator discs per string.				
4.	Outside dia of the disc. Mm				
5.	Spacing – mm				
6.	Creepage distance of the single disc –mm				
7.	Electro-mechanical strength of single disc. Kg.				
8.	Withstand voltage of single disc.				
8.1	Power frequency: a) Dry-kV (rms)				
8.2	b) Wet-kV (rms) Impulse voltage 1.2/50 micro second.				
	a) Positive-kV (peak)				
	b) Negative-kV (peak)				
9.	Withstand				

Sl. No.	Description.	Single Suspension	Double suspension	Single Tension	Double Tension.
9.1	voltage for the complete string. Power frequency:				
	a) Dry-kV (rms)	With and without corona ang.			
9.2	b) Wet kV (rms) Lighting impulse voltage 1.2/50 micro second.				
		-do-			
9.3	a) Positive kV(peak) b) Negative Kv(Peak) Switching surge voltage 250/2500 micro second (for 400KV only)				
		-do-			
10.	a) Dry-kV (rms) b) Wet kV (rms) Flashover voltage for the disc.				
10.1	Power frequency:				
	a) Dry-kV (rms)				
10.2	b) Wet kV (rms) Lighting impulse voltage 1.2/50 micro second.				
	a) Positive kV(peak)				
11.	b) Negative Kv(Peak) Flashover				

Sl. No.	Description.	Single Suspension	Double suspension	Single Tension	Double Tension.
11.1	voltage for the complete string. Power frequency:				
	a) Dry-kV (rms)	With and without corona ring.			
11.2	b) Wet kV (rms)				
	Lighting impulse voltage 1.2/50 micro second.				
	a) Positive kV(peak)				
	b) Negative Kv(Peak)				

GUARANTEED TECHNICAL PARTICULARS

FOR

ISOLATORS

**GUARANTEED TECHNICAL PARTICULARS FOR DISCONNECTOR
(ISOLATORS)**

(To be filled in separately for Disconnectors of different voltage classes and types)

<u>400 KV</u>	<u>220 KV</u>	<u>132 KV</u>	<u>33</u> <u>KV</u>
---------------	---------------	---------------	------------------------

1. Type / installation
2. Manufacturer's Name and
Country of manufacture
3. standard/s according to which
the isolator are manufactured
4. Maximum design voltage at which
the isolator can operate (kv)
5. frequency (Hz)
6. Rated Voltage (kv)
7. Max. current that can be safely interrupted by the isolator
Inductive (A & % PF)
Capacitive (A & % PF)
8. Continuous current rating (Amps)
9. Rated short time current
 - (i) For 3 second (KA rms)
 - (ii) Rated peak short time current (kVp)
10. Current density at the minimum cross-section of
 - a) Moving blade (Amps/Sq.mm)
 - b) Terminal pad
 - c) Contacts
 - d) Terminal Connector
11. Max. temp rise of current carrying parts when carrying rated current continuously.
(deg. C)
12. factor for specified site conditions.
13. Derating Insulation levels.
 - i) Impulse withstand voltage (kV peak)
 - a) Phase to Earth

- b) **Across isolating Distance**
- ii) **Switching surge withstand voltage (kV peak)**
 - (a) **Phase to Earth**
 - (b) **Across isolating Distance**
- iii) **Power frequency withstand voltage (kV rms)**
 - (a) **Phase to Earth**
 - (b) **Across isolating distance**
- iv) **Radio interference voltage at 1.1 times maximum line to ground voltage (micro volts)**
- v) **Corona inception voltage (kV rms)**
- vi) **Corona extinction voltage (KV rms)**

14. Minimum clearance in air:

- i) **Between poles (mm)**
- ii) **Between live parts and earth (mm)**
- iii) **Between live part when switch is open**
 - (a) **On the same pole (mm)**
 - (b) **Between adjacent poles (mm)**

15. Rated mechanical terminal load

- a) **Load along the terminal connector side (kg)**
- ii) **Load across the terminal connector side(kg)**

16. Torque required to operate the switch in Kg. m.

14. Contact zone

- (i) **Horizontal deflection (mm)**
- (ii) **Vertical deflection (mm)**
- (iii) **Total amplitude of longitudinal movement w.r.t. conductor supporting fixing contact (mm)**

15. Design and Construction

- i) **No. of Insulators per pole**
- ii) **Contacts**
 - a) **Material and grade**
 - b) **Cross-sectional area in sq.mm**
- i) **Moving Blades**

- a) **Material and grade**
- b) **Cross sectional area**
- ii) **Contact Support**
 - a) **Material and size of channel / block**
 - b) **Material and size of plate**
- iii) **Rain hood – Material grade and size**
- iv) **Turn and twist mechanism**
 - a) **Material and size of clamps**
 - b) **Material and size of springs**
 - c) **Whether springs are encased**
- v) **Nuts and Bolts.**
 - a) **Size, material and grade in live parts.**
 - b) **Size material and grade in other parts**
- viii) **Insulator base plate**
Material and size of plate below insulators
 - ix) **Bearings.**
 - a) **Material and size of housing**
 - b) **No. of bearings, location and size**
 - x) **Tandem pipe**
 - a) **Size class and no. of pipes**
 - b) **Size of shackle, screw**
 - c) **No. of bearings / bush and its material and size**
 - xi) **Type of inter lock**
 - xii) **Down pipe size and class**
 - xiii) **Type of universal / swivel joint**
 - a) **Between bearing and down pipe**
 - b) **Between down pipe and operating mechanism**
 - xiv) **Operating mechanism**
 - a) **Control cabinet**
Material and thickness
Degree of protection

Type size and no. of cable glands

Whether removable gland plate provided.

b) Make type, rating and qty. of motors per isolator

Gears

Limit switches

Contactors

Over load relay

Single phase preventor

Auxiliary switch

Terminal blocks

Insulator wires

HRC fuses

Pole discrepancy relay

Timer

Space Heater

Interlocks

xv) Insulators

a) Type

b) No. of units per insulator stack.

c) Rating of insulator (kV)

d) Height of each insulator stack (mm)

e) Bolt circle diameter (mm)

f) Tensile strength (kg)

g) Compressive strength

h) Torsional strength (kg. m)

i) Cantilver strength upright (kg)

j) Power frequency dry flash over voltage (kV) rms

k) Power frequency wet flash over voltage (kV) rms

l) Power frequency puncture voltage (kV) rms

m) Impulse flash over voltage (positive wave) (kV) peak

n) Impulse withstand voltage (kV) peak

o) Power frequency withstand voltage (kV) rms

p) **Visual discharge voltage level (kV) rms**

q) **Creepage distance**

Total (mm)

Protected (mm)

r) **Dry arcing distance (mm)**

xvi) **Base**

a) **Size of steel sections used**

b) **Overall size**

c) **Total weight**

xvii) **Terminal connectors**

a) **Clamp Body**

Alloy Composition

Plating if any

Area at min. cross section

b) **Bolts and nuts size**

Alloy composition

Tensile strength

c) **Type of washers used**

d) **Materials of braids**

e) **Temperature rise when carrying rated current at 50 deg. C ambient (deg.C)**

f) **Weight of each type of clamp (kg)**

List of bought out items.

Sl. No.	Particulars of components	Qty.	Rating	Make	Type
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19.0 List of test certificates (Type and routine)

20.0 List of drawings furnished.

GUARANTEED TECHNICAL PARTICULARS

FOR

SURGE ARRESTORS

GUARANTEED TECHNICAL PARTICULARS

Sl No.	Description	<u>390 KV</u>	<u>216 KV</u>	<u>120 KV</u>	<u>30 KV</u>
1	Bidder's Name and Address.				
2	Manufacturer's Name.				
3	Manufacturer's type designation.				
4	Applicable standards.				
5	Arrester class and type.				
6	Rated Arrester Voltage (KV rms).				
7	Maximum continuous operating voltages (MCOV) at design ambient temperature (KV-rms).				
8	Nominal discharge current (8/20 micro second wave) (KA).				
9	Minimum discharge capability referred to rated voltage at minimum of discharge characteristics (KJ/KV).				
10	Line discharge class as per IEC.				
11	Maximum switching surge residual voltage at 1 KA (KVP) for 390KV,216KV, 120KV and for 30KV at 500A.				
12	Maximum switching surge residual voltage at 1 KA for 216 KV.				
13	Maximum residual voltage for 8/20 micro-second current wave.				
	(a) At 50 % nominal discharge current.				
	(b) At 100 % nominal discharge current.				
	(c) At 200 % nominal discharge current.				
14	Maximum residual voltage with 1 micro-second current wave at 10 KAP (KVP).				
15	One minute power frequency (dry) & (wet) withstand voltage of arrester (KV-rms).				
16	Impulse withstand test voltage of arrester housing with 1.2/50 micro-second wave (KVP).				
17	High current short duration (4/10 micro-second impulse wave) (KAP).				
18	Low current long duration (KAP).				
19	Reference voltage and corresponding				

	reference current of arrester (KV) (mA).				
20	Maximum internal leakage current by its rms or peak value and both resistive and capacitive component separately at				
	(a) COV (resistive/capacitive) (mA).				
	(b) 1.1 COV (resistive/capacitive) (mA).				
	(c) COV at 150°C (resistive/capacitive) (mA).				
	(d) Reference voltage (resistive/capacitive)(mA).				
21	Pressure relief class.				
22	Are the protection levels affected by pollution of external insulation.				
23	Energy absorption capability per operation of the arrester, during a switching surge discharge (KJ).				
24	Maximum amount of energy that may be despatched into the arrester during discharge assuming that discharge takes place within 1 minute period and state the switching surge current (KJ/KA).				
25	Internal pressure required to operate pressure relief device as a percentage of burst pressure of porcelain (KJ) & %.				
26	Dynamic over-voltage withstand capability (KV-rms).				
	(a) For 0.1 Second.				
	(b) For 1 Second.				
	(c) For 10 Seconds.				
	(d) For 100 Seconds.				
27	Minimum prospective symmetrical fault current (KA).				
28	Rejection rate of ZnO blocks during manufacturing and operation for the past three years (%) separately.				
	(a) 2004-2005.				
	(b) 2005-2006.				
	(c) 2006-2007.				
29	ZnO DISC DATA.				
	(a) Rated voltage of ZnO disc. (KV-rms).				

	(b) No. of ZnO discs in a unit (Nos.)				
	(c) No. of units of arrester (Nos.)				
	(d) Height/thickness of ZnO discs (mm).				
	(e) Diameter of ZnO disc (mm).				
30	EXTERNAL INSULATION.				
	(a) Type.				
	(b) Applicable standard.				
	(c)(i) Lightning Impulse withstand test voltage of housing with 1.2/50 micro sec. Wave (KVP).				
	(ii) Wet switching impulse test voltage (KVP)				
	(d) One minute power frequency withstand voltage of arrester housing KV rms.				
	[i] Dry.				
	[ii] Wet.				
	(e) Total creepage distance of arrester housing (mm).				
	(f) Cantilever strength of complete arrester (Kg-m).				
31	OVER ALL DIMENSIONS.				
	(a) Overall Height (mm).				
	(b) Height upto top of terminal pad from mounting plane (mm).				
	(c) Material of terminal pad.				
	(d) Size of terminal pad (mm).				
	(e) Mounting dimensions and diameter of mounting holes (mm).				
	(f) Diameter of insulator (mm).				
	(g) Total weight of complete arrester (Kg.)				
32	TERMINAL CONNECTOR.				
	(a) Manufacturer's Name.				
	(b) Applicable standards.				
	(c) Type.				
	(d) Material of connector.				
	[i] Clamp body.				
	[ii] Bolts and Nuts.				
	[iii] Spring washers.				
	(e) Rated current (Amps.)				
	(f) Rated terminal load (kg.)				
	(g) Factor of safety.				
	(h) Minimum thickness of any part				

	(mm).				
	(i) Weight of clamp complete with hard ware (kg.)				
	(j) Type test report as per IS enclosed.				
	(k) OGA Drawing enclosed.				
33	INSULATORS.				
	(a) Manufacturers Name.				
	(b) Type.				
	(c) Applicable standards.				
	(d) Height (mm).				
	(e) Diameter (top)(mm).				
	(f) Diameter (bottom) (mm).				
	(g) Total creepage distance (mm).				
	(h) Rated voltage (KV – rms).				
	(i) Power frequency withstand voltage for 1 min. dry and wet (KV – rms).				
	(j) 1.2/50 micro - second impulse withstand voltage (KVP)				
	(k) Corona Extinction voltage (KV-rms)				
	(l) Weight (kg.)				
	(m) Maximum allowable span (mm).				
	(n) Cantilever strength (Kg – m).				

- | | | |
|-----|---|-----|
| | a) H.V. Winding. | KV |
| | b) L.V.Winding | KV |
| 5. | Rated frequency. | Hz |
| 6. | Number of phases. | |
| 7. | Connections:- | |
| | a) H.V. Winding. | |
| | b) L.V. Winding. | |
| 8. | Connection symbol (See IS: 2026 (Part-IV-1977)). | |
| 9. | Tappings:- | |
| | a) Range | |
| | b) Number of steps for high voltages variation. | |
| 10. | Reference ambient temperature:- | |
| | a) Maximum ambient air/temperature. | °C. |
| | b) Maximum daily average ambient air temperature. | °C. |
| | c) Maximum yearly average ambient air temperature. | °C. |
| | d) Minimum ambient air temperature. | °C. |
| | e) Maximum cooling water temperature. | °C. |
| 11. | Type of cooling (See IS-2026 (Part-II)/1977.) | |
| 12. | Temperature rise (See 2026 (Part-II)/1977) | |
| | a) Temperature of oil | °C. |
| | b) Winding. | °C. |
| 13. | i) Total loss at rated nominal voltage at normal tap & rated frequency. | KW |

- ii) Stray loss at 75°C.
- iii) % Regulation.

14. (A) Component losses.

- a) No-load loss at rated nominal voltage and normal frequency. KW
- b) Load loss at rated current and rated frequency at normal tapping at 75°C. & at extreme taps.

(B) Resistance at normal tap & at 75°C.

- i) H.V.
- ii) L.V.

15. Impedance voltage & percentage Impedance at full rated current at 75°C. for the

- a) Normal tap.
- b) Lowest tap position
- c) Highest tap position.

16. Reactance at rated current and rated frequency. Percentage.

17. No load current at rated nominal voltage and rated frequency and at 50%, 75%, 100%, 110% & 121% voltage & at rated frequency.

18. Insulation level (See IS-2026 (Part-III/1977)).

- a) Separate source power frequency voltage withstand
 - i) H.V. Winding KV rms.
 - ii) L.V. Winding. KV rms.
- b) Induced over voltage withstand.
 - i) H.V. Winding. KV rms.
 - ii) L.V. Winding. KV rms.
- c) Full wave lighting impulse withstand voltage

with time vrs. peak voltage characteristic curves.

- i) H.V. Winding. KV Peak.
- ii) L.V. Winding. KV Peak.
- d) P.I. value.

19. Efficiencies at 75°C at unity power factor.

- a) At full load. Percent
- b) At $\frac{3}{4}$ full load -do-
- c) At $\frac{1}{2}$ full load -do-
- d) At 120% of full load.

20. Regulation at full load at 75°C

- a) At unity power factor. -do-
- b) At 0.8 power factor loading & lagging. -do-

21. Equipment for ONAN cooling.

- a) State.
- i) No.of Radiators on main tank.
- ii) Make & type

Total radiating surface

- iv) Thickness of radiator fins
- v) Clear distance between fins
- vi) Width of radiator fins

22. Number of coolers or cooler banks per transformer

23. Rating of each cooler or cooler bank.

24. Terminal arrangement.

- a) High voltage.
- b) Low voltage.
- c) Neutral.

25. Approximate masses:-

- a) Core Kg.
- b) Winding. Kg.
- c) Tank, fittings & accessories. (Name of accessories to be mentioned). Kg.
- d) Oil. Kg.

- e) Core coil assembly Kg.
 f) radiators Kg.
 g) Total mass Kg.
26. a) Approximate quantity of oil required for first filling. Ltrs.
 b) Name of the manufacturer of oil used
27. Approximate tank dimensions for over all dimensions.
- a) Length mm
 b) Breadth. mm
 c) Height. mm
 d) Thickness of main tank cover plate, side & bottom plate. mm
 e) Tank inside & outside dimension. Length/breadth/height. No. of tubes in each radiator. Tube length in copper, thickness & dia. Each side tubes (Nos.). mm
28. Despatch details.
- a) Approximate mass of heaviest package. Kg.
 b) Approximate dimensions of largest package.
 i) Length. mm
 ii) Breadth. mm
 iii) Height. mm
29. Un-tanking height. mm
30. Additional technical particulars.
 i) (a) i. Maximum flux density at highest system voltage & 48.5 c/s frequency. Tesla or Wo/m².
 ii) Maximum flux density at rated system voltage & rated frequency.
 (b) Maximum current density in windings. } Amps/Sq.Cm

(c)	Size of conductor used.	HV/LV
	High voltage.	
	Low voltage.	
ii)	Efficiency at 75°C and 0.8 P.F. lagging	
	At full load.	Percent.
	At $\frac{3}{4}$ full load	-do-
	At $\frac{1}{2}$ full load	-do-
	Over loading capacity & efficiency.	
iii)	Load at which maximum efficiency occurs.	-do-
iv)	Maximum efficiency.	Percent.
v)	Impulse level with 1/50 Micro.S. Wave.	
	High voltage	KV
	Low voltage	KV
vi)	No-load loss at 110% rated nominal voltage and rated frequency.	KV
vii)	No load current at 110% & 121% of nominal voltage & rated frequency.	Percentage.
viii)	Type of winding.	
	High voltage.	
	Low voltage.	
	No. of turns of H.V.	
	No. of turns of L.V.	
ix)	Insulation materials.	
	Turn insulation high voltage.	
	Turn insulation low voltage.	
	Insulation core to low voltage.	
	Insulation high voltage to low voltage.	
x)	Clearance:-	
	Minimum clearance between phases.	
	a) In oil.	mm
	b) Out of oil.	mm
	Maximum clearance high voltage to tank in oil.	mm

Minimum clearance high voltage to earth in oil.

mm

xi) Minimum clearance height for lifting core & windings from tank.

mm.

31. CORE :-

(i) Core materials used. (grade & thickness).

(ii) Loss in watts/Kg. of core materials corresponding to desired flux densities.

(Watts/Kg. curve to be furnished along with the bid.).

(iii) EMF per turn

(iv) Core circumference dia (d).

(v) No. of core bolt holes per phase.

(vi) Dia of each core bolt holes in mm.

(vii) Net iron section (cm²).

Limb/Yoke.

(viii) Weight (Kg.)

(ix) Total GI (Kg.)

(X) Total (KW).

No. of steps.

1

2

3

4

Stack in mm.

Width of core in mm.

Stacking factor of core.

32.(a) WINDING :-

Current per phase (Amp.)

LV

HV

HV regulating.

conductor bare (mm) No. of

conductor insulation (mm).
Conductor section (mm²)
Current density (A/mm²)
Turns per phase (T).
Coils per limb.
Arranged.
Turns per coil.
Turns per layer.
Layers per coil.
Winding depth.
Coil dia inside.
Coil dia outside.
Length of mean turns.
Resistance at 75°C,
Total I² R including stray at 75°C,
Weight of copper with/without
insulations.

- (b) Radiators provided (Nos.).
No. of fins provided.
Radiator size in mm (Length x wide x fin Nos.)
Loss to be dissipated by Radiators in KW.
Dissipation per fin at 50°C.
Thermal head in mm.
Radiator area.

33. Oil data:-

1. Quantity for first filling. Ltr.
2. Grade of oil used.
3. Maker's name.
4. BOV at the time of filling.
5. Type of oil.

34. Make of breather and type with capacity
of silica gal filled in grams.

- 35. Inter layer insulation provided in design for:-**
- 1. Top and bottom layer. mm**
 - 2. In between all layers. mm**
 - 3. Details of insulation. mm**
 - 4. Whether wedges are provided at 50% turns of the coil.**
- 36. Insulation materials.**
- a) For conductors. H.V.**
 - b) For core. L.V.**
- 37. Particulars of bushings:-**
- 1. Maker's name.**
 - 2. Type IS-3347/IS-1180.**
 - 3. Rating as per I.S.**
 - 4. Dry flash over voltage KV**
 - 5. We flash over voltage KV.**
- 38. I.R. value at 30°C.**
- HV/E**
- LV/E**
- HV/LV**
- 39. Polarisation Index :-**
- Measurement of Insulation resistance at 10 minutes/1 minute.**
- HV/E.**
- LV/E.**
- HV/LV.**

GUARANTEED TECHNICAL PARTICULARS

FOR

CONTROL & RELAY PANEL

TECHNICAL DATA REQUIREMENTS

CONTROL AND RELAY PANELS

(Bidder's Name) -----

1. Name and address of Manufacturer of panels 1.
2. Manufacturer's type and designation 2.
3. Type of construction (Simplex /duplex) 3.

- | | | |
|----|---|------------|
| 4. | Thickness of sheet steel | 4. |
| | (i) Front | i) |
| | (ii) Back | ii) |
| | (iii) Sides | iii) |
| 5. | Degree of protection | 5. |
| 6. | Name of the manufacturer of relays. | 6. |
| 7. | DC voltage of the relays | 7. |
| 8. | Make and Model of static (o.2 accuracy class) 8. | |
| | Type) energy meters | |
| 9. | Confirm whether offered manufacturer of C&R 9..... | |
| | Panels and protective relays have tested | |
| | Commissioned & they are in successful operation | |
| | For at least two years in 400 /220/132/33 kV system. | |
| | For 400/220/132 KV Sub-Station | |

1).

(A) TYRANSMISSION LINE PROTECTION

Numerical Distance protection Scheme (Main-1)

1. Name and address of Manufacturer of Relay/panels 1.
2. Manufacturer's type and designation 2.
3. Switched or Non-switched type (is 3.
It with separate measurements for
Single/three phase faults)
4. Setting range of off set feature 4.....
5. Whether the relay is having self 5.
Monitoring feature.
6. Whether relays is compatible for 6.
PLCC equipment and can be used
for Permissive Under reach/over
reach /Blocking scheme etc.
7. Suitable for single and three phase Trip?7.
8. Type of shaped characteristic 8.
9. Whether it is communicable to other relays 9.....
of different manufacturer. Also mention the
communicating protocol.
10. Features like broken conductor,SOTF,Distance 10.....
to fault locater & other features as per Tech Spec

are available or not.

11. No of tripping contacts with making Capacity of 30 amp for 0.2 seconds. 11.
12. In case 16 contacts as per above Clause are not available with the distance relay Offered, type tripping relays being offered. 12.
13. Maximum operating time for at 50% of the Reach setting of 2 ohms and 10/20 ohms (with CVT) including all trip relays, if any (Bidder is required to enclose isochronic Curve with CVT on line) 13.
 - a) at SIR=4 a)
 - b) at SIR=15, (3 phase faults) b)
 - c) at SIR=15 (other faults) c)
14. IDMT earthy fault relay meeting Normal Inverse Characteristics as per IEC 60253 Is being offered as built in feature for 400/220/132 KV lines. 14.....
15. If no, type of IDMT relay being offered 15.....
16. Built in feature offered with the relay (YES/NO) 16.....
 - a) Disturbance recorder a)
 - b) Fault locator b)
 - c) Over voltage (one stage only) c)
 - d) Auto reclose along with Dead line d)
 - e) Charging and check synchronizing. e)
17. Indicate the no. of Binary Input & Out put contacts 17.....

(B) Numerical Distance protection Scheme (Main-2)

1. Name and address of Manufacturer 1.
2. Manufacturer's type and designation 2.
3. Switched or Non-switched type (is it with separate measurements for Single/three phase faults) 3.
4. Setting range of off set feature. 4.....
5. Whether the relay is compatible for PLCC Equipment and can be used for permissive Under reach/over reach/Blocking scheme etc. 5.
6. Suitable for single and three phase Trip 6.
7. Type of shaped characteristic 7.
8. No of tripping contacts with making Capacity of 30 amp for 0.2 seconds. 8.

9. In case 16 contacts as per above Clause are not Available with the distance relay Offered, type of tripping relays being offered. 9.
10. Maximum operating time for at 50% of the Reach setting of 2 ohms and 10/20 ohms (with CVT) including all trip relays, if any (Bidder is required to enclose isochronic Curve with CVT on line) 10.
 - a) at SIR=4 a)
 - b) at SIR=15, (3 phase faults) b)
 - c) at SIR=15 (other faults) c)
11. Built in feature offered with the relay (YES/NO)
 - a) Disturbance recorder a)
 - b) Fault locator b)
 - c) Over voltage (one stage only) c)
 - d) Auto reclose along with Dead line d)
Charging and check synchronizing.

(C) BACKUP DIRECTIONAL OVER CURRENT AND EARTH FAULT PROTECTION SCHEME(Numerical)

1. Name and address of Manufacturer 1.
2. Manufacturer's type and designation 2.
3. Three over current and one E/F elements 3.
Are whether independent or composite unit
4. Type of relay (Numerical) 4.
5. Directional sensitivity. 5.
6. Whether characteristics conform to IEC 255-3 6.
7. Over current unit setting range inverse time 7.....
8. Earth fault unit setting range inverse time 8.
9. VT Fuse failure relay/ feature included 9.
For alarm.
10. Whether it is communicable to other relays 10.....
of different manufacturer. Also mention the communicating protocol.

(D) LINE OVER VOLOTAGE PROTECTION RELAY

1. Name and address of Manufacturer. 1.
2. Manufacturer's type and designation 2.

3. Type of relay (Electromechanical/static/Numerical)3.
4. Operation indicator provided? 4.
5. Operating time 5.
6. Resetting time 6.
7. Whether monitors all three phases? 7.
8. Built in feature of Main/Main 2 distance Relay is offered. If so, which stage is Offered as built in 8.

(E) DISTANCE TO FAULT LOCATOR

1. Name and address of Manufacturer of panels 1.
2. Manufacturer's type and designation 2.
3. Built in feature of Main/Main 2 distance Relay is offered 3.
4. Maximum registering time 4.
5. Whether direct display unit provided? 5.
6. Whether both phase to phase fault and Phase to earth fault measuring units included? 6.
7. Whether-On-Line type 7.
8. Accuracy for the typical conditions defined Under technical specification. 8.

(F) DISTURBANCE RECORDER

a. Acquisition unit.

1. Name and address of Manufacturer . 1.
2. Manufacturer's type and designation 2.
3. No. of analogue channels 3.
4. No. of digital recording channels. 4.
5. Built in feature of Main 1/ Main 2 distances. Relay is offered. 5.
6. Pre-fault memory (milli seconds) 6.
7. Post fault memory (seconds) 7.
8. Total storage memory is seconds. 8.
9. Sampling Frequency. 9.

- | | | |
|-----|--|----------|
| 10. | Resolution of the event channels (ms) | 10. |
| 11. | Time display present? | 11. |
| 12. | Data out put in COMTRADE is available. | 12. |

b. Evaluation Unit.

- | | | |
|----|--|---------|
| 1. | Name and address of Manufacturer | 1. |
| 2. | Manufacturer's type and designation | 2. |
| 3. | No. of acquisition unit that can be connected`
To one evaluation unit. | 3. |
| 4. | Technical parameters of evaluation unit | 4. |
| | A. Processor and speed. | A. |
| | B. RAM and hard disk capacity. | B. |
| | C. Additional facilities. | C. |
| | D. Details of printer. | D. |
| 5. | Details of power supply arrangement for
Acquisition unit (including printer). | 5. |

(G) AUTO RECLOSE RELAY

- | | | |
|----|---|---------|
| 1. | Name and address of Manufacturer. | 1. |
| 2. | Manufacturer's type and designation. | 2. |
| 3. | Electromechanical/ static /numerical. | 3. |
| 4. | Auto re closure relay along with Dead line charging
And check synchronizing relay (For 132 KV
Lines) offered as a part of distance relay. | 4. |
| 5. | Built in feature of Main 1/ Main 2 distances.

Relay is offered. | 5. |
| 6. | Suitable for single and three phase? | 5. |
| 7. | Single phase dead time setting Range. | 6. |
| 8. | Three phase dead time setting range. | 7. |
| 9. | Reclaim time setting range. | 8. |
- 2.)

TRANSFORMER PROTECTION

a) Differential relay.

- | | | |
|----|----------------------------------|---------|
| 1. | Name and address of Manufacturer | 1. |
|----|----------------------------------|---------|

2. Manufacturer's type and designation 2.....
3. Second harmonic restraint provided. 3.
4. Whether three instantaneous units provided 4.
5. Operating current setting range. 5.....
6. Bias setting range,. 6.
7. Operating time at 5X setting current. 7.
8. Resetting time. 8.
9. How ratio / phase angle corrections are being done (inter posting transformer/ internal feature in the relay) 9.
10. Whether numerical or not 10.....
11. Fifth Harmonic restraint feature. 11.....
12. Communication protocol 12.....

b) Restricted Earth Fault Protection

1. Name and address of Manufacturer 1.
2. Manufacturer's type and designation 2.....
3. Operating time at 2 x setting. 3.
4. Whether numerical 4.....
5. Whether suitable for all type of transformer windings or not. 5.....

c) Over Fluxing relays.

1. Name and address of Manufacturer 1.
2. Manufacturer's type and designation 2.....
3. Whether inverse time operating characteristics 5.
4. Maximum operating time. 6.
5. Accuracy of operating time. 7.
6. Resetting time. 8.

d) Directional O/C and E/F relays.

1. Name and address of Manufacturer 1.
2. Manufacturer's type and designation 2.....
3. Whether Characteristic will confirm to IEC 255-3 3.....
4. Directional sensitivity. 4.....
5. Over current unit setting range 5.

- a) Inverse time a)
 - b) High set b)
 - 6. Earth fault unit setting range. 7.
 - a) Inverse time a)
 - b) High set b)
 - 7. Whether numerical 7.....
 - 8. Features of disturbance recording 8.....
- 3)

GENERAL PROTECTION / MONITORING EQUIPMENT

a) Trip Circuit Supervision relay.

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....
- 3. Whether pre-closing and post closing Supervision provided? 3.
- 4. Time delay. 4.

b) High Speed Trip Relays.

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....
- 3. Contact rating. 3.
 - a) Making and carry continuously a)
 - b) Make and carry for 0.5 sec. b).....
 - c) Break. c)
 - i) Resistive load. l)
 - ii) Inductive load. li)
 - (With L/R= 40 milli sec.).
- 4. Operating time at rated voltage (maximum) 4.
- 5. Resetting time .. 5.
- 6. Whether supervisory relays included. 6.

c) Local breaker back-up protection.

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....

- | | | |
|----|-----------------|---------|
| 3. | Operating time | 3. |
| 4. | Resetting time. | 4. |
| 5. | Setting ranges | 5. |
| | a) Current | a) |
| | b) Time. | b) |

4)

BUS BAR PROTECTION

- | | | |
|-----|---|-----------|
| 1. | Name and address of Manufacturer | 1. |
| 2. | Manufacturer's type and designation | 2. |
| 3. | Type of relay
(Numerical) | 3. |
| 4. | Principle of operation (Biased.High/Low impedance) | 4. |
| 5. | Operating time | 5. |
| 6. | Resetting time. | 6. |
| 7. | Resetting ranges. | 7. |
| | (i) Current. | (i) |
| | (ii) Time. | (ii) |
| 8. | Whether will it cause tripping for the differential
Current below the load current of heavily
Loaded feeder (Bidder shall submit application
Check of the same). | 8. |
| 9. | Whether LBB protection features available. | 9. |
| 10. | Features of disturbance recording | 10. |
| 11. | Communication protocol | 11. |

5)

Meters and Instruments Indicating meters.

- | | | |
|----|--|----------|
| 1. | Name and address of Manufacturer | 1. |
| 2. | Manufacturer's type and designation | 2. |
| 3. | Operating principle or type of movement. | 3. |
| 4. | Range: | 4. |
| | (i) Voltage. | (i) |

- (ii) Current (ii)
- (iii) Frequency (iii)
- iv) Megawatt (iv)
- v) Megavar (v)
- 5. Accuracy class. 5.
- 6. Total deflection angle 6.
- 7. Overall dimensions in mm. 7.
- 8. Burden 8.
 - (i) Current coil (i)
 - (ii) Voltage coil. (ii)
- 9. Digital type 9.....

a) Recording Meter for voltage

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....
- 3. Accuracy class. 3.
- 4. Full span response time 4.
- 5. Is it strip type recorder/ digital type 5.
- 6. If it is digital type 6.....
 - i) No of channels beings used. I)
 - ii) Whether time tagged information is available ii)
 - iii) Whether EMNC./EMI compatibility is tested iii)

b) Recording Meter for Current

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....
- 3. Accuracy class. 3.
- 4. Full span response time 4.
- 5. Is it strip type recorder/ digital type 5.
- 6. If it is digital type 6.....
 - i) No of channels beings used. I)
 - ii) Whether time tagged information is available ii)
 - iii) Whether EMNC./EMI compatibility is tested iii)

c) Recording Meter for MW

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....
- 3. Accuracy class. 3.
- 4. Full span response time 4.
- 5. Is it strip type recorder/ digital type 5.
- 6. If it is digital type 6.....
 - i) No of channels beings used. I)
 - ii) Whether time tagged information is available ii)
 - iii)Whether EMC./EMI compatibility is tested i ii)**

d) Recording Meter for MVAR

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....
- 3. Accuracy class. 3.
- 4. Full span response time 4.
- 5. Is it strip type recorder/ digital type 5.
- 6. If it is digital type 6.....
 - i) No of channels beings used. I)
 - ii) Whether time tagged information is available ii)
 - iii)Whether EMC./EMI compatibility is tested iii)**

e) Recording Meter for frequency.

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....
- 3. Accuracy class 3.
- 4. Full span response time. 4.
- 5. Is it strip type recorder/ digital type 5.
- 6. If it is digital type 6.....
 - i) No of channels beings used. I)
 - ii) Whether time tagged information is available ii)
 - iii) Whether EMC./EMI compatibility is tested iii)

6) OTHERS:

a) Terminal Block

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....
- 3. Rated current. 3.
- 4. Rated voltage. 4.
- 5. Minimum no. of conductors of area 2.5mm² suitable for connection. 5.
- (i) All circuits except CT./P.T.Circuits. (i).....
- (ii) C.T. Circuits. (ii)

b) Switches.

i) Control Switches.

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....
- 3. No.of contacts. 3.
- 4. Type of handle. 4.
- 5. Rating of handle. 5.
- 6. Rating of contacts. 6.
- a) Make and carry continuously. a)
- b) Make & carry for 0.5 sec. b)
- c) Break resistive load, in Amps (d.c) c)
- d) Break inductive load with L/R=40 m.sec inn Amps. (d.c) d)
- 7. Life of switch in terms of million mechanical operations 7.

ii) Synchronizing switch

- 1. Name and address of Manufacturer 1.
- 2. Manufacturer's type and designation 2.....
- 3. Contact ratings. 3.
- 4. No.of positions. 4.
- 5. Removable handle type? 5.
- 6. No.of contacts 6.

iii) Indicating Lamps.

1. Name and address of Manufacturer 1.
2. Manufacturer's type and designation 2.....
3. Ratings
 - (i) Current (i)
 - (ii) Voltage (ii)
 - (iii) Wattage (iii)
4. Whether series resistors are provided? 4.
5. If series resistors provided, give 5.
 - (i) Ohmic value (i)
 - (ii) Wattage (ii)
6. Life of Lamps in burning hours. 6.
7. Permissible voltage variation 7.
8. Whether LED type 8.....

iv) Push Buttons.

1. Name of Manufacturer. 1.
2. Manufacturer's type and designation 2.....
3. Contact ratings. 3.
4. No.of contacts 4.

v) Semaphore Indicators.

1. Name and address of Manufacturer 1.
2. Manufacturer's type and designation 2.....
3. Is colour similar to mimic? 3.
4. No.of positions 4.
5. Burden DC 5.
6. Is the coil continuously rated? 6.

vi) Trransducers.

1. Make 1.
2. type & Model No. 2.
3. Nominal AC input voltage. 3.
4. Frequency. 4.
5. Input measuring Range 5.

- | | | |
|-----|----------------------------|----------|
| 6. | Output current range. | 6. |
| 7. | Accuracy range. | 7. |
| 8. | Response time. | 8..... |
| 9. | A.C. ripple on output | 9. |
| 10. | Load Resistance (Maxm.) | 10. |
| 11. | Auxiliary supply voltage.. | 11. |

vii) Annunciators.

- | | | |
|----|---|---------|
| 1. | Make | 1. |
| 2. | Type & Model No. | 2. |
| 3. | Static/electromechanical | 3. |
| 4. | No. of lamps per window | 4. |
| 5. | Lamps | 5. |
| | a) Voltage | a) |
| | b) Wattage. | b) |
| 6. | Minimum duration of impulse for initiating.
Contact in millisecond | 6. |
| 7. | Type of reset self/manual. | 7..... |

GTP FOR LIGHTING

3. Degree of Protection 3.

E. Lighting Transformer E.

1. Manufacturer's Name and address 1.

2. Type 2.

3. Rating (KVA) 3.

4. Standards Applicable 4.

5. Degree of protection for enclosure 5.

F. Lighting Poles

1. Manufacturer's Name and address 1.

2. Type 2.

3. Dimensions 3.

G. Lighting Wires. G.

1. Manufacturer's Name & Address. 1.

2. Voltage grade 2.

3. Cross section of conductor. 3.

4. Insulation Thickness. 4.

GTP FOR DISTRIBUTION BOARD

DISTRIBUTION BOARD

L.T. Switchgear

- | | | |
|---|--------|-------|
| 1. Manufacturer's Name | 1. | ..... |
| 2. Whether Manufacturer's have supplied 50 Nos. draw out Air circuit breaker panel out of which 5 Nos. are with CT and relaying scheme. | 2. YES | NO |
| 3. Whether manufacturer's have supplied 50 Nos. MC panels similar to the offered panels. | 3. YES | NO |
| 4. Whether 100 nos. (at least) circuit breakers of the make and type being offered are already been operating satisfactorily. | 4. YES | NO |
| 5. Rated short circuit current | 5. | |
| 5.1 Symmetrical short circuit withstand Current at rated voltage of switchgear cubicle. | 5.1 | ..... |
| 5.2 Peak short circuit withstand current | 5.2 | ..... |
| 6. Degree of protection. | 6. | ..... |
| 6.1 Breaker / MCC/ AC & DC | 6.1. | ..... |
| 6.2 Distribution Cubicles. | 6.2 | ..... |
| 6.3 Busbar Chamber | 6.3 | ..... |
| 7. Standard height, width & depth of typical panel | 7. | |
| 7.1 Circuit Breaker Panel | 7.1 | ..... |
| 7.2 MCC panel | 7.2 | ..... |
| 7.3 AC/DC Distribution Board. | 7.3 | ..... |
| 8. Width of cable alley | 8. | ..... |
| 9. Whether equipment are type tested as per IS | 9. YES | NO |