GUJARAT ENERGY TRANSMISSION CORPORATION LTD.

SARADAR PATEL VIDYUT BHAVAN,
RACE COURSE, BARODA – 390 007.

TECHNICAL SPECIFICATIONS

FOR

22KV & 11KV CONTROL & RELAY PANELS

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TECHNICAL SPECIFICATION FOR 22 KV & 11KV CONTROL & RELAY PANELS

SECTION – I

SPECIFIC REQUIREMENT

1.0.0 SCOPE:

This section covers specific requirements and Section - II covers general requirements, which are uniform generally for all projects. Both sections are essential for correct and complete interpretation. When specified requirements of the sections conflict, those of section I shall govern.

2.0.1 STANDARDS:

The panels and materials covered by this specification shall comply with the requirements of the latest edition of the following standards as amended up-to-date, except where specified, otherwise in the specifications.

1.	A.C. Electricity meter	-	IS 722 (Part I & IV)
2.	Indicating Instruments	-	IS 1248
3.	Recording Instruments	-	IS 6236

However, in the event of offered panels / items / equipments conforming to standard other than Indian Standards, the salient points of differences between the standards adopted and the specified standards shall be indicated in the offer.

3.0.0 SYSTEM DETAILS:

a)	Nominal voltage	-	22 kV / 11 KV
b)	Maximum voltage	-	24 kV / 12 KV
c)	Frequency	-	50 Hz
d)	Number of phases	-	3
e)	Neutral earhing	-	Solid
f)	Auxiliary supply	-	A.C.415V,(+10%, - 15%) 50 C/s, 3 phase 4 wire D.C.110 V, + / - 10%, 2 wire (unearthed).

4.0.0 CLIMATIC PARTICULARS:

a)	Maximum ambient temperature of Air in shade (^{0}C)	50
b)	Minimum ambient temperature of Air in shade (^{0}C)	4
c)	Maximum yearly average ambient temperature (^{0}C)	40
d)	Minimum yearly average ambient temperature (^{0}C)	30
e)	Maximum relative humidity (%)	95
f)	Average number of thunder storm days per annum	15
g)	Average annual rain fall (CM)	115
h)	Maximum wind pressure (Kg / Sq.Mtr.)	150
i)	Earth quake acceleration (g)	0.08 x 2 kg.
j)	Height above main sea level	Not exceeding 1000 meters.

5.0.0 DRAWING:

Drawing in duplicate shall be submitted by each bidder with the offer for preliminary scrutiny.

(i) Principle dimensional details of each control and relay panel.

(ii) Front, rear views & sectional side view of the panels with instruments, devices and relay positions marked.

(iii) Details of protection schemes considered for the panels for lines, transformers etc. and annunciation's system offered.

6.0.0 DETAILED DESCRIPTION:

6.1.0 Construction of Board and detailed description:

6.1.1 The control and relay panel shall be of simplex type and comprise of one vertical stationary front panel provided with door (fitted and lockable) on the rear.

6.1.2 The control relay panels shall be fabricated out of structure leveled finished sheet steel of minimum thickness 3 mm for front side and 2.5 mm for all other sides and necessary stiffening members. They shall form rigid, unyielding, free standing, completely assembled enclosures, and neat in appearance. All structural members shall be bolted or welded together. All joints shall be

made flush and all edges shall be bent at right angles and rounded. Necessary arrangements shall be made for bolting the adjacent panels together as well as for fastening them to the floor. Suitable vibration absorption devices and kick plates along the base shall be bent at right angles and rounded. The opening required for mounting the equipment shall be punched or cut and filed smooth.

6.1.3 Panel shall be painted first with anti-rusting paint and then by two coats of synthetic enamel light grey of paint shade 631 of IS: 5 for exterior and glossy white paint for interior.

6.1.4 Controls, Relays and instruments shall be mounted on the front of the panel and not on any moving parts of panel. The panels shall be dust & vermin proof. They shall be suitable IP 54 degree of protection. They shall be suitable for tropical climate. The panels shall be supplied complete with wire through, wiring supports, interior lining device, wiring, terminal blocks, space heaters channels, base grounding bolts, nuts, washers etc.

6.1.5 DIMENSIONS:

The approx. dimension of the panels shall be as under:

Height	-	2312 mm including base frame of 50x50x4 mm
Depth	-	610 mm
Width	-	610 mm

6.2.0 MIMIC DIAGRAM AND SYMBOLS:

Coloured mimic diagrams of metal or plastic or painted with synthetic enamel paint with symbols to provide exact representation of the system shall be fixed on the front of control panel. Control switches and ***LED*** semaphore indicators shall be incorporated in the mimic diagram to represent the respective circuit breaker and isolators. Scheme of mimic diagram shall be subject to the approval of the purchaser. Width of diagram shall be 10 mm.

6.3.0 Name Plates & Marking:

Name plates shall be white background with black engraved letters. Each equipment parts / item on the panels shall also have an appropriate

nameplate. Name plates for relays shall be marked with their function and standard code number.

6.4.0 Indicating Lamps:

Indicating lamps shall be of LED type LED type having integral module type construction and suitable for 22.5mm cut out diameter. The supply for these lamps shall be 110 V D.C. unless stated otherwise. Lamp covers shall be preferably of screwed type, unbreakable and mounded from heat resisting material. They shall be translucent to diffuse light and unless stated otherwise, coloured as follows:

(a) 'RED' for indicating 'close' position of breakers and isolators.
(b) 'GREEN' for indicating 'open' position of breakers and isolators.
(c) 'BLUE' for spring charged position.
(d) 'WHITE' and 'AMBER' for trip circuit healthy & auto trip indication respectively.

6.5.0 *LED* Semaphore Indicators:

38 / 50 mm ***LED*** semaphore indicators shall be provided on front side or the panel on Mimic diagram for indication of position of circuit breakers, isolators and earthing switches. They shall be of two-coil type and their operating voltage shall be 110V D.C unless otherwise stated.

6.6.0 Switches:

6.6.1 All switches shall be of rotary operated type with silver to silver contacts of adequate making, carrying and breaking current ratings and shall be provided with easily removable protective terminal covers. The contacts of all switches shall preferably be of open and close type with snap action to minimize arcing. Switches shall be capable of accommodating additional number of contacts, if required subsequently, and this point shall be brought out in the offer. The bidder shall clearly state the continuous current ratings and interrupting rating for D.C. and A.C inductive and non-inductive circuits. The type of switches used shall be subject to approval of the purchaser.

6.6.2 Circuit breaker and isolator control switches shall be of three position spring return to neutral type, with pistol grip handles. The rating of the switches shall not be less than 10 Amps continuous and 150 Amps for one second. Adequate number of spare contacts shall be provided on breaker control switches for control, interlocking, annunciation and indication.

6.7.0 Instruments Meters and Recorders:

Current Transformer Details.

1)	CT Ratio	a) 600-450-300/1-1-0.577 Amps.	
		b) 300-150-75 / 1-1-1 Amps.	
		c) 300-150 /1-1-0.577 Amps.	
2)	No. of Cores	3	
3)	Purpose	Core – 1	Metering
		Core – 2	Back up protn.
		Core – 3	Differential protn.
4)	Rated burden (VA)	30	(Core – 1)
	(Lowest Ratio)	30	(Core – 2)
	(at minimum tap)	---	(Core – 3)
5)	Class of accuracy	0.5	
		5 P	
		P S	
6)	i) Rated accuracy / limit factor	10 at minimum ratio for all CTs.	
	ii) Instrument security factor.	5 or less at minimum ratio for all CTs	
7)	Minimum knee point voltage (at highest ratio)	600 V for (a) 600 V for (b) 650 V for (c)	
8)	Exciting current at knee point voltage.	As per IS : 2705	
9)	Resistance of secondary winding.	-- do --	

Voltage Transformer Details.

1	Nominal system voltage :	22 kV / 11 KV
2	Highest system voltage :	24 kV / 12 KV
3	Frequency	50 Hz
4	Earthing	solidly earthed
5	Number of cores	Two
6	Ratio : core – I	22 or 11/√3 kV / 110/√3 V
7	Ratio : core – II	22 or 11/√3 kV / 110/√3 V
8	Rated Burden core – I	100 VA
9	Rated Burden core – II	200 VA
10	Class of accuracy core – I	0.5 (Metering)
11	Class of accuracy core – II	3 P (Protection)
12	over voltage factor :	1.2 continuous 1.5 for 30 seconds

6.7.1 1. No. of Digital Multi Function Meter (MFM):

Multifunctional, Flush Mounted, 3-phase Digital Power Meter showing RMS values of all the three phase Voltages (Phase to Neutral, Phase to Phase Voltages in KV), Currents (Line Currents in Amp), Power (in KVA, KW & KVAR), Power factor, Frequency, Total Harmonic Distortion (THD) for both Voltage and Current.

Technical Parameters:
1. Rated Aux Power Supply : 110/220 V DC ±15 %
2. Voltage Inputs : 63.5/110 V, 4 Nos (Vr, Vy, Vb, Vn) derived from 22/√3kV/110/√3V PT
3. Current Inputs : 1 A, 3 Nos (Ir, Iy, Ib), derived from CTs (600-450/1A, 300-150/1A)
4. Burden : (i) 0.2 VA max for each phase voltage input
(ii) 0.3 VA max for each phase current input
(iii) 10 VA max for Aux Supply
5. Accuracy Class: 0.5S
6. Meter Size : 96x96mm
7. Display : Bright Seven Segment Digital LCD/ LED display, 3/4 line, 4 Digits display along with Selection Key Pad
8. Communication port : Standard RS-485 port at rear side
9. Communication Protocol : Modbus
10. Terminal Connectors : Suitable to connect 2 Nos of 2.5 Sq mm, Multi Stranded Cu wires
11. Standards : It shall comply to relevant EMI, EMC, Safety & Environmental Standards

6.7.0 Energy Meters:

The static energy meter shall be as per attached technical specifications and it shall be compatible to the existing DAS (Data Acquisition System) working in GETCO network.

Energy meters shall be of *SEMS* make & it shall be as per discretion of GETCO & shall be finalized during detailed engineering.

Annunciation System:

6.8.0 General:

Alarm annunciation system shall be provided in the panel in order to draw the attention of the operator to the abnormal operating conditions or the operation of some protective devices.

6.8.1 Emergency Annunciation:

This annunciation is used to draw the attention of the operator when the circuit breaker / contactor is tripped automatically. The audible annunciation shall be provided by means of a "Bell". The visual annunciation shall be by flickering of a common fascia window provided on the respective panel on which the control of the tripped breaker is located. The tripped breaker shall be identified by the discrepancy annunciation by the flickering of the corresponding position of the indicating lamp.

6.8.2 Warning annunciation:

This is used during the occurrence of an abnormal operating condition, other than the tripping of the circuit breaker / conductor. The audible annunciation shall be provided by means of 'Hooter'. The visual annunciation shall be obtained by flickering of the respective fascia window. Certain number of alarms under this category shall have to be time delayed and this annunciation shall appear after an adjustable time delay of 2 to 10 sec., after the closure of the particular contact. Arrangements for the purpose shall be provided by the supplier.

6.9.0 RELAYS:

Relays shall be as per the specifications given here separately.

6.10.0 PROTECTION:

Numerical Non directional Over current & Earth fault protection for feeder & Transformer panel while Numerical Non directional Over current & Earth fault protection, Neutral Displacement (in case of capacitor bank with RVT)/ Unbalance current Protection (in case of capacitor bank with NCT) , Over voltage Protection, Under voltage Protection & Leading Power Factor Controller for Capacitor Bank as per the relay specifications shall be provided.

6.11.0 AUXILIARY RELAYS:

The supply and circuit monitoring relay shall be connected to initiate an alarm upon failure of respective supply / circuit. They shall preferably have reverse flags, which drops when relay is de-energized. Otherwise, an indicating lamp shall be provided with each monitoring relay for indication of its operation.

6.12.0 ELECTRICAL EQUIPMENT AND WIRING:

6.12.1 Electrical equipment supplied by the successful bidder shall be designed for use under the climatic conditions prevailing at site. Metal parts shall be protected against corrosion by plating and / or painting. All wiring, both power and control, shall have insulation of non-hygroscopic type unless specifically stated otherwise.

6.12.2 Control wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and terminal blocks. Each wire shall bear an identifying ferrule at each and or connecting point. Color coding of control wiring as per modern standard practice shall be adopted. All wires shall have P.V.C. insulation for 1100 Volts and shall be suitable for switch board and of adequate cross section stranded copper wire. The wire shall be flame retardant and vermin proof type, suitable for the tropical climatic conditions.

6.12.3 All the operating coils and secondary circuits shall withstand a power frequency test voltage as per the relevant standard for one minute.

6.13.0 TERMINAL BLOCKS:

6.13.1 One piece moulded, barrier type, noninflammable plastic material, of 800 Volt grade terminal block complete with washers, heads, strips & protective covers shall be used. Continuous current ratings for the terminal blocks shall not be less than 45 Amps. At least twenty percent spare terminal blocks, shall be provided on each panel. The terminals blocks shall be located at the bottom on one side of the panel.

6.13.2 Purchaser's control cable shall be of 2.5, 4.0 sq. mm size copper. The terminals shall be suitable for connection of copper. In case of 2.5 sq. mm size, the number of cables to be taken inside the terminal may be added up- to 4. The terminal size should be suitable for these cables.

6.13.3 The control schemes shall incorporate necessary arrangements for isolation purpose while testing & checking faults in control and signaling circuits.

6.14.0 SPACE HEATERS:

Tabular space heaters of 60W with thermostat control suitable for connection to single phase, 240 Volts, A.C. supply complete with switches, conveniently located, shall be provided at the bottom of the cubicle to prevent condensation of moisture. The watt loss shall be low enough to keep the surface temperature well below permissible limits.

6.15.0 Test Blocks:

6.15.1 Switchboard type, back connected, semi-flush mounting type test blocks with contacts suitably rated shall be provided with links or other devices to enable insertion of a device into the circuit without causing open circuit in C.T. secondary or to enable short circuiting of the C.T. secondary.

6.15.2 Test blocks shall provide complete isolation of meters, instruments and relays, so that testing power can be supplied either from the instrument transformers or from an external source.

6.15.3 If any test plug is to be used with the test blocks, each type of such test plugs shall be supplied free with main equipment.

6.16.0 SAFETY EARTHING:

Control panels shall be equipped with copper bar ground bus having a minimum cross sectional area of 150 sq. mm (25 x 6 mm). Ground bus shall be securely mounted across the inside base of the panels. Provisions shall be made for extending the grounding bus bar to future adjoining panels. Earthing wires shall be connected by using suitable terminals & clamp connections. Solder connections shall not be employed. The neutral point of star connected L.V. windings of instrumental transformers, whenever necessary, shall be connected with the main earth wire of the panel earthing system.

6.17.0 SWITCHBOARD LIGHTING:

The switchboard shall be illuminated by fluorescent Lamp (CFL)/ ***LED lamp*** with lighting Fixture rated for 240V AC supply, controlled by panel door switch and fuse.

6.18.0 SUPPORTING STEEL:

All necessary embedded leveling steel, anchor bolts channels and other parts for supporting and fastening the panels shall be supplied by the successful bidder.

6.19.0 ACCESSORIES:

The bidder shall supply necessary accessories like test blocks, test links, special terminal boards etc. for testing, operation and maintenance of all relays and meters.

6.20.0 TROPICALISATION:

Wiring, terminal blocks, relays, instruments meters & control devices shall be suitable for installation in a tropical monsoon area, having a hot humid climate and dry and dusty season with ambient conditions as per section II. All equipment / items / parts and accessories shall be painted by means of spray or dip coating, and shall be protected against fungus growth condensation, vermin and other harmful effects due to tropical environment.

6.21.0 PAINTING:

A suitable rust resisting primer paint shall be applied on the interior and exterior steel surfaces of control panel after removing rust (by sand blasting) foreign adhering matter of grease, scale etc. An under-coat to serve a base and binder for the finishing coat shall be applied. The finishing coat on the exterior of the panels shall be of light grey colour shed No.631 of IS:5. Polished cellulose enamel light grey paint evenly sprayed on the outside and glossy white paint evenly sprayed on the inside shall be applied as finishing coat. Sufficient quantity of finishing paint shall be supplied for minor touching up required at site.

6.22.0 FIRE PROTECTION:

All equipment connections and cabling shall be designed & arranged to minimize the risk of fire and damage due to fire.

7.0.0 TESTS:

Type Tests :

The following tests from NABL accredited laboratory shall be carried out in accordance with latest / amended / up to date IS/IEC. The bidder has to submit all the type test reports as stated hereunder for the offered item along with the technical bid. The type test reports from NABL approved laboratory shall not be older than seven years. Type test reports shall be valid as on the last date of submission of bid.

(A) Type Test of Control & Relay Panels

i. Degree of Protection IP54

(B) Type Tests of Relays

Important Note :

In case of non-submission / partial submission or type test reports of which validity is over, the bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid.

7.1.0 Routine & Acceptance Test:

All control & relay panels shall be subjected to routine tests according to the relevant standards and to such other tests as may be required to ensure that

each panel is satisfactory and in accordance with this specification.

The Purchaser reserves the right to witness all the tests and advance intimation shall be given regarding these tests. Test reports of all such tests shall be submitted to the purchaser for approval before inspection.

Any modification required in the testing procedure shall be made as directed by the Purchaser at no additional cost to the Purchaser. No panel shall be dispatched from the manufacturer's work before the relevant tests reports have been approved by the purchaser. The successful bidder shall send two copies of the certified final test reports to each consignee of all factory tests carried out on each panel, relay, meter, switch, instrument, transformer and other devices, which shall furnish complete information including the method of application and duration of test. List of routine tests to be performed on the panel shall, be as per the Quality Assurance Plan, approved by the purchaser

8.0.0 CO-ORDINATION WITH OTHER MANUFACTURERS:

The control panel manufacturer shall also co-operate and co-ordinate in every respect with the suppliers of the switchgear, carrier communication equipment and other associated equipment and shall provide complete technical data, schematic drawings of control indication, protection etc.

9.0.0 PACKING & TRANSPORTATION:

9.1.0 After satisfactory final inspection & tests and after written approval has been given by the Purchaser, the vendor shall adequately pack the material for rail / road transport & deliver whole of the equipment to the site. The marking shall include the reference of contract number and the name and address of the consignee.

9.2.0 The vender shall be responsible for arranging transport to site and shall satisfy himself that the transport arrangements satisfactory.

9.3.0 The panel may be transported in suitable case with all instruments. Relays, switches and other devices mounted in position & wired. Instrument, relays etc. shall be packed in special protective containers & dispatched separately, if

required. Four copies of the packing list shall be sent at least three weeks before the goods are delivered.

9.4.0 The packing list for each panel shall indicate complete details of the equipments being dispatched to enable the consignee to identify the parts and to ensure that no equipment stated to have been supplied/transported has either be lost in transit or damaged to initiate for proceeding for replacement. If the invoice does not contain full details and if any part, not specifically mentioned in the packing list, is missing in transit, the vender shall be responsible for the same and shall supply such parts to the purchaser without any extra cost.

10.0.0 GUARANTEED TECHNICAL PARTICULARS:

The bidder shall furnish complete guaranteed technical particulars as called for in Bidding Schedule Appendix-I of this specification. Particulars which are subject to guarantee, shall be clearly marked. Tenderer lacking information in this respect shall not be considered.

11.0.0 INSTRUCTION MANUAL AND DRAWING SETS:

11.1.0 Two (2) copies of operating, maintenance & erection manuals in English language and two (2) copies of drawing sets shall be supplied with each panel.

11.2.0 The manual shall be bound volume & shall contain all the printed drawings, requisite information for erection, operation and maintenance of the equipment parts and the following particulars.

a) Marked erection prints identifying the component parts of the equipment as dispatched with assembly drawings.
b) Performance curves, name plate details & other data of all devices.
c) Complete list of parts.

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SIGNATURE AND DESIGNATION OF THE BIDDER

STATEMENT OF MATERIALS

11 KV CONTROL AND RELAY PANELS – SPECIFIC REQUIREMENT PER PANEL

SR No	Particulars	Unit	Transformer panel	Feeder Panel	Capacitor bank Panel
1	Automatic ***LED*** semaphore for breaker	No	01	01	01
2	Automatic ***LED*** semaphore for Isolator	No	02	02	02
3	Indication lamp (closed, open, trip circuit healthy, spring charged, auto trip)	No	05	05	05
4	Breaker control switch (Pistol grip, 3 positions with lost motion device with one spare contact in each position)	No	01	01	01
5	***Digital Multi Function Meter***	No	01	01	01
6	Static KWH meter	No	01	01	01
7	Numerical non directional O/C & E/F relay	No	01	01	01
8	Electromagnetic / Static Neutral displacement relay OR Numerical unbalance relay (in case of bank with NCT)	No No	00 00	00 00	01 02 (for 2 banks) 01
9	Electromagnetic / Static Over Voltage Relay	No	00	00	01
10	Electromagnetic / Static Under Voltage Relay	No	00	00	01
11	Leading power factor controller relay	No	00	00	01
12	5 Minute delay Relay / Timer	No	00	00	01
13	Trip circuit supervision relay	No	01	01	01
14	Master Trip Relay	No	01	01	01
15	6/12 way annunciation (static type with 3 nos. push buttons for accept, reset and lamp test with aux. relay with bell, booter, alarm relay and flasher relay	No	01 (06 way)	01 (06 way)	01 (12 way)

SR No	Particulars	Unit	Transformer panel	Feeder Panel	Capacitor bank Panel
16	Panel illumination lamp with door operated switch	No	--To be provided for each panel--		
17	Space heater (60 W) with thermostat control, ON / OFF switch and required fuses	No		--do--	
18	Mimic diagram	No		--do--	
19	Car type lockable handle.	No		--do--	
20	3.0/2.5 mm thick sheets steel for front/all sieds respectively	No		--do--	
21	Circuit wiring to comply to specification with required fuses, links, terminal blocks	No		--do--	
22	Push buttons for trip ckt. healthy.	No	01	01	01
23	Test terminal block for energy meter	No	01	01	01
24	Test terminal block for Relay	No	01	01	03
25	M.S Foundation bolt/nuts size 18 mm dia x 120mm long	No	04	04	04

Note : Indicating lamps offered shall be as under:

a)	C.B. Closed.	:	‘Red’ colour
b)	C.B. open.	:	‘Green’ colour
c)	Trip circuit healthy.	:	‘White’ colour
d)	Spring charged.	:	‘Blue’ colour
e)	Auto trip.	:	‘Amber’ colour

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SECTION – II
GENERAL REQUIREMENTS

1. SCOPE:

This section covers performance, design, manufacture, testing, inspection, dispatch and delivery of electric control and relay panels, control desks and accessories. Both sections of this specification are mutually dependent and are essential for correct and complete interpretation. Section I covers specific requirements and Section II covers general requirements which generally are uniform for all projects. When requirements of both sections conflict, those of section I shall prevail.

1.1 The following works are included within the scope of this specification :

a) Design and fabrication of complete panel including provision for all equipment/parts/items and wiring.

b) Painting of all equipments, specified in Section-I of this specification, together with such auxiliary items as may be incidental or complementary to those specified.

c) All internal wiring to equipment and terminals and inter panel wiring.

d) Furnishing of all necessary material and equipment required for the control panel/desk to perform as specified in section.

e) Electrical detailing as outlined in this specification.

f) Preparation and furnishing of all drawing as required.

1.2 Bidder shall separately set out in his proposal all deviations from this specification in the enclosed schedule of deviations. Unless the proposed deviations are brought out clause by clause in the prescribed schedule, the proposal shall be deemed to be in total non -conformity with this specification.

2. STANDARD:

2.1 The intent of this specification is to specify essential general requirements rather than all details of design, construction and equipment. The vender shall be responsible for furnishing a control board complete in all respects and details,

within the limits outlined above in “SCOPE” and conforming in all respects to high standards of engineering, design and workmanship. The vender shall be responsible to make good at his own expense, any failure of circuits to function as intended when the board is installed.

2.2 All materials and equipment offered shall confirm to the requirements of the latest editions of the relevant Indian Standards and Codes of Practices.
However, in the event of offering parts/items/equipment conforming to standard other than Indian Standard or this specification, the salient points of comparison between the standard adopted and Indian Standards shall be indicated in the proposal.

2.3 Any materials, equipment or methods which the vender considers preferable to those specified herein for the purposes intended may be offered for consideration and prior approval.

3. GENERAL DESCRIPTION:

Simplex Control board shall comprise of single vertical standing control or relay panels sections bolted together at their sides to form single control or relay or Control relay board. Each panel shall have a hinged rear access door provided with locks.

4. **GENERAL CONSTRUCTIONS:**

Control Board shall be completely closed, constructed from specially selected smooth finished sheet steel not less than 3mm for front and 2.5mm for all other sides and top in thickness, bent and formed into a rigid unit and suitable for mounting auxiliary apparatus. There shall be sufficient reinforcement to provide flat level surfaces resistance to vibration and rigidity during transportation and installation. Support and enclosure of cables and wiring shall be safe, neat and shall provided sufficient accessibility.

4.1 Design, material selection and workmanship shall be such as to result in a neat appearance outside and inside, with no welds, reverts or bolt heads appearing from outside & with all exterior surfaces true and smooth.

4.2 Cut outs and small wiring for equipment shall be according to equipment manufacturer's drawings and diagrams.

4.3 Equipment/parts/items shall be mounted such that removal and replacement can be accomplished individually without interruption of service to adjacent equipment. Equipment parts/items mounted inside the panel shall be so located that terminals and adjacent devices are readily accessible with but the use of special tools, Terminal markings shall be clearly visible.

4.4 Relays and devices mounted on or inside the control board shall have identification markings clearly visible from inside of control board enclosure. Devices mounted on the control board shall also be labeled on the outside of the Control Board.

4.5 Control Board base shall be designed with a flat bearing surface for mounting on two strips each 10mm thick of approved type of shock absorbing materials which shall be supplied by the vender. Foundation templates accompanied by details in regard to method of mounting and cable trench holes to be provided in the foundation platform shall be furnished by the vender well in advance of the dispatch of the panels.

5. DESIGN DETAILS:

Panels and openings shall have edges and corners slightly rounded for safe handling.

5.1 Supports shall be provided for purchaser's incoming and outgoing cables. Terminal blocks shall be provided for connections between these cable and control board wiring, wiring tray shall be provided for vertical panel wiring and for interconnecting wiring between front and rear panels for each section. Terminal blocks shall be provided such that individual panels and front & rear sections of panels can be conveniently removed and relocated, if necessary Longitudinal through extending throughout the full length of the panels shall be provided for inter-panel wiring in such a location that removal of front and rear panels does not affected. Wiring shall be installed so that it can be readily inspected and maintained.

5.2 Auxiliary equipment shall be mounted inside the panels in a manner that will not interfere with the inspection or maintenance of the wiring and the terminal connections. Wiring through trays, cable supports and mounting for terminal blocks shall be provided for future circuits, whenever these are specified.

5.3 One piece mounded, barrier type, 800-volt grade terminal blocks complete with washers, heads, terminal screws and identification strips shall be used. Continuous current ratings for the terminal blocks shall not be less than 10 Amps for general circuits and 25 Amps for the heavy-duty circuits. At least ten percent spare terminal blocks shall be provided on each panel.

	British unit / Size
i) Potential Control circuit	2.5 mm^2 / Copper: Or Equivalent
ii) C.T. Circuits	4.0 mm2 / Copper: Or Equivalent

5.4 The vender shall be solely responsible for correctness of the internal wiring and for the proper functioning of the equipment furnished by him.

5.5 Designation for the panel sections, relay instruments and meters, control devises, circuit breakers, test blocks, fuses etc. shall be clearly marked close to the equipment. Laminated plastic name plate shall be provided for small relays, meters, test facilities and control devices.

5.6 A mimic shall be mounted on the face of the panels in the general location indicated on the switch board layout drawings accompanying this specification. This mimic shall be of screwed on type, anodized aluminium or plastic or painted with synthetic enamel paint of approved fast colour material that is readily cleaned. Colours shall be employed as specified in part one.

5.7 Auxiliary A.C. & D.C. supply, PT circuits and other common services (for inter panel wiring) shall be provided near the top of the panels, running throughout the length of the Board.

5.8 Adequate illumination shall be provided for the access on the inside of the switch board.

Illumination for simplex panels shall be through provision of a 240V, 1 Phase 50 Hz, fluorescent Lamp (CFL) with lighting fixture, controlled by panel door switch and fuse.

5.9 Tubular space heaters suitable for operation at 240V, 1 Phase, 50 Hz A.C. supply complete with switches & thermostat located at convenient positions shall be provided at the bottom of the cubicle to prevent condensation of moisture. The watt loss per unit surface of the heaters shall be low enough to keep surface temperature well below visible heat.

5.10 Auxiliary equipment, which has to be mounted adjacent or complementary to the equipment specified in part one, shall be mounted inside the enclosure on inner surface of panels or on supplementary structures.

5.11 Clamping devices shall be provided for fixing purchaser's incoming multi-core control cables. These clamps shall be of robust construction, capable of clamping the cable firmly without injury to insulation. Cable type & sizes will be specified later.

6. PAINTING:

A suitable rust resisting primer shall be applied on the interior and exterior surfaces of the steel after removing rusts, greases, scale etc., an under coat to serve as base and binder for the finessing coat shall be provided. Polished cellulose enamel of colour specified in part one will be evenly sprayed on the outside with light – gray and glossy white paint for inside shall be applied. A small quantity of finishing paint shall be supplied for minor touching up required at site.

7. **WIRING:**

Control Board panels shall be furnished completely wired, ready for purchaser's connections at the terminal blocks. All inter panel wiring and connections shall be furnished by the vender.

7.1 Control wiring shall be securely supported neatly arranged, readily accessible and connected to equipment terminal and terminal blocks. Terminals on the

terminal blocks shall be marked & numbered by the vender to show wiring designation and shall be suitable for connecting purchaser's cables. Terminal marking shall correspond to the designations on the wiring diagrams.

7.2 Wiring shall be carried out with 800 V grade wires of adequate size of copper. Wiring shall comprise switchboard type, single core, multi-conductor (Minimum three strands) annealed copper wire with PVC Insulation and shall be flame, retardant and vermin proof type, suitable for the climatic conditions outlined in part one.

7.3 Wire terminals shall be made with compression type connectors which firmly grip the conductor and the insulation. Wire terminations shall be provided with insulated sleeves to reduce the possibility of short circuits.

7.4 Numbered sleeves shall be used in the control panel wiring. Sleeves bearing identical numbers shall be placed at both, ends of the wire, the sleeve number being shown in the panel wiring. This is to facilitate easy replacement of components during maintenance.

8. TROPICALIZATION:

Wiring, terminal blocks, relays instruments, meters and control devices shall be suitable for application in tropical climates and shall be given suitable treatments to protect them against tropical conditions which are conductive to rust and fungus growth.

9. TEST FACILITIES:

Protective relays and energy meters shall have built in test blocks. Devices which are not available with built in test blocks or which have been specified to have separate auxiliary devices in their test circuits shall be supplied with external test facilities. Test blocks in such case shall be mounted near the auxiliary device.

9.1 Test blocks shall provide complete isolation of meters, instruments and relays, so that testing power can be supplied either from the instrument transformers or from an external source.

9.2 Terminal blocks with disconnecting facilities shall be used for C.T. & P.T. secondary circuits and auxiliary AC & DC Supply.

9.3 A set of test devices shall be provided for C.T. Circuits in addition to the terminal blocks. These shall be mounted on the front of the relay panel with extra out lest suitable for insertion of devices and with disconnecting facilities. C.T.s. shall not be open circuited during testing operations.

10. EARTHING:

Control panels shall be equipped with a copper ground bus having a minimum cross sectional area of 150 sq. mm. Earth bus shall be securely mounted across the inside base of the panels. Provisions shall be made for extending the earthing bus bar to future adjoining panels. Earthing wires shall be interconnected by sing suitable terminals and clamp connections. Solder connections shall not be employed.

10.1 P.T. & C.T. neutral or common leads shall be grounded only at the terminal blocks where they enter the control board from the transformer. Such ground shall be made by use of jumper or link to the ground bus so that ground may be removed from one group without disturbing continuity of grounding system.

_____ _____

SEAL OF THE FIRM **SIGNATURE AND DESIGNATION OF THE TENDERER**

SECTION - III

GUARANTEED TECHNICAL PARTICULARS
(TO BE FILLED IN BY THE BIDDER AND FURNISH WITH TECHNICAL BID)

This schedule contains GTP for all the possible Devices/ Components the C&R panel generally have. However, the GTP is to be filled up in this format for the required Devices/ Components. Instead of simply confirming, the Bidder shall fill in the particulars against appropriate items in respect of each rating and type of equipment offered in the broad categories listed below along with supporting authentic technical documents.

	Description	
A	**PANEL**	
i	Make	
ii	Panel Details 1. Type of panel (Simplex/ Duplex) 2. Equipment mounted on which side of the panel 3. No. of doors and on which side of the panel. Thickness of sheet steel (a) Front (b) Door Frame (c) Base Frame (d) Side (e) Cubicle roof (f) Door 4. Overall dimensions of each panel (width x Depth x Height) mm	
iii	Details of painting 1. IS `Code of Practice for phosphating iron and steel' in which accordance the sheet steel work is done. 2. Shed no. and IS of colour. 3. Paint thickness	
iv	Largest package by transport (1) Gross weight (2) Overall dimensions	
v	GA drawing no. attached.	
vi	Mounting details	
vii	Other details, if any.	
B	**PANEL WIRING**	
i	Insulation grade and type	
ii	It shall be single core multi strand flexible wire.	
iii	Conductor used	

iv	Size of wiring conductor for following. 1) PT Circuits 2) CT Circuits 3) DC supply circuits 4) Other circuits	

v	Colour code of wiring for following. 1) PT Circuits 2) CT Circuits 3) DC supply circuits 4) Other circuits	
vi	Type of Lugs, Sleeves and Ferrules to be used for panel internal wiring.	
C	**TERMINAL BLOCKS**	
i	Make & Type	
ii	Construction details	
iii	Voltage grade	
iv	Current rating	
v	Type of TB for CT, PT, Aux AC & DC wiring and other wiring.	
vi	No. of 2.5 sq. mm Cables that can be connected.	
vii	No. of spare terminals.	
D	**EARTHING**	
i	Conductor or material used for earthing	
ii	Size of the earthing conductor	
iii	Colour and size of the wire used for earthing of different devices in the panel to the earthing bar.	
E	**CIRCUIT LABLE**	
i	Material size and color.	
F	**CONTROL SWITCH FOR CIRCUIT BREAKER:**	
i	Make	
ii	Type of switch	
iii	Rating of contacts 1) Voltage 2) Make and carry continuously. 3) Make and carry for 0.5 sec. 4) Break resistive load with L/R ratio of 40 ms.	
iv	Whether locking arrangement provided.	
v	Type of handle	
vi	Dimensions	
vii	Mounting details and drawing no.	
viii	Detailed technical literature furnished.	
ix	Other information, if any.	

G	***LED* SEMAPHORE INDICATORS**	
i	Make	
ii	Type	
iii	Diameter of the disc.	
iv	Operating voltage	
v	Burden	
vi	Whether latch in Mechanism provided.	

H	**PUSH BUTTONS**	
i	Make	
ii	Type	
iii	Contact type(momentary/maintained)	
iv	Whether shrouding provided to prevent inadvertent operation.	
v	Whether integral engraved integral plates provided.	
vi	No. of NO/NC contacts.	
I	**INDICATING LAMPS**	
i	Make	
ii	Type	
iii	Size of lamps	
iv	Colour of lamps	
v	Life of LED in burning hours.	
vi	Dimensions and mounting details.	
vii	Other information, if any.	
J	**ANNUNCIATORS**	
i	Make	
ii	Type	
iii	Whether conforms to following. 1. It shall be static. 2. Window shall be replaceable. 3. NO/NC selectable 4. Sequence/ grouping selectable 5. Choice of colors 6. Choice of windows sizes 7. AC/DC fail facia facility	
iv	No. of windows.	
v	Dimensions of each Windows (L X W X H)	
vi	Auxiliary supply voltage 1. For DC fail annunciation (AC Volt) 2. For other than DC fail annunciation (DC Volt) 3. Permissible voltage variation for both supply + / - %	

vii	Minimum duration of pulse for initiating contacts - not more than 10milisec.	
viii	Provision of testing facilities for flasher and audible alarm circuit	
ix	Scheme diagrams	
x	Detailed literature attached.	
xi	Other details, if any.	
K	**INSTRUMENTS AND METERS:** KWH & ***MFM***	
i	Make	

ii	Type and Model of Instruments	
iii	Size	
iv	Whether magnetically Shielded	
v	Limits of Errors in The effective range	
vi	Maximum scale length	
vii	Total deflection angle	
viii	Class of Accuracy	
ix	Whether tropicalised	
x	Auxiliary Supply	
xi	Short Time overload	
xii	VA burden i) Current coil ii) Potential coil	
xiii	Power consumption i) Current coil ii) Potential coil	
xiv	Continuous over load rating of Current coil.	
xv	Continuous over load rating of Potential coil.	
xvi	Short time over voltage rating of Potential coil.	
xvii	Short time over current rating of Current coil.	
xviii	Temperature at which calibrated degree centigrade.	
xix	Range of temp. for Correct operations.	
xx	Other details, if any.	
xxi	Type of mounting.	
xxii	Ref. no. of descriptive leaflet, submitted.	

L	**Relays** **- Please fill up the GTP of Relays given separately in SCHEDULE – B of Relay Specifications section**

NOTE:-

1. **The Bidder shall furnish the various make for bought out items wherever required instead of indicating 'or its equivalent'.**
2. **Any other materials required other than above, for successful operation, shall be indicated in a separate sheet.**

SEAL OF THE FIRM

SIGNATURE AND DESIGNATION OF THE BIDDER

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SECTION –I I

SPECIFICATION FOR PROTECTIVE RELAYS

1.0 SCOPE

1.1 The overall scope of work proposed to be assigned to the successful bidder according to this specification covers the following aspects.

1.1.1 The design, manufacture, testing at manufacturer's works, supply and demonstration of the Protective Relays as detailed in the Protective Relays schedule, F.O.R destination supply thereof, testing and commissioning at site.

1.1.2 Design and manufacture of Protective Relays to meet the requirements of Protection of power equipments viz.

a) 22KV , 11KV feeders
b) 22 KV, 11KV side of 66/22 or 11KV, 132/22 or 11KV Two winding transformers

1.1.2.1 Design and fabrication of Protective Relays along with all necessary accessories like switches, indicating LED etc. to provide self contained and ready to use Protective Relays as per this specification.

1.1.3 Complete testing at manufacturer's works.

1.1.4 F.O.R. destination supply of completely assembled Protective Relays.

1.1.5 Testing and commissioning of these Protective Relays at site.

1.1.6 It is not the intent to specify completely all the details of the design and construction of Protective Relays. However, the Protective Relays shall conform in all respects to high standards of engineering, design and workmanship as mentioned in clause 4.0 and shall be capable of performing continuous commercial operation up to the supplier's guarantee. In a manner acceptable to the purchaser, who will interpret the meaning of drawings and specifications, and shall have the power to reject any work of material which, in his judgment is not in accordance therewith. The offered Protective Relays shall be complete with all components necessary for their effective trouble free operation. Such components shall be deemed to whether those are specifically brought out in this specification and/or the commercial order or not.

2.0 SCHEDULE OF REQUIREMENT

2.1 The requirements of Protection relays are attached in Annexure: I S CHEDULE OF REQUIREMENT AND DESIRED DELIVERIES)

2.2 The consignee details/ Delivery instructions shall be issued by CE (Project)/ ACE (Testing), GETCO, Corporate office, Vadodara, to the successful bidder after successful inspection and testing of all relays & equipments at manufacturer's works.

2.3 Any special tools jigs and testing equipment if required for the maintenance/testing of the equipment offered shall be quoted as optional items. Unit prices of such equipment shall be quoted.

2.4 The delivery of the material, in any case shall be finished within 6 months from date of receipt of the order from purchaser.

2.5 Recommended spares

The bidder shall furnish in his offer, a list of recommended spare with unit rates for Protective relays that may be required for trouble free operation for a period of 10 years. The purchaser reserves the right of selection of items and quantities of these spares to be ordered.

3.0 STANDARDS:

Unless otherwise specified elsewhere, in this specification, the rating, performance and testing of Protective Relays shall conform to the latest revisions, available at the time of placement of order of all relevant standards. However the supplier shall submit the copies of English version of the relevant standards applicable to the Protective Relays.

4.0 PRINCIPAL TECHNICAL PARAMETERS:

The Protective Relays covered in these specifications shall have the technical requirements listed in **Annexure – III.**

5.0 GENERAL TECHNICAL REQUIREMENTS:

5.1 SCOPE OF WORK.

5.1.1 Supply of Protective Relays as specified in accompanying **schedule `G'** and in this specification together with such auxiliary equipment and materials as required. The bidder shall indicate make, type and designation of each Protective Relays in the bid.

5.1.2 Preparation and furnishing of all the required drawings.

5.1.3 Testing of Protective Relays and associated equipment and furnishing of test certificates

5.1.4 Preparation and furnishing of commissioning instructions, operation and maintenance manuals with all operational features/optional features.

5.1.5 The successful bidders have to submit **three sets of all types of drawings**, **operation and maintenance manuals.**

5.2 GENERAL REQUIREMENT FOR THE PROTECTIVE RELAYS:

Design, material selection and workmanship shall be such as to result in neat appearance inside and outside with no weld, rivets or bolt heads apparent from outside and with all exterior surface true and smooth.

5.2.0 RELAYS:

5.2.1 All relays shall confirm to the requirements of IS: 3231/IEC-60255 or other applicable standards. Relays shall be suitable for flush or semi-flush mounting on the front with connections from the rear.

5.2.2 All AC operated relays shall be suitable for operation at 50 Hz. AC voltage operated relays shall be suitable for 110V VT secondary and current operated relays for 1 or 5 amp. CT secondary. All DC operated relays and timers shall be designed for the DC voltage specified, and shall operate satisfactorily between 80% and 110% of rated voltage. Voltage operated relays shall have adequate thermal capacity for continuous operation.

5.2.3 The protective relays shall be suitable for efficient and reliable operation of the protection scheme described in the specification. Necessary auxiliary relays and timers required for interlocking schemes for multiplying of contacts suiting contact duties of protective relays and monitoring of control supplies and circuits etc. also required for the complete protection schemes described in the specification shall be provided. All protective relays shall be provided with at least two pairs of potential free isolated output contacts. Auxiliary relays and timers shall have pairs of contacts as required to complete the scheme contacts shall be silver faced with spring action. Relay case shall have adequate number of terminals for making potential free external connections to the relays coils and contacts, including spare contacts.

5.2.4 All protective relays, auxiliary relays and timers except the lockout relays and interlocking relays specified shall be provided with self-reset type contacts. All protective relay and timers shall be provided with externally hand reset positive action operation indicators with inscription. All protective relays which do not have built-in hand-reset operation indicators shall have additional auxiliary relays with operating indicators (flag relays) for this purpose.

5.2.5 Timers shall be of continuous rating. Time delay in terms of ms obtained by the external capacitor resistor combination is not acceptable. The variable pot type timer is not acceptable.

5.2.6 **No control relay which shall trip the power circuit breaker when the relay is de-energized shall be employed** in the circuits.

5.2.7 Auxiliary seal-in-units if provided on the protective relays shall preferably be of shunt reinforcement type. If series, relays are used the following shall be strictly ensured.

a) The operating time of the series seal-in-unit shall be sufficiently shorter than that of the trip relay in series with which it operates to ensure definite operation of the flag indicator of the relay.

b) Seal – in – unit shall obtained adequate current for operation when one or more relays operate simultaneously.

c) Impedance of the seal – in- unit shall be small enough to permit satisfactory operation of the trip coil on trip relays when the D.C supply voltage is minimum.

5.2.8 All protective relays shall be provided with one extra isolated pair of contacts wired to terminals exclusively for future use.

5.2.10 The setting ranges of the relays offered, if different from the ones specified **shall also be acceptable if they meet the functional requirements.**

5.2.11 For numerical relays, the scope shall include the following.

a) Necessary **original customized licensed software** and hardware to up/down load the data to/from the relay from/to the personal computer installed in the sub station. However, **the supply of PC is not covered under this clause**.

b) The software shall be suitable for operations like switching, retrieval of information or changing of setting groups, if DR facility is available then retrieve oscillographic fault data from the relay memory and to store fault record data as oscillographic records in standard COMTRADE format. The software shall be suitable to provide oscillographic data into several different graphical representations that can be used to analyze the fault or event captured by the relay It shall also be possible to calculate additional values from the captured signals and displaying analog curve with time base phasor diagram locus diagrams, harmonic graphs etc. Automatic upload of DR files should be possible. The software shall be suitable for creating / modifying logics of the protective relay.

c) The relay shall have communication facility with suitable port for local communication with PC.

d) The relay shall be provided with all the software mentioned in the catalogue. Also, a communication cable required to connect the relay with PC shall be supplied one each per 10 nos. of the specific type of the relay.

5.2.12 Any alternative/additional protections or relays considered necessary for providing complete effective and reliable protection shall also be offered separately. The acceptance of this alternative/additional equipment shall lie with the GETCO.

5.2.13 All the bidders have **to demonstrate,** mentioned fully programmable numerical relays, as may be demanded by the GETCO, free of cost within 15 days after issue of intimation for verifying its functions, features, accuracies etc. **the testing shall be performed by fully 3 phase automatic testing set**. The relays, which don't meet requirements, don't function as per GTP will not be accepted.

5.2.14 The bidder shall include in his bid a list of installations where the relays quoted have been in satisfactory operation.

5.2.15 All relays and their drawings shall have phase indications as R-Red, Y-Yellow, B-Blue.

6.0 TYPE TESTS:

The following tests from NABL accredited laboratory shall be carried out in accordance with latest / amended / up to date IS/IEC. The bidder has to submit all the type test reports as stated hereunder for the offered item along with the technical bid. The type test reports from NABL approved laboratory shall not be older than seven years. Type test reports shall be valid as on the last date of submission of bid.

a. Performance tests:

i. Accuracy requirements
ii. Limits of operating range of auxiliary energizing inputs and auxiliary Voltage dependence.
iii. Limits of frequency range and frequency dependence
iv. Rated burden
v. Mechanical Endurance test
vi. Characteristic and Functional test

b. Thermal requirements:

i. Maximum allowable temperature
ii. Limits of short time thermal withstand value of input energizing quantities.
iii. Limiting dynamic value

c. Insulation Tests:

i. Dielectric Tests
ii. Impulse Voltage withstand Test
iii. Insulation resistance measurement

d. Influencing Quantities:

i Permissible ripples
ii. Interruption of input voltage

e. Electromagnetic Compatibility Test:

i. 1 MHZ burst disturbance test
ii. Electrostatic Discharge Test
iii. Radiated Electromagnetic Field Disturbance Test
iv. Electrical Fast transient Disturbance Test
v. Conducted Disturbances Tests induced by Radio Frequency Field
vi. Magnetic Field Test
vii. Emission (Conducted and Radiated) Test.
viii. Surge Immunity Test

f.Contact performance Test
i. Contact making/Breaking capacity test

ii. Continuous capacity test

g. Environmental tests:
i. Dry Cold Test
ii. Dry Heat test
iii. Storage temperature test
iv. Damp heat cyclic test

h. Mechanical Tests:

i. Vibration response & Vibration endurance test
ii. Bump test
iii. Shock response test
iv. Seismic test

i. Enclosure Test:

i. Degree of Protection test – IP51

j. Safety Test:

i. Single fault condition assessment
ii. Earth bonding impedance test
iii. Mechanical resistance to shock and impact
iv. Protection against electrical shock
v. Protection against the spread of fire

6.0.2 Important Note :

In case of non-submission / partial submission or type test reports of which validity is over, the bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid

6.0.1 The Protective Relays offered shall be fully type tested **as per clause 5.0, Section-I.**

6.0.2 The reports for the type tests mentioned in Annexure-II shall be submitted by the bidder for the Protective relays, Disturbance recorder and Event Logger. However, the type test report not mentioned in Annexure-II, but relevant to the offered protective relay as on date shall be attached with a copy of English version of that standard.

6.0.2 The **purchaser reserves the right to demand** repetition of some or all the type test in the presence of the purchaser's representative. For this purpose the bidder may quote unit rates for carrying out each type test.

6.1 **Acceptance and routine tests.**

All acceptance and routine test as stipulated in the relevant standards shall be carried out by the supplier in presence of Purchaser's representative without any extra cost. Immediately after finalization of the programme of type / acceptance/ routine / testing the supplier shall give two weeks advance intimation to the purchaser to enable him to depute his representative for witnessing the tests.

List of Acceptance and routine tests:

1. Identification and verification of Type / Designation, Detailed model no. and Rating
2. Physical inspection
3. High voltage test (2kV for 1 min.)
4. IR test
5. Permissible auxiliary voltage test
6. Secondary Injection
7. Functional test
8. Trip time measurement
9. Binary Input, Output and LED operation checks
10. Communication with the Computer through software

The tests shall be carried out with Numerical Relay Testing Kit at the Supplier's works.

6.2 **QUALITY ASSURANCE PLAN:**

6.2.1 The bidder shall invariably furnish along with his offer the quality `assurance plan adopted is him/his sub-supplies in the process of manufacturing all major equipment/component.

6.2.2 Precaution taken for ensuring usage of quality raw materials and sub-components shall be stated in the quality assurance plan.

6.2.3 The bidder should specifically express their consent to accept additions, revisions to their quality assurance plan to meet the purchaser's requirements if needed. The final quality assurance plan to be adopted, with mutual consent, shall be decided after discussion with successful bidder.

6.2.4 The offers are likely to be rejected if the quality assurance plan & details as per clause No. 6.2.1 **to 6.2.3** are not submitted along with the offer.

7.0 PERFORMANCE GUARANTEE

All Protective Relays supplied against this specification shall be guaranteed for a period of **24 months from the date of commissioning**.

8.0 DOCUMENTATION:

The bidder shall furnish as **a part of their offer**, **complete set in triplicate** of technical literature/manuals (**one copy must be original one**), and typical schematic drawings in respect of each Protective Relays offered by them.

8.0 (A) Demonstration

During technical scrutiny of the bid purchaser may ask to give demonstration of the offered Protective Relays at purchaser's site. The bidder shall demonstrate the Protective Relays within one week of intimation from purchaser.

9.0 PACKING AND TRANSPORT

9.1. All Protective Relays/material shall be suitably packed for transport, carriage at site and outdoor storage during transit. The contractor shall be responsible for any damage to the Protective Relays during transit due to improper and inadequate packing. The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols i.e. `FRAGILE' `HANDLE WITH CARE', `USE NO HOOK' etc. The contents of each package shall bear marking that can be readily identified from the package list and packing shall provide complete protection from moisture, termites and mechanical shocks etc.

9.2 Wherever necessary proper arrangement for attaching slings for lifting shall be provided and all packages clearly marked with gross weight, signs showing `UP' and 'DOWN' sides of boxes, contents of each package, order no. and date, name of the plant/SS/ of which the material in the package forms part of and any handling and unpacking instructions considered necessary. Any material found short inside the intact packing cases shall be supplied by the manufacturer/supplier without any extra cost.

9.3 Bidder shall ascertain, prior to shipment, from concerned authorities, the transport limitations like weight and maximum allowable package size for transportation. Fragile material such as Instruments and other glass material shall be carefully covered with shock absorbing protective materials, such as thermocol, silica gel or equivalent moisture absorbent material in small cotton bags shall be placed inside the packing wherever necessary

9.4 Each consignment shall be accompanied by a detailed packing list containing the following information.

a) Purchase order reference.

b) Name of consignee

c) Details of consignment

d) Destination

e) Total weight of consignment

f) Handling and unpacking instructions.

g) Bill of materials indicating contents of each package

h) Sign showing upper/lower side of the crate.

10.0 SCHEDULES:

10.1. The bidder shall fill in the following schedules which form part of the bid specification and offer. If the schedules are not submitted duly filled in with the offer, the offer is likely to be rejected.

Schedule – B	Guaranteed Technical particulars
Schedule – G	List of the offered Protective Relays.

10.4 Unless other wise brought out separately by the bidder in the schedules of deviations the protective relay offered shall be deemed to conform to the specification, as listed in this bid, scrupulously.

10.3 For any deviation from the specification which is not specifically brought out in the schedules shall be supported by authentic documents, standards and clarifications, otherwise the offer may be liable for rejection. Any deviation from the specification shall be high lighted giving reasons and unit prices.

10.4 If the Protective Relay is being designed and manufactured in collaboration with other manufacturer, the following information shall be submitted by the bidder along with his offer.

a) **Copy of authorization between the bidder and manufacturer**.
b) List of orders for offered Protective Relays, executed/ being executed by the supplier.

11 INFORMATION TO BE FILLED IN INVARIABLY BY THE BIDDER:

For ready reference of the purchaser, the items of information required to be invariably furnished by him in his offer, are listed below:

1. Four copies of the authentic English translation of each of the standards to which the offered Protective Relays conforms.
2. Schedule - `B' and `G '.
3. Documents and drawing listed in Clause no. 8.0

12 UNIT RATE FOR OTHER ACCESSORIES.

12.1 The bidder has to submit along with their offer unit rate of all the type of accessories required for trouble free operation of the protective relay for minimum 10 years. The offers without above unit rate are likely to be rejected.
12.2 The above unit rate shall be kept valid till the expiry of guarantee period.

13. GUARANTEE FOR MAINTENANCE SPARES AND SERVICES:

The bidder shall guarantee for supplying maintenance spares and services as well as repairing of protective relay for a period of the life **expectancy of 25 years**.

14. GENERAL:

14.1. The successful bidder has to provide reproducible tracings/ soft copy for all the drawings as a part of supply contract to the CE (Projects) GETCO, HO, VADODARA for documentation.

14.2. The successful Bidder has to provide instruction manual, all drawings, literature etc. for all relays and devices, write up for testing and commissioning procedures, relay setting calculations etc. detailed circuit diagrams with trouble shooting protocols to all consignee destinations as well as to the ACE (Testing), GETCO, and the CE.(Projects) GETCO, HO, VADODARA

14.3. The successful bidder has to do **testing/commissioning** of protection relays to be supplied of each type and also impart training to GETCO engineers at three places **by deputing his Service Engineer free of cost.**

14.4. The successful bidder has to depute his service engineer along with necessary tools/kits/instruments/testing accessories required for testing, commissioning of relays and devices.

ANNEXURE: I

SCHEDULE OF REQUIREMENTS AND DESIRED DELIVERY

Sr. No.	Name of Sub-Station	Particulars	Qty.	Desired Delivery
		Successful bidder has to collect the details of substations and locations from CE (Project), GETCO, Corporate Office, Baroda.		

SIGNATUARE AND
SEAL OF BIDDER

ANNEXURE: II
PROTECTIVE RELAYS – LIST OF STNDARDS

Sr.No.	Standard no.	Title
1.	IS-3231	Electrical relays for power system protection.
2.	IEC-255 Part 1 to 3	Electrical relays for power system protection.
3.	BS – 142	Electrical relays for power system protection
4.	IS – 1248 IS – 2419	Indicating instruments.
5.	BS – 89	Indicating instruments
6.	IS – 6236	Recorders
7.	BS-90	Recorders
8.	BS – 152	Relay coding, auxiliary wiring and panel and wiring.
9.	IS – 8686	Static protective relays
10.	IS – 2147	Degree of protection for cubicles
11.	IS – 5	Colour for ready mixed paints and channels.
12.	IS – 3842 Part- II to IV	Application guide for protection
13.	IS – 6005	Code of practice for phosphating iron and steel
14.	IS-5578	Guide for making of insulated conductors.
15.	IS – 11353	Guide for uniform system of marking and identification of conductors and apparatus terminals.
16.	IS – 9482-1980	Characteristics values of input and outputs of single side band PLCC terminals.
17.	IS- 9528 Part-1 and 2	Planning of (single side band) power line carrier systems.
18.	IS – 10706 – 1983	Methods of tests for single side band PLC terminals.
19.	IS-8997-1978	Coupling device for PLC systems (note This is to be referred for the PLCC terminal connections.
20.	IEC-686-1	Transducers
21.	IS – 2206	Fuses
22.	IS – 9000	Dry heat test
23.	IEC – 801-4	Electrical heat transient bursts.
24.	IS 694	PVC Insulated cable for working voltage up to & including 1100 volt.

List of IEC Standards

Sr.No.	Standard no.	Title
Electromagnetic Compatibility type test:		
1.	IEC-60255-22-1, Class-III,	MHz burst disturbance
2.	IEC-60255-22-2, Class-III IEC-61000-4-2, Class-III	Electrostatic discharge Direct application Indirect application
3.	IEC-60255-22-4, Class-A	Fast transient disturbance
4.	IEC-, 60255-22-5	Surge immunity test
5.	IEC-60255-22-7, Class-A	Power frequency immunity test
6.	IEC-61000-4-8, Class-V	Power frequency magnetic field test
7.	IEC- 60255-22-3	Radiated electromagnetic field disturbance
8.	EN-61000-4-3	Radiated electromagnetic field disturbance
9.	IEEE/ANSI/C37.90.2	Radiated electromagnetic field disturbance
10.	IEC- 60255-22-3	Conducted electromagnetic field disturbance
11.	IEC- 60255-25	Radiated emission
Insulation tests:		
1.	IEC- 60255-5	Dielectric test Impulse voltage test Insulation resistance
Environmental tests:		
1.	IEC-60068-2-1	Cold test Storage test
2.	IEC-60068-2-2	Dry heat test
3.	IEC-60068-2-3	Damp heat test, steady state
4.	IEC-60068-2-30	Damp heat test, cyclic
CE compliance		
1.	IEC- 60255-26	Immunity
2.	IEC- 60255-26	Emissive Test
3.	EN-50178	Low voltage directive
Mechanical tests		
1.	IEC- 60255-21-1	Vibration
2.	IEC- 60255-21-2	Shock and bump
3.	IEC- 60255-21-3	Seismic

ANNEXURE: III

PRINCIPAL TECHNICAL PARAMETERS OF RELAYS

SR. NO.	Item	Specification

1	**NON-DIRECTIONAL O/C AND E/F PROTECTION RELAY.**	**(A) Features:** a) Shall be **Numerical** type. b) Shall have 2 over current and 1 Earth Fault element. c) TRUE RMS Measurement. d) Have **selectable and front panel programmable** normal, inverse, very inverse & IDMT **Characteristic**. e) **Selectable CT Secondary**. I.e. 1A / 5A f) High set over current with selectable time delay. g) High set Earth fault with selectable time delay h) Shall have **Breaker Failure Protection** as in built feature. i) Include hand reset Flag/LED indicators for phase identification for all faults. j) Readable Human Machine Interface with LED/ LCD display. k) Should be able to **store at least last 3 events with fault data** viz. Fault current, Faulty Phase etc. l) Shall have Self monitoring feature. m) Relay offered shall be communicable type. **(B) Technical Parameters:** 1. Rating: 1A / 5A, 50 Hz ±2.5 Hz 2. Auxiliary Supply: 110 V DC ±15 % **(C) Relay settings:** 1. Over Current: 50% - 200% (In steps of 5%) 2. Earth Fault: 5% - 80% (In steps of 5%) 3. High set O/C: 0.5 – 15 times In or more. 4. High set E/F: 0.5 – 12 times In or more. 5. Time multiplier: ***0.025*** – 1.0 (In steps of 0.025) (Independent for O/C & E/F) 6. Time delay for high set element : 0.02 to 2 sec (in steps of 0.01 sec) 7. Pick up: Within 1.1 times of set current value. 8. Reset current: 95% to 90% of pick-up current. 9. Operating Time: As per selectable characteristic. For Inst. Element < 40 ms for 2xIn.

		(D) Other Features: 1. Provide sufficient number of potential free contacts to cater the needs of connection to alarm annunciation. • Output contacts: Minimum 2 N/O contacts with - Continuous carry 5 A - Make & Carry for 0.5 s 30 A - Make & Carry for 3.0 s 15 A • Signaling contact: Minimum 4 Nos for following signals - Relay Faulty - Relay Operated - High set operation - IDMT operation 2. **Local PC Communication**: • RS232/RS485 3. **Housing** • Flush Mounting • Screw Terminals ('O' Lug for CT Connection) • Degree of Protection IP51 4. **Temperature and humidity** (a) Ambient temp -10 to 55 ^{o} C (b) Relative humidity 10% to 90% Non Condensing (c) Operate range 0-95% (d) Storage temp. -40 to 70 ^{o} C
2	**NEUTRAL DISPLACEMENT RELAY**	The relay shall 1) be Single pole type 2) be of electromagnetic/static type 3) have voltage setting of 5.4, 7.5, 12.5 & 20 V, 50 Hz A.C. 4) have alarm and trip output contacts. 5) be high speed with typical operating time of less than 25 ms. 6) be provided with Hand reset flag/LED type operation indicator.

3	**UNBALANCE CURRENT RELAY**	The relay shall be suitable for rated current of 1 amp & have suitable D.C/D.C converter suitable for 110 V D.C. (Preferably 88V TO 300V D.C.). DC voltage range of – 15% to + 25% harmonic level is max, .2% at rated value. It shall 1) be Single pole ***OR*** two pole type (in case of controlling 2 Banks) 2) be of numerical type 3) be **two** Stage relay so that alarm & tripping can be set at different values of current 4) have current setting of 10- 50 % of rated current. 5) have alarm and trip output contacts. 6) have a local user interface (MMI) comprising of a 2-3 line alphanumeric LCD display and a soft touch key pad to access the settings, events and records in the relay. 7) include hand reset flag/LED indicator. 8) be high speed with typical operating time of less than 25

		ms. 9) be provided with sufficient number of potential free contacts to cater the needs of connection to alarm annunciation. Data acquisition and optional trip facility to be connected by purchaser whenever needed. 10) store minimum 3 Nos of fault data.
4	**OVER VOLTAGE RELAY**	The relay shall 1) be electromagnetic/static type 2) be Single pole type 3) have adjustable voltage setting range of 100 – 150% of rated voltage & adjustable time setting range of 0 to 10 seconds continuously or in step of 1 Sec. 4) have alarm & trip out put contacts. 5) have drop off to pick up ratio equal to or greater than 95%. 6) be provided with Hand reset flag/LED type operation indicator.
5	**UNDER VOLTAGE RELAY**	The relay shall 1) be electromagnetic/static type 2) be Single pole type 3) have adjustable voltage setting range of 40 – 90% of rated voltage & adjustable time setting range of 0 to 10 seconds continuously or in step of 1 Sec. 4) have alarm & trip out put contacts. 5) be provided with Hand reset flag/LED type operation indicator.
6	**HIGH SPEED TRIP RELAY**	As per the system design sufficient relays having potential free contacts for trip circuit of breaker shall be provided. The relay shall 1) Have Heavy Duty Contacts for trip circuit. 2) Provide sufficient number of potential free contacts to cater the needs of connection to alarm annunciation, Optional trip facility to be connected by Purchaser where needed. 3) It shall be instantaneous with inherent operating time less than 10 ms. It shall have hand resetting type contacts. It shall 110V DC operating and preferably provided with single coil. 4) Be provided with operation indicator.

7	**TRIP CIRCUIT SUPERVISION RELAY**	Trip circuit supervision relay shall be provided for trip coil of the breaker. The relay shall a) Monitor the complete trip circuit with circuit breaker in pre-close & post-close condition. b) Monitor loss of DC supply. c) Have a delay on drop off d) Provide alarm output. e) Include hand reset flag indicator. f) Provide sufficient number of potential free contacts to meet the scheme & future requirement.

SCHEDULE – B

GUARANTEED TECHNICAL PARTICULARS

(TO BE FILLED IN BY THE BIDDER AND FURNISH WITH TECHNICAL BID)

The GTP is to be filled up in this format and, in the page of Bid Specification only, to be submitted in duplicate along with the offer. This is intended for speedy comparison of various bidders GTP. The Bidder shall fill in the particulars against appropriate items in respect of each rating and type of Protective Relays offered in the broad categories listed below:

A	**NUMERICAL NON-DIRECTIONAL OVERCURRENT AND EARTH FAULT RELAY WITH HIGH SET**	
1	Make	
2	Type	
3	Rating	
4	Auxiliary Supply	
	settings	
5	Over Current	
6	Earth Fault	
7	High set O/C	
8	High set E/F	
9	Time multiplier	
10	Whether independent for O/C and E/F or not	
11	Time delay for high set element	
12	Pick up value	
13	Reset current	
14	Operating Time For Inst. Element	
15	No. of tripping contact	
16	Tripping contacts rating Continuous carry Make & Carry for 0.5 s Make & Carry for 3.0 s	
17	No. of Signaling contact	
18	Communication ports and protocol	
19	Housing	
20	Temperature and Humidity	
21	Relay burden	
22	In built Breaker Failure Protection	
B	**NEUTRAL DISPLACEMENT RELAY**	
1	Make	
2	Type	
3	Voltage setting range	
4	No. of contacts	
5	Operating time	
6	Operation Indicator	

C	**UNBALANCE CURRENT RELAY**	
1	Make	
2	Type	
3	Whether comply to Principle Technical Parameters as per Annexure III	
4	Whether Numerical and have true RMS measurement.	
	Display type for HMI	
5	Give the details of self monitoring (Hardware & Software) and indication/ alarm facility on internal relay failure	
6	• Current Input (CT Secondary) • Whether selectable from front panel at site	
7	Auxiliary Supply and its burden with permissible tolerance.	
8	No. of poles	
9	Current setting range for Unbalance Current alarm for current input 1 & 2	
10	Current setting range for Unbalance Current trip for current input 1 & 2	
11	Burden at CT inputs	
12	• No. of fault event can be stored • Type of data stored on fault	
13	No. of Binary Inputs	
14	No. of outputs. (Trip/ Signaling)	
15	Contact rating Make and carry continuously Make and carry for 0.5 sec. Break resistive load and inductive load with 40m sec. time constant Whether self reset or hand reset	
16	Ref. no. of descriptive leaflet enclosed	
17	Temp. rise over ambient temperature	
18	One minute power frequency withstand volt.	
19	Degree of Protection	
20	Mounting and dimensional details.	
21	Overall dimensions	
22	Weight	
D	**OVER VOLTAGE RELAY**	
1	Make	
2	Type	
3	Voltage setting range	
4	Time setting range	
5	No. of contacts	
6	Drop off to pick up ratio	
7	Operation Indicator	
E	**UNDER VOLTAGE RELAY**	
1	Make	
2	Type	

3	Voltage setting range	
4	Time setting range	
5	No. of contacts	
6	Operation Indicator	
F	**HIGH SPEED TRIP RELAY**	
1	Make	
2	Type	
3	No. of contacts: - Heavy Duty Contacts - Other contacts	
4	Operating time	
5	Operation Indicator	
G	**TRIP CIRCUIT SUPERVISION RELAY**	
1	Make	
2	Type	
3	No. of contacts	
4	Delay on Drop Off	
5	Operation Indicator	

SEAL OF THE FIRM

SIGNATURE AND ESIGNATION OF THE BIDDER