

SECTION-III

**TECHNICAL SPECIFICATION FOR 33 KV CONTROL AND RELAY
PANELS AGAINST TN-2527.****1.0 SCOPE :**

1.1 This specification covers design, engineering, manufacture, assembly, shop testing, inspection and testing before supply and delivery of Control and Relay Panels for 33 KV circuits to be installed at various 33/11KV sub-stations covered under Rajasthan and as detailed hereunder.

1.2 It is not the intent to specify completely herein all the details of the design and construction of equipment. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation upto the Bidder's guarantee, in a manner acceptable to the Purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any work or material which, in his judgement, is not in accordance therewith. The offered equipment shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

2.0 STANDARDS :

The Relays, associated components and enclosures shall conform to the latest issues of standards as given below, except to the extent explicitly modified in the specification.

Indian Standard No.	Title
IS-3231	Protective Relays
IS-8686	Static protective relays
IEC: 60255	Electrical Relays.
IS-1248	General requirements of indicating and integrating meters

IS-2705/1981 IS-4201/1983	Current Transformers Application guide for current transformers
IS-2419 IS-3156/1981 IS-3043/1966	Dimensions of panel mounting and indicating & recording instruments Voltage Transformers Code of practice for earthing
IS-8530/1977	MDI
IS-14697-1999	Specification for AC Static Transformer operated watt hour and VAR hour meter 0.2 S and 0.5 S.
IEC-62053-22-2003 IEC-62052-11-2003	Specification for AC Static Watt hour meters, class 0.2 S & 0.5 S.
CBIP Technical Report No.88 revised July, 1996 read with amendment issued (April,99, September,99 and also any other amendment thereafter).	Specification for AC Static Electrical Energy Meter.
IS-9224	HRC cartridge fuse
IS-3202	Climatic proofing for electrical equipment
IS-345	Code for wiring numbers
IS-6005	Code for practice for Phosphating, Iron and Steel.
IS-6875	Control switches (LV switching device for control and auxiliary circuits.)
IS-375	Marking and arrangement for switchgear Busbar main connection and auxiliary wiring.
IS-1554	PVC insulated cable upto and including 1100 V.
IS-5578	Marking & arrangements for switchgear

IS-11353	bus bars, Main connections and auxiliary wiring.
IS-2147	Degrees of protection provided by enclosures for low voltage switchgear & control gear
IS-5	Colours for ready mix paints
IS-8623	Specification for low voltage switchgear and control gear assemblies.
IS-13947	Specification for low voltage switchgear and control gear. (Covers degree of protection)
IS:13703-1 -	LV Fuses for voltages not exceeding 1000 volt AC or 1500 Volt DC
IEC:60279 -	Low Voltage Power Fuses
IS-2147 & IS/IEC:60947-1-2004 -	Degree of Protection provided by enclosures for low voltage switchgear & control gear.
	(other relevant IS/IEC with latest amendments)

2.1 In case equipment conforms to other International standards which ensure equivalent or better performance than that specified under clause 2.0 then the English version of such standards or the relevant extracts of the same shall be forwarded with the bid and the salient features of comparison shall be brought out separately in additional information schedule.

3.0 SERVICE CONDITIONS:

3.1 Climatic Conditions:

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

- | | | |
|-----|--|-----------------------|
| i) | Location | In state of Rajasthan |
| ii) | Maximum ambient air temperature (deg C) | 50 deg C |

	in shade	
iii)	Minimum ambient air temperature (deg C)	-5 deg C
iv)	Average daily ambient air temperature (deg C)	45 deg C
v)	Max. yearly weighted ambient temperature (deg C)	35 deg C
vi)	Max. relative humidity	100%
vii)	Max. altitude above mean sea level (Metres)	Varies from 61 Mts. to 815 Mts
viii)	Average annual rainfall (mm)	15 cm to 100 cm
xi)	Max. wind pressure (Kg/Sq.mt)	195
x)	Isoceraunic level (days/year)	4 Months (June to Sept)
xi)	Seismic level (Horizontal Acceleration)	0.3 g

NOTE : Hot and humid tropical climate is conducive to rust and fungus growth. The climatic conditions are also prone to wide variations in ambient conditions. Smoke is also present in the atmosphere. Heavy Lightning also occurs during June to October.

3.2 Auxiliary Power Supply

Auxiliary electrical equipment shall be suitable for operation on the following supply system:

- | | | |
|----|---|---|
| a) | AC Supply | 415 V, 3 Phase 4 wire
50 HZ, neutral grounded
AC supply
(230 V single phase) |
| b) | D.C. Alarm, control and protective device | 110 VDC, 2 wire. |

Each of the foregoing supplies shall be made available by the Purchaser at the terminal point for each board for operation of relays/switches and auxiliary equipment.

Bidders scope include supply of interconnecting cables, terminal boxes etc. The above supply voltage may vary as below and all devices shall be suitable for continuous operation over entire range of voltages.

- i) AC supply: Voltage +/- 10% frequency +/- 5%
- ii) DC supply: -15% to +10%

4.0 PRINCIPAL PARAMETERS :

4.01 The C&R panels, required at various sub stations can be broadly classified into following categories of panels :

S.No.	Particulars.	Type of panels	
		Simplex	Duplex.
1.	33 KV C&R panel for controlling (a)HV side of 2 Nos.) of 33/11 KV) transformers)	A	-
2.	33 KV C&R panels for controlling 2 nos. 33 KV feeder circuits.	B	-

4.02 The requirement of various sub stations will comprise of one or more of these panels. The simplex panel shall be complete in itself and provided with doors at the back, while the Duplex panels shall be with end doors which shall be provided only with transformer panels. The various panels shall generally be equipped as per Schedule-A. Statement showing CT ratio their technical particulars and instrument ranges to be provided at various sub-stations are placed at annexure I & II. Statement showing ratio of voltage transformers and capacitive voltage transformers proposed to be provided at various sub stations is placed at Annexure.III.

5.0 GENERAL TECHNICAL REQUIREMENT :

5.01 This specification cover the design, engineering, manufacture, assembly, inspection and testing before supply and delivery of control and relay board duly

mounted with protective relays, metering equipments etc. required for the satisfactory operation of radial and interconnected 33 KV lines, Bus couplers and 33KV side of 33/11KV Power Transformer at various 33/11KV grid sub stations included in the specification to the satisfaction of purchaser.

5.02 The intention of the specification is to provide protective relaying & metering equipments on control boards enumerated in the specification and to be complete in every respect for the functions designated. It is required that the supplier, in accepting the contract, agrees to furnish all apparatus, appliances and material whether specifically mentioned or not but which may be found necessary to complete or test any of the herein specified protective schemes in compliance with the requirements of the specification without any extra charges.

5.03.01 Considerations may be given to alternatives which the supplier considers advisable by reasons of his own manufacturing requirements and experience, provided descriptive literature is submitted pointing out the recommended device or arrangement as equal to, or superior to that required by the accompanying specification.

5.03.02 The each supplier/tenderer should indicate the list of recommended spares and relays which should be purchased (i.e.P.S. module, spare relays and contacts, tripping relays).

5.03.03 Each supplier/tenderer should also indicate the list of test kits and test accessories required to test their relays which should be purchased.

5.03.04 The supplier will give training at the works for the relays which are being supplied first time to protection engineers free of cost and assist them in field for commissioning of these schemes (First five) free of cost.

5.04 RELAYING REQUIREMENTS :

5.04.01 The relay offered by the supplier shall comply with the requirements of latest issue of ISS:3231 & IS:8686 or relevant BSS or IEC and shall be suitable for operation

in the climatic conditions specified under clause 3.1 of this specification . If complying with a specification other than BSS/ISS/IEC then an English translation of the same shall accompany the tender.

5.04.02 Each relay shall be provided with dust tight, removable covers with glass/clear plastic windows. The relay shall be so arranged that on opening the case, it shall be impossible for any dust which may have collected in or upon the case, to fall on the relay mechanism. The operation of the relays shall be practically free from errors due to normal variation in frequency and wave form and from ambient temperature effects between (-) 5 deg. C to 50 deg.C.

5.04.03 All relay voltage current coils/elements shall be able to withstand the maximum possible thermal and mechanical stresses likely to be encountered in service, without damaging the coil/element and mechanical parts. Each relay coil/elements shall be vacuum impregnated with an insulating compound and shall be heat and moisture resistant. The continuous electrical rating of all the coils shall be 110%.

5.04.04 The volt ampere burden of the relay coils shall be low and, as per the best modern design, shall be such that the setting and calibration will not easily get out of adjustment. All contacts shall preferably be made of pure silver and shall be readily renewable and self cleaning type.

5.04.05 Time delay features which depend upon dash pots or other devices which are appreciably effected by change in temperature or humidity will not be acceptable. Permanent magnets shall be non ageing type.

5.04.06 Terminal blocks shall have bases and barriers moulded integrally with brass inserts and shall be suitable for 660 volts service, individual studs or screws with retainer type washer for terminals shall be provided for each incoming and outgoing feeders.

5.04.07 All fault detecting relays shall be equipped with operation indicators. In three phase relays with separate elements, each phase shall have separate indicator.

5.04.08 Annunciation and alarm circuits shall be operated by contacts on an auxiliary tripping relay or by a separate relay added for that purpose. All tripping shall be done by auxiliary tripping relays fed from separate D.C. source thereby providing isolation of the relaying circuits from the circuit breaker D.C. control sources. Auxiliary tripping relays for all protections included in this specification shall be hand reset type. Transformer auxiliary protection like winding temperature trip, oil temperature trip, Buchholz trip/alarm and Oil surge trip shall be through auxiliary relays.

5.04.09 All the relays shall be provided with test blocks in panel so designed that the relays may be tested in situ. The relays should have provision of testing either through test block or test plug easily accessible by injecting the voltage/current/frequency (as applicable) from external testing instruments / source without first disconnecting / reenergizing the primary electrical circuit protected by the relays. Facilities for isolating the tripping circuit during such testing shall be also provided.

The requirement of test block shall not be applicable in case of drawout type relays which can be tested by using test plug without removing the relay from its casing.

Relay TTB shall have trip bypass arrangement.

The testing facilities provided in the relays shall be specifically stated in the bid. Necessary test plug etc. as may be required for proper testing shall be included in the contractor's scope of supply. One test plug with five panels or part thereof are to be supplied.

5.04.10 All relays shall be suitable for 5 Amps. rated C.T. secondary current and secondary voltage of 110/Root 3 volts between phase and neutral. The non-directional polarization for earth fault shall, however, be rated for 110V. The normal frequency will be 50 cycles per second.

5.04.11 All devices required for correct operation of each relay shall be provided by the supplier without extra cost.

5.04.12 For over current & earth Fault protection, only numerical relay shall be provided. In three phase protection relay, the setting for over-current element shall be 50-200% (in step of 10%) and for earth fault element from 10 to 80% (in step of 10%). The numerical relay shall have following features:-

- a. Self Diagnosis
- b. Minimum last five abnormal events recording (over current & earth fault) including fault level and phase along with date & time.
- c. On-line display of current.
- d. Communicable with open Protocol having RS-485 port.
- e. The relay should contain four shots, three phase, programmable & auto reclose control feature. The auto reclosing control feature shall only be provided for the 33 KV Feeder Type C&R Panel only.

5.04.13 Based on the results of comprehensive test, the tenderer shall declare the performance of the protective system in terms of the following :

- i) Fault setting.
- ii) Time of operation.
- iii) Stability limit.

5.04.14

The bidder must furnish type test reports as per relevant ISS/ IEC along with bid to suit the environmental conditions of our State, in respect of the relay (of the type and design offered) which should have been type tested in NABL accredited test laboratory in respect of such tests for which the lab has been accredited (for Indian make Relays)/ CPRI/ Nationally accredited testing laboratory (for Foreign make Relays). These type test reports should not be older than **five years** from the date of opening of bid. Bids without Type Test reports will be treated as Non-Responsive.

5.04.15 MAKE OF RELAYS

The following make of relays are acceptable to Nigam:-

- i) AREVA

- ii) ABB
- iii) EASUN REYROLLE
- iv) JVS
- v) SEL
- vi) ASHIDA
- vii) C&S
- viii) MEGAWIN
- ix) CGL
- x) STELMEC

Any other equivalent make of Relay shall be acceptable subject to prior approval of this office.

5.05 PROTECTION FOR 33 KV SYSTEM

5.05.1 INCOMER (HV side of 33/11 KV transformer)

Protection will be provided on 33 KV incomer which includes four pole IDMTL non directional inverse time combined over current & earth fault relay with instantaneous attachment with stabilizing resistance.

5.05.2 FEEDER PROTECTION

Protection of 33 KV feeder circuits against line faults shall be met by four pole IDMTL non directional inverse time combined over current & earth fault relay with instantaneous attachment.

5.06 FAULT/TROUBLE ALARM ANNUNCIATION SCHEME :

5.06.01 Each C/R panel shall be equipped with Annunciation scheme for indicating all the annunciations required for the trip and non trip alarms as per details given hereunder. Each annunciation shall be clearly labelled to indicate the nature of particular annunciation.

5.06.02 The following switches shall be provided with the annunciator :

i) A common push button switch near the annunciator unit which when pressed shall cancel the audible alarm by means of the alarm cancellation relay. The indication lamps incorporated in the control switch shall remain illuminated, but shall change from flashing to steady glow.

ii) A common reset push button shall be provided. By pushing this button ,annunciation shall be restored to the

normal condition. The lamp incorporated in the control switch should not glow after resetting all the protection devices.

iii) A test push button switch shall be provided to illuminate all the lamps of the associated group. As long as the test switch is held in pressed position all the lamps shall remain illuminated.

5.06.03 Necessary auxiliary relays shall be provided in the annunciator scheme to indicate each trip alarm individually. Each alarm whether trip or nontrip shall have visual as well as audible annunciation.

5.06.04 The visual annunciator alarm shall be in the form of flashing display type glow pattern. The illuminated facias with inscription on the glass transducent plastic to indicate the operation of particular protection device shall be provided. The window shall remain illuminated till the particular initiating contact is reset.

5.06.05 As regards the audible indication, the automatic trip of the circuit breaker due to the operation of protection relays shall be indicated by sounding of a hooter. All non trip alarms shall be indicated by an alarm bell/ electronic bell.

5.06.06 33 KV Feeder circuits

Following trip/Non trip alarm shall be provided on each panel controlling two 33 KV feeder circuits.

Trip

- i) Over current Feeder I trip.
- ii) Earth fault Feeder I trip.
- iii) Over current Feeder II trip.
- iv) Earth fault Feeder II trip.

Non trip

- i) Trip circuit Feeder I faulty.
- ii) Trip circuit Feeder II faulty.

5.06.07 33 KV Transformer

Following trip/Non trip alarm shall be provided on each panel controlling 2 Nos. 33 KV Transformer circuits.

Trip

- i) Over current HV trip Transformer 1.
- ii) Earth fault HV trip Transformer 1.
- iii) Over current HV trip Transformer 2.
- iv) earth fault HV trip Transformer 2.
- v) Buchholz alarm Transformer 1
- vi) Buchholz alarm Transformer 2
- vii) Buchholz trip Transformer 1
- viii) Buchholz trip Transformer 2
- ix) Oil temperature trip Transformer 1
- x) Oil temperature trip Transformer 2
- xi) Winding temperature trip Transformer 1
- xii) Winding temperature trip Transformer 2
- xiii) Oil surge relay trip Transformer 1
- xiv) Oil surge relay trip Transformer 2

Non trip

- i) Trip circuit faulty Transformer 1.
- ii) Trip circuit faulty Transformer 2.
- iii) Minimum oil guage Transformer 1.
- iv) Minimum oil guage Transformer 2.
- v) Oil temperature alarm Transformer 1.
- vi) Oil temperature alarm Transformer 2.
- vii) Winding temperature alarm Transformer 1.
- viii) Winding temperature alarm Transformer 2.
- ix) D.C. under Voltage alarm Transformer 1.
- x) D.C. under Voltage alarm Transformer 2.

5.06.08 It will be responsibility of the supplier to provide all the alarms and annunciation equipments required for the safe and efficient operation of the sub stations. General description of the alarms required are given but the supplier shall include other alarms that he considers necessary.

5.07 SPECIFICATION OF INDICATING AND INTEGRATING INSTRUMENTS AND METERS :

5.07.01 All indicating instruments shall be of switch board type back connected suitable for flush mounting and

provided with dust and vermin proof case for tropical use and finished in black colour. All fixing screws, nuts and threaded parts shall be designed according to relevant Indian Standards. Ammeters, Voltmeters, HT Trivector Meters, as well as power factor meters shall be square pattern and shall conform to the provisions of the latest edition of IS:2419/1963. Energy meters shall conform to the provisions of relevant IS amended upto date.

All instruments shall have practical means of adjustment of accuracy. The limits of errors for ammeters, voltmeters, Power factor meters and watt meters shall be those permissible for class.1 instruments of switch board type given in IS:1248. The energy meters shall however conform to class.0.5S accuracy. The calibration of the instruments shall function satisfactorily when mounted on steel panels or alternatively magnetically shielded instruments shall be used.

5.07.02 AMMETERS AND VOLT METERS :

All ammeters and voltmeters shall be of moving iron spring controlled type. Ammeters shall be provided in all the individual feeder panels and transformer control panels to indicate the current in all the phases. The ammeters shall be suitably scaled to indicate the current for all the ratios of current transformers. A phase selector switch with four position shall be used to measure the current in all the three phases and in the fourth position the ammeters shall be out of circuit.

The voltmeters shall be provided wherever asked for in the detailed equipment requirement. A phase selector switch with six positions shall be used to indicate the voltage between phases and between phases and earth.

5.07.03 A.C. STATIC H.T. TRIVECTOR METERS :

A.C. Static H.T. Trivector Meter shall be as per latest specification of JVVNL. The meters shall be located at eye level to facilitate observations of readings correctly.

Purchaser reserves the right to get energy meters separately purchased from other source, installed on the

control and relay panels to be supplied by the tenderer under this contract. In that event duly blanked cutout with mounting arrangement and wiring shall be provided on the control and relay panels as per details furnished by the purchaser. The price of the control and relay panel shall be reduced corresponding to the unit price given in the tender.

5.07.04 TESTING BLOCKS :

Testing terminals shall be provided for carrying out calibration tests on Energy meters, without disconnecting the connecting leads or removing the meters. The test plug shall be so arranged that when the testing respectables are fitted, the current and voltage are automatically disconnected from the source and injection from the separate source is possible.

5.07.05 Unit prices of each metering and indicating instruments shall be given in the schedule of prices. For making adjustments in the panel mountings depending upon exact system requirement.

5.08 SPECIFICATION OF CONTROL AND RELAY BOARD

5.08.01 The equipment offered should conform to relevant Indian Standards or equivalent IEC standards. The references of the relevant standard specifications wherever mentioned in the text of this specification have been given accordingly. Other authoritative standards which ensure an equal or better quality than the standards specified will also be accepted.

5.08.02 The Boards shall comprise of cubicles placed side by side to form continuous boards. The duplex type shall be mounted back to back and so arranged as to have a covered corridor in between to provide access to the internal wiring. Hinged lockable access doors shall be fitted at both ends of the corridor and switch boards interior shall be automatically lit by the opening of these doors. The control boards for the same line voltages at each sub-station shall be placed side by side.

5.08.03 For the existing sub stations the tenderer shall ensure the matching of control & relay boards with the existing ones. The complete details of the existing control & relay panels shall be supplied to the successful

tenderer. The following points shall be particularly coordinated

- i) The height and depth of the panel shall be perfectly matched.
- ii) Colour of panels both on exterior and interior shall be matched.
- iii) Size and appearance of instruments, control switches and indicating lamps mounted on the front of the panels shall be matched with the existing ones to the extent possible.
- iv) The size, colour and disposition of the mimic diagram shall be perfectly matched with the existing scheme.

5.08.04 For other new sub stations, access doors with concealed hinges having a swing of not less than 1050 mm on full opening of their position shall be provided at suitable locations. The equipment specified shall be manufactured in the manner set out and where not set out, to the reasonable satisfaction of the purchaser.

5.08.05 The control and relay cubicles shall be of folded type construction. The front panels, base frame and door frame shall be manufactured from CRCA sheet steel 10 SWG (3mm) thick, while the side panels, roof and doors shall be manufactured out of 14 SWG (2mm) thick CRCA sheet steel. The bottom of the cubicle frame shall be suitable for erection on flush concrete floor. Evenly spaced grout bolts projecting through the base channels forming members of the frame shall be used for securing cubicles to the floor. The dimensions of control and relay panels where no specific matching is required shall be as follows :

Height	: 2312 mm (inclusive of base channel height of 102 mm).
Width	: 750 mm or suitable to accommodate equipments
Depth	
Duplex panel.	: 610+762+610 mm (Corridor width is 762 mm).
Simplex panel.	: 610 mm

5.08.06 The front panels of all the cubicles shall be detachable and all inter connections from the control to the relay cubicles and vice versa shall be through terminal connectors. The inter connections shall preferably run

underneath the top cover. In order to avoid sectionalising the leads at two points, the top cover may be provided with hinges on the part.

5.08.07 The complete switch board shall be dust and vermin proof and shall be suitable for tropical use. All holes and extension windows in the panels shall be blanked and access doors shall be lined with compressible line at the edges. The complete boards shall incorporate all necessary meters, instruments, relays, control switches, indicating lamps, mimic buses, audible and visual alarms, horizontal and vertical wiring supports, earth bars, interior lighting system, terminal blocks, cable glands, fuses, labels, cleats, ferrules, space heaters, automatic semaphore indicators and other necessary equipment. In the relay panels, it will be the responsibility of the supplier to make provisions for the leads to be connected to the annunciator scheme for different trip and non trip alarms. The enclosure shall provide a minimum degree of protection equivalent to IP51 in accordance to IS2147.

5.08.08 All power and control cables will be connected in separate distributing trenches running immediately, underneath the control & relay panels. The cables will branch off into each cubicle through entry holes in the concrete floor opening in the bottoms of the cubicles. The tenderer shall mark the details of the cable entry holes, glands and position of grouting bolts to enable the purchaser to prepare foundations with pockets for grouting bolts while casting floor.

5.08.09 PAINTING :

All unfinished surfaces of steel panels and frame work shall be sand blasted to remove rust, scale, foreign adhering matter and grease. A suitable rust resisting primer shall be applied on the interior and exterior surface of steel, which shall be followed by application of an under coat suitable to serve as base and binder for the finishing coat.

i) All sheet steel work shall be phosphated in accordance with IS:6005 code of practice for phosphating iron and steel.

ii) Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning.

iii) Rust and scale shall be removed by pickling with dilute acid followed by washing with running water rinsing with slightly alkaline hot water and drying.

iv) After phosphating thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying.

v) The phosphate coating shall be sealed with application of two coats of ready mixed, stoved type zinc chromate primer. The first coat may be "flash dried" while second coat shall be stoved.

vi) After application of primer two coats of finishing synthetic enamel paint shall be applied. Each coat shall be applied followed by stoving the second coat after inspection of first coat of painting. Generally the exterior colour of paint shall be as per shade 631 of IS5, except where specific matching is required.

vii) Each of coat of primer and finished paint shall be of slightly different shade to enable inspection of painting.

viii) In case the tenderer proposes to follow any other established painting procedure like electrostatic painting, the procedure shall be submitted along with the tender for purchaser's review and approval.

5.08.10 PANEL WIRING :

5.08.10.1 All wiring other than for annunciation circuits shall be of switch board type 2.5 sq.mm PVC insulated multi strand tinned copper conductor/ Copper conductor suitable for 660V service and in accordance with relevant Indian Standards. For annunciation and alarm circuits, the wiring will be done with 1.5 sq.mm PVC insulated multi strand copper conductor. Polyvinyl chloride used shall have excellent resistance against burning, moisture, oil and vermin and shall be finished with clear colour. Rubber insulated wiring shall not be acceptable.

5.08.10.2 The wiring shall be supported by plastic cleats/PVC channels. Wires shall be terminated on to the terminal blocks with annealed and tinned (not soldered)

crimp tag termination, separate termination being used for each wire, and the size of termination suited to the size of wire terminated. Wiring shall in general be accommodated on the sides of the cubicles and the wires for each circuit shall be separately grouped.

5.08.10.3 Wires shall not be jointed or tied between terminated points. At the terminal connections, washers shall be interposed between terminals and holding nuts. All holding nuts shall be secured by locking nuts. The connecting studs shall be secured by locking nuts. the connecting studs shall project at least 6 mm from the lock nuts surface.

5.08.10.4 Bus wires shall be fully insulated and run separately. Fuses and links shall be provided to enable all circuits in a panel except lighting circuit to be isolated from the bus wire. When ever practicable all circuits in which the voltage exceeds 125 volts, shall be kept physically separated from the remaining wiring. The function of each circuit shall be marked on the associated terminal boards.

5.08.10.5 All wiring diagrams for the control and relay Boards shall be drawn as viewed from the back of the cubicles and shall be in accordance with the relevant I.S.

5.08.10.6 Wiring connected to the space heaters in the cubicle shall have porcelain beaded insulation over a safe length from the heater terminals.

5.08.10.7 All wiring inter connecting the front panels with the rear panels of the switch boards over the access shall be wired in gutters held against the ceiling of corridors by means of screws. As the front and the back panels will be detachable, the interconnection shall be made through suitable terminal connectors securely fixed on the panel.

5.08.10.8 All voltage bus wiring ,audible and non audible alarm bus wiring, A C & D C control supply, bus wiring for panel lighting and such other wiring which runs from panel to panel within the switch board shall be laid out in gutters and shall be suitably screened.

5.08.10.9 All wire shall be suitable for bending to

meet the terminal studs at right angle with the studs and they shall not be skewed. Metal cases of all apparatus mounted on panels shall be separately earthed by means of flexible copper wire or strip.

5.08.10.10 The following colour scheme of the wiring shall be used :

i)	A.C. three phase circuits	Colour
	No. 1 Phase	Red
	No. 2 Phase	Yellow
	No. 3 Phase	Blue
ii)	Neutral Conductor	Black
iii)	Connections to earth	Green
iv)	D.C. circuits	Grey

5.08.11 FERRULES :

5.08.11.1 Ferrules engraved with the same numbers, letters and symbols as indicated in the connection and wiring diagrams shall be provided on the terminal ends of all wires for easy identification of circuits for inspection and maintenance.

5.08.11.2 Ferrules shall be of strong and flexible insulating material with glossy finish to prevent adhesion. They shall be engraved and clearly and durably marked and shall not be affected by dampness.

5.08.11.3 Ferrules numbering shall be in accordance with IS:375/1963. The same ferrule number shall not be used on wires in different circuits on a panel.

5.08.11.4 All points of interconnection between the wiring carried out for equipments for different suppliers, where a change of number can not be avoided, double ferrules shall be provided on each wire with appropriate numbers on the changing end. The change of numbering shall be shown on the appropriate connection wiring diagram of the equipment.

5.08.11.5 Alternatively marking of the wires may be done with legible numbers painted on the wires.

5.08.12 TERMINAL BLOCKS :

5.08.12.1 Terminal block connectors built from cells of moulded dielectric and brass stud inserts shall be provided for terminating the outgoing ends of the panel wiring and the corresponding incoming tail ends of control cables. Insulating barrier shall be provided between adjacent connections. The height of the barriers and the spacing between terminals shall be such as to give adequate protection while allowing easy access to terminals. Provision shall be made on each pillar for holding 10% extra connections. All blocks shall be shrouded by easily removable shrouds of non inflammable moulded and transparent dielectric materials.

5.08.12.2 The terminal blocks shall be suitable for 660 volts service and for connection with copper wires.

5.08.12.3 Terminal blocks shall be mounted in such a manner as to afford easy access to terminations and to enable ferrule number to be read without difficulty. Wire ends shall be so connected to the terminals that no wire terminal number gets marked due to succeeding connections. In other words ferrule numbering at the terminals should be unambiguous and fool proof. Terminal board rows shall be adequately spaced and shall not be less than 100 mm apart so as to permit convenient access to wires and terminals. Labels in the form of engraved plastic plates shall be provided on the fixed portion of terminal boards.

5.08.12.4 No live metal parts shall be exposed at the back of the terminal boards.

5.08.12.5 All studs, nuts, bolts screws etc. shall be threaded according to the latest relevant Indian or equivalent International Standards.

5.08.13 SPACE HEATERS :

Tubular/Rectangular space heaters suitable for connection to the single phase 230 volts A.C. supply complete with switches located at convenient positions shall be provided at the bottom of each cubicle to prevent condensation of moisture. The Watt loss per unit surface of heater shall be low enough to keep surface temperature well below

visible heat. Each cubicle shall also be provided with a switch of appropriate rating for control for space heater.

5.08.14 MIMIC DIAGRAM.

Painted colour bands shall be used for the mimic bus. The Width of mimic diagram and its colour shall be matched with the existing panel. The mimic shall represent a single line arrangement of the station switch Yard equipment. The colour for showing the 33 KV voltage on the mimic shall be used as green. However where specific matching is not required the color scheme for mimic shall be as under :

33 KV - Brilliant Green - Shade 221 of IS 5

11 KV - Signal Red - Shade 537 of IS 5.

The mimic diagram shall be at the eye level.

5.08.15. SEMAPHORE INDICATORS

Automatic ,rotating disc type semaphore indicators for indication of 'Close'and 'open' position of circuit breakers, isolators and earth switches shall be incorporated in the mimic diagram. Other equipments such as transformers, voltage Transformers etc. shall be represented by suitable symbols.

The operating coils of the semaphore indicators shall be continuously rated and shall be operated from 110 volts D.C. The units will operate satisfactorily between the limits of 80 to 120 percent of rated D.C. voltage. The Semaphore disc shall have a 90 degree angular movement clock wise/counter clock wise to show on/off position of the equipment.

5.08.16 INDICATING LAMPS.:

5.08.16.1 Indicating lamps shall be provided on the control Board to indicate the following:

- i) Visual indication of 'on' and 'off' position of each circuit breaker.
- ii) Auto trip indication for each circuit breaker.
- iii) Spring charged indication for circuit breaker.
- iv) V.T. supply indication on one part of the Panel.

5.08.16.2 Each lamp body shall be of moulded insulation and shall be able to withstand a high voltage of appropriate value. All lamps shall be suitable for 110 volts D.C. supply and shall have low wattage of consumption and shall provide a wide angle of illumination of sufficient intensity for comfortable viewing.

5.08.16.3 The 'on' and 'Off' position indication lamps shall operate at 230 V Single phase A.C. supply. Automatic change over contactor for changing the 'on' and 'off' position indication lamps from A.C. supply to D.C. supply shall be provided to keep the lamps in working condition in case of failure of AC supply. Suitable, IVT shall be added wherever there is voltage difference between AC/DC supply.

5.08.16.4 A glass of appropriate colour shall be screwed into the front of the lamps body. The design of the indication lamps shall be such as to facilitate replacement of burnt lamps. An engraved label indicating the purpose of the lamp shall be provided with each lamp. The tenderer shall quote unit prices for lamps and lenses to enable the purchaser to order certain spare quantity alongwith the main panels.

5.08.17 SWITCH BOARD LIGHTING :

The switch Board interiors shall be illuminated by incandescent lamps connected to a 230 Volts single phase A.C. Supply. The illumination of interior shall be free from hand shadows and shall be planned to avoid any strain or fatigue to the wireman who may be called upon to do work. A door operated button switch shall be provided for control of lighting on both entrances of corridor of duplex C&R panels. In case of simplex panels each cubicle shall have its own interior illumination lamp operated by respective door switch.

5.08.18 TRIP CIRCUIT SUPERVISION :

For continuous supervision of the trip circuits, continuous trip circuit supervision relay shall be installed. The relay shall operate self reset alarm contact for failure of trip supply and open circuit of trip coil or trip circuit wiring. The relay shall monitor the trip circuit in both

close and open position of the circuit breakers.

5.08.19 TITLE PLATES :

A title plate bearing the name and purpose of each panel shall be fixed on the top of each control as well as relay panel.

5.08.20 TEST BLOCKS :

Switch board type back connected test blocks with contacts shall be provided with links or other devices for shorting terminals of CT leads before interrupting the normal circuit for injection from an external source or for inserting testing instruments in the circuit without causing open circuit of the CT. The voltage testing studs shall preferably be housed in the narrow recesses of the block moulding insulation to prevent accidental short circuit across the studs. All test blocks for metering and the relays etc. whenever required, shall be of flush mounting pattern and the number of test blocks being provided on each control and relay panel shall be stated in the tender.

5.08.21 SAFETY EARTHING :

Earthing of current free metallic parts or metallic bodies of the equipments mounted on the switch boards shall be done with 2.5 sq.mm PVC insulated green coloured copper wire. The two ends of this line shall be provided with crimp tag terminations and connected to a tinned copper earth bar of 25mm x 3mm section running longitudinally at the bottom of the control Board.

The neutral point of star connected secondary winding of instrument transformers and one corner of the open delta

connected LV side of voltage transformers, if used, shall be similarly earthed by tails connected with the main earth bar at the switch board earthing system. Multiple earthing of any instrument transformer circuit shall be avoided.

5.09 CO-ORDINATION :

5.09.01 Circuit Breaker, current transformers, voltage transformers, CVTs, isolating switches, H.T. TVM carrier equipment etc., are being purchased from other

suppliers and wiring diagrams of these equipments shall be furnished by the respective suppliers. Supplier of control and relay boards shall be responsible for preparing complete wiring diagrams and cable schedules including the control circuits of various equipments and shall also undertake to mount and wire any equipment received loose from other suppliers.

5.09.02 The control and relay board shall be suitably fabricated to match and arranged to form one continuous board with the existing panels at various sub stations wherever mentioned.

5.09.03 The feeder protection schemes proposed to be provided shall be co ordinated with the existing protection at the remote end of the section. The other protection schemes, wherever asked for, shall be suitably co ordinated with the existing protection at the various sub stations. Other coordination work if required, will also be done without any extra cost by the supplier of control and relay board.

5.09.04 The supplier shall be solely responsible to propose/select the suitable carrier frequency for carrier aided protection schemes, meeting the requirement of our existing systems and arrange allocation of frequency from the wireless advisor, Govt. of India. All relays/associated equipments shall be supplied as per frequency finally approved allocated by the wireless advisor Govt. of India accordingly.

6.0 TESTS :

6.1 TEST BEFORE DESPATCH : The Control & relay Panels and accessories shall be subjected at maker's works before despatch, to the following tests as per ISS.

A) ROUTINE TEST ON EACH UNIT AS PER RELEVANT STANDARD IS 8623-1977 :

- 1) Inspection of wiring & electrical operation test.
- 2) Dielectric Test.
- 3) Checking of protective measures & of electrical continuity of the protective circuit.

6.2 TYPE TESTS :

The 33 KV C&R Panel offered shall be fully type tested as per relevant standards. The bidder must furnish type test reports along with bid as per the qualification requirement of the Tender Specification. However, the purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative. For this purpose, the bidder should indicate unit rates for carrying out such type tests. These test charges shall not be taken into consideration for bid evaluation.

6.2.2 A) TYPE TESTS SHALL HAVE BEEN CONDUCTED ON ONE UNIT

AS PER RELEVANT STANDARD IS 8623-1977 latest amended:

1) Verification of degree of protection IP-55 of encloser (i.e.C&R Panel) in accordance to IS-13947 Part-1 or IEC 60947-1-2004 (with latest amendments).

B) TYPE TEST REPORTS IN RESPECT OF APPROVED MAKE OF RELAYS ARE NOT REQUIRED TO BE FURNISHED FOR AUXILIARY & OTHER RELAYS (EXCEPT OVER CURRENT & EARTH FAULT RELAY). THE FOLLOWING TYPE TESTS ARE REQUIRED TO BE FURNISHED IN RESPECT OF NUMERICAL OVER CURRENT & EARTH FAULT RELAYS:-

- i) Insulation Test.
- ii) High Frequency Disturbance Test.
- iii) Electrical Fast Transient Test.
- iv) Relay Characteristic, Performance & Accuracy Test.
- v) Steady State Characteristics & operating time Test.
- vi) Test for Thermal requirement.
- vii) Test for Mechanical requirement.
- viii) Test for rated burden.
- ix) Contact performance test.

C) TYPE TESTS TO BE CONDUCTED ON ONE UNIT OF ANNUNCIATOR (as per applicable IS/IEC standards with latest amendments):

- a) High Voltage Test at 2 KV A.C. r.m.s. for one minute (IS: 3231/IEC 255-4 Clause 12.3)
- b) Impulse Test 1.2/50 micro sec. 5 KV impulses (IS:8686/IEC 255-4).
- c) Performance/ Functional Test.

- d) Temperature Rise Test.
- e) Auxiliary Supply variation Test.
- f) High Frequency Disturbance Test (IS: 8686)

6.2.3 However, the purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative. For this purpose, the bidder should indicate unit rates for carrying out such type tests. These test charges shall not be taken into consideration for bid evaluation.

6.3 TEST ON BOUGHT OUT ITEMS

Tests are not required to be performed on bought out equipments like Relays, HT TVMs, switches etc. at the works of manufacturer except operational tests. Furnishing Test Certificate of equipments from the original equipment manufacturers shall be deemed to be satisfactory evidence. Inspection of the tests at Sub-contractors works will be arranged by the supplier whenever required.

6.4 ROUTINE/ACCEPTANCE TESTS :

The following tests shall be got conducted in presence of purchaser's representative.

- 1) Checking of wiring of circuits & their continuity.
- 2) One minute 2 KV insulation withstand test at 50 cycles on all equipments on the panels & wiring.
- 3) Insulation resistance of complete wiring circuit by circuit with all equipments mounted on the panel.
- 4) Checking the operation, function and calibration of protection schemes, instruments & meters
- 5) Checking of colour scheme used in wiring as per following requirement :

i)	A.C. three phase circuits	Colour
	-----	-----
	No.1 Phase	Red
	No.2 Phase	Yellow
	No.3 Phase	Blue
ii)	Neutral conductor	Black

iii) Connections to earth	Green
iv) D.C. Circuits	Grey

- 6) Checking of same ferrule numbers at both ends of wires.
- 7) Routine tests in accordance with relevant IS or other the international standards shall be carried out on all the instruments, relays and other devices or manufacturer's routine test reports shall be enclosed with inspection report.

6.5 TOLERANCE ON TEST RESULTS :

The tests shall be conducted as per relevant ISS.

6.6 TEST AT SITE :

The purchaser reserves the right to conduct all tests on Control & Relay Panels after arrival at site and the contractor shall guarantee test certificate figures under actual service conditions.

7.0 INSPECTION :

All the tests (as mentioned at Clause 6.4) and Inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the bidder and purchaser at the time of purchase. The bidder shall afford the inspection officer(s) representing the purchaser all reasonable facilities without charges, to satisfy him that

the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The Inspection may be carried out by the purchaser at any stage of manufacture/ before despatch as per relevant standard.

Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be

defective. The Bidder shall keep the purchaser informed in advance, about manufacturing programme so that arrangements can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance/ routine testings of the bought out items.

The Bidder shall give 15 days advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests. The inspection charges would be to the purchaser's account (Boarding , lodging and to & fro journies upto the place of inspection only).

8.0 DOCUMENTATION :

8.01 SPARES AND OPTIONAL ITEMS :

The supplier shall necessarily include in his tender an itemwise price list of various protection schemes, relays, meters, accessories and other optional items used in the manufacture of C&R panels offered by him to facilitate ordering of spares as well as to make suitable adjustment in prices on account of subsequent additions/deletions of any of these items. The tender without such price list is likely to be ignored. (Please also see clause 5.03.02 to 5.03.04)

8.02 GUARANTEED TECHNICAL PARTICULARS :

Guaranteed technical and other particulars as asked for shall be supplied with the tender. Any tender lacking in this respect may be rejected. Particulars of guarantee shall be clearly marked.

8.03 DRAWINGS :

In addition to any other drawings which the tenderer may like to enclose, to explain the merits of his proposal, the following drawings shall be enclosed with the tender in quadruplicate :

- i) Principal dimensional details of each C&R panel.
- ii) Front & rear views with instruments relays and devices positions marked AC/DC.

- iii) Elementary diagrams of all metering, protection, annunciation and other circuits.
- iv) Feeder protection scheme.

All the items of equipment included in this specification shall be provided with rating plates as per relevant standards and in addition with following particulars :

- i) Name & Address of Supplier.
- ii) Telephone No.
- iii) Fax No.
- iv) Date of Despatch.
- v) Date of Expiry of Warranty.
- vi) Name of Purchaser.
- vii) TN No.

The tenderer shall be responsible for any discrepancies/ errors or omissions in the drawings and other particulars approved by the purchaser or not. 5 sets of such approved drawings would be supplied for each S/S alongwith the panel Board.

8.04 ILLUSTRATED AND PRINTED LITERATURE :

Four copies of each of the descriptive and printed literature in respect of all the ammeters, voltmeters, selector switches, HT Trivector Meter, power factor meter, control switches. Relays etc., proposed to be used shall be supplied alongwith the tender. A descriptive note indicating the salient points of the scheme offered shall also accompany each copy of the tender. In the event of an order, 3 sets of complete literature as well as operating/maintenance instruction manuals shall be supplied for each sub station alongwith panel board & another three sets to purchaser for other use.

8.05 Test Reports :

- i) Four copies of type test reports shall be furnished to the Purchaser within one month of conducting the tests. One copy will be returned duly certified by Purchaser to the Supplier within three weeks thereafter and on receipt of the same Supplier shall commence with the commercial production of the concerned material.

ii) Four copies of acceptance test reports shall be furnished to the Purchaser. One copy will be returned duly certified by the Purchaser and only thereafter shall the materials be despatched.

iii) All records of routine test reports shall be maintained by the Supplier at its works for periodic inspection by the Purchaser.

iv) All test reports for tests conducted during manufacture shall be maintained by the Supplier. These shall be produced for verification as and when requested for by the Purchaser.

9.0 PACKING AND FORWARDING :

9.1 The loose equipment shall be packed in crates suitable for vertical/horizontal transport as the case may be and suitable to withstand handling during transport and outdoor storage during transit. The Supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Any material found short inside the packing cases shall be supplied by Supplier without any extra cost.

9.2 Each consignment shall be accompanied by a detailed packing list containing the following information :

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

The Supplier shall ensure that the packing and bill of material are approved by the Purchaser before despatch.

10.0 QUANTITY AND DELIVERY REQUIREMENTS :

S. No.	Description of Item	Qty.	Delivery Schedule
1.	36 KV Control & Relay Panel (Transformer Type) with Non-Directional Earth Fault relay with Degree of Protection class IP 55.	10	Delivery to commence within 60 days maximum from the date of receipt of order and completion in Six months thereafter at equal quarterly rate.
2.	36 KV Control & Relay Panel (Feeder Type) with Degree of Protection class IP 55.	20	
	Total	30 Nos.	

ii) The scope of supply shall include a supply of 10% extra quantity of bolts, nuts, washers, split pins, cotter pins and such other small loose items free of cost.

11.0 HT TVMs :

3 phase 4 wire A.C. Static H.T. Trivector meter of accuracy class 0.5S for measurement of energy as per latest specification of JVVNL, shall be provided.

Following makes of HT TVMs are acceptable:

- i) Secure
- ii) L&T
- iii) ABB/Elster
- iv) Schlumberger
- v) Genus Infra
- vi) HPL make

Any other make being procured by Nigam shall also be acceptable.

11.2 In case bidders want to provide HT TVMs other than above make then as a qualification requirement the bidder must have supplied upto atleast 80% of total quantity of respective HT TVMs (similar type and model) as worked out on the basis of quantities of panels indicated in schedule of requirement (Annexure-B) of this specification in any one year during last 5 years (i.e. continuous period of 12 months) as on date of bid

opening. Atleast 20% of the total quantity of respective HT TVMs (similar type and model) as worked out on the basis of quantities panels indicated in schedule of requirement (Annexure-B) of this specification must have been in successful commercial operation for last 2 years as on the date of bid opening.

The successful bidder(s) has to furnish 1 No. sample of HT TVM to be provided in the 33 KV C&R Panel to the MM wing within 30 days from the date of receipt of detailed Purchase Order for getting it tested in MT Lab before commencement of supplies. The supplies will be commenced only after approval of sample of HT TVM. If approval of sample of HT TVM is not conveyed by the Nigam within 15 days of receipt of sample, then commencement period will be extended correspondingly.

11.3 The technical suitability of relays/schemes may also be examined by Protection Wing & acceptability will be judged appropriately.

12.0 MAKE AND TYPE OF BOUGHT OUT ITEMS :

12.1 The following make of bought out items will be acceptable to department :

S.No.	Name of Item	Make
1.	Indicating Instrument (Analog type)	AE/IMP/MECO/RISHABH
2.	Indicating Instrument (Digital type)	AE/IMP/MECO/RISHABH
3.	Control Switch for Circuit Breaker/Trip Transfer.	ALSTOM/RECOM/SWITRON/ KAYCEE
4.	Selector Switch for Voltmeter/Ammeter	SWITRON/KAYCEE/RECOM
5.	Semaphore Indicator	ALSTOM/ DAV IND.(Deepl)/ER

6.	Indicating Lamp	ALSTOM/TEKNIC/ VAISHNO/ DAV Ind. (Deepl)
7.	Annunciator	MINILEC/YESHMUN/ INSTALRAM/PROTON/ JVS/PRADEEP/ALAN
8.	Push Button	TEKNIC/VAISHNO/ESSEN DAV Ind. (Deepl)
9.	A.C. Hooter/Bell	TARGET/INDUSTRIAL HOOTER/ALAN/JVS
10.	D.C. Hooter	TARGET/INDUSTRIAL HOOTER/ALAN/JVS
11.	Heater	SOFIA/ELTER/AIREX KAYCEE
12.	Link Type test terminal block for testing of TVM	IMP/CAPITAL/ DAV Ind. (Deepl)
13.	CFL Tube	PHILIPS/CROMPTON/BAJAJ
14.	2 Pin/3 Pin socket with Switch (5/15A)	ISI MARK

Other makes shall also acceptable if it is of "ISI MARK" or type tested for which tenderers shall furnish attested photostat copies of ISI Certificate/type test report not older than 5 years for the respective make offered alongwith tender.

12.2 Make / type of each relay, indicating instruments, integrating instruments, control switches, selector switches, indicating lamps, semaphore indicators, annunciator scheme, bell, hooter etc. shall be clearly and invariably indicated in the GTP (Guaranteed Technical Particulars), bill of material and unit price list. Only specific make accessories shall be indicated. The word "EQUIVALENT/REPUTED MAKE" will not be given for consideration.

13.0 GUARANTEE PERIOD OF CONTROL AND RELAY PANELS :

The guarantee period of each control & relay panels along with all accessories shall be for the period of 5 years from the date of receipt of panel along with all accessories.

If the supplier fails to attend the complaint within 15 days from the date of receipt of complaint intimated first time by the field officer/ purchaser etc. (the date of receipt of complaint shall be treated as the date of email/ 3 days from the date of despatch of complaint by the field officer/ stores/ Purchaser etc.), then penalty @1/4% per week or part thereof for first 4 weeks in case delay is exceeds more than 4 weeks then @1/2% per week or part thereof shall be charged for entire delay, subject to a maximum of 5% . This penalty will be in addition to the penalty leviable due to Delay in Delivery of material as per GCC clause No. 1.24.

Further to this, in case of emergency, 33 KV C&R Panel can be get rectified by the **sub-divisional officers/ M&P officers** (as authorized by Nigam) at the risk & cost of the supplier firm, **by obtaining quotation from three firms, for same item/equipment, meeting the general requirement of specification.** The rectification of 33 KV C&R Panel means satisfactory performance report duly signed by the **sub-divisional officers/ M&P officers** (as authorized by Nigam) i.e. incharge of 33/11 KV Sub-Station.

14.0 TERMS OF PAYMENT:-

A) FOR NEW SUPPLIERS:

100% (Hundred percent) payment of each consignment shall be made along with taxes & duties by the Sr. Accounts Officer (CPC), Jaipur Discom, Jaipur subject to furnishing of SBG & PBG in terms of relevant clause of GCC. In absence of furnishing of Security Bank Guarantee & Performance Bank Guarantee, 88% payment of the cost of each consignment along with 100% taxes, duties and freight and insurance charges shall be made on production of receipted challan duly verified by the consignee. **No payment shall be released without furnishing of complete type test reports.**

B) For old & established suppliers:-

85% (Eighty Five Percent) Payment of each consignment with taxes & duties shall be payable on supply of equipment in absence of type tests and 15% payment will be released after

successful type test reports. In case of failure of any of the type test reports, the 15% payment shall be forfeited for the used material and remaining unused material will be lifted back by the supplier. In absence of furnishing of Security Bank Guarantee & Performance Bank Guarantee, 73% payment of the cost of each consignment along with 100% taxes, duties and freight and insurance charges shall be made on production of receipted challan duly verified by the consignee.

15. ADDITIONAL ORDER

Repeat orders for additional quantities, upto 50% of original ordered quantities, may be placed by the Nigam, on the same rates, terms and conditions given in the contract.

16. QUALITY ASSURANCE PLAN :

- 1) The Bidder shall invariably furnish following information along with his offer, failing which the offer shall be liable for rejection. Information shall be separately given for individual type of equipment offered.
 - i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw material are tested, list of tests normally carried out on raw material in the presence of Supplier's representative, copies of test certificates.
 - ii) Information and copies of test certificates as in (i) above in respect of bought out items.
 - iii) List of manufacturing facilities available.
 - iv) Level of automation achieved and list of areas where manual processing exists.
 - v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
 - vi) Special features provided in the equipment to make it maintenance free.
 - vii) The bidder should have adequate facilities to carryout accurately all required tests during manufacturing and routine/acceptance tests as per relevant ISS/IEC standards at the final end routine/acceptance. The supplier will ensure that all testing/measuring instruments/apparatus are calibrated at regular periodicity from reputed test house as per relevant standards and a certificate of testing authority is made available to purchaser's inspector at the time of inspection. Such calibration certificates, in any case shall not be older than one year on the date of such tests".

- viii) List of testing instruments and apparatus along with their last date of calibration, available with the Bidder for testing of equipment specified and test plant limitation, if any, vis-a-vis the type, special, acceptance and routine tests testing during manufacture specified in the relevant standards. These limitations shall be very clearly brought out in "Schedule of Deviations".
- 2) The Supplier shall also submit the following information to the Purchaser, along with drawings/GTPs/BOM of ordered material, within 15 days of placement of order for purchaser's approval:-**
- i) Name of the raw material as well as bought out accessories and the names of sub-suppliers selected from those furnished along with the offer.
 - ii) Type test certificates of the raw material and bought out accessories/items.
 - iii) Quality Assurance Plan (QAP) withhold points for Purchaser's inspection. The QAP and Purchaser's hold points shall be discussed between the Purchaser and the Supplier before the QAP is finalized.
- 3) The Supplier shall submit the routine test certificates of bought out items and raw material at the time of routine testing of the fully assembled equipment.

17. Purchasing on the Risk & cost of supplier, in case of non-execution of order/delay in delivery.

As per field requirement, as it is, material (s) / equipment (s) is /are urgently required to Nigam and for which final notice has been given to supplier but supplier is being breach of agreement against stipulated delivery schedule, if at any time during the currency of the contract, the performance in whole or in part be prevented or delayed by more than the three months of the delivery schedule, the purchaser reserves the right to procure the material/equipment on order or part thereof from any other source at the risk and cost of the contractor/ supplier.

DETAILS OF EQUIPMENTS

SCHEDULE-A

1. 33KV CONTROL AND RELAY PANELS FOR CONTROLLING TWO CIRCUIT BREAKERS FOR HV SIDE OF 33 KV TRANSFORMER : TYPE-A
-

Equipment for each circuit shall occupy space on front of panel on either side of vertical centre as under :

For Transformer 1

- | | | | | | | | | | | | | | |
|-------|---|--------|----------------------|------|-----|-----------------------|--------|------|-----------------------------|--------|-----|---------------------------------|--------|
| One | Section of painted and overlaid mimic diagram for one main and one auxiliary bus arrangement with symbol. | | | | | | | | | | | | |
| Three | Semaphore indicators for automatic position indication of Isolators. | | | | | | | | | | | | |
| One | Semaphore indicator for automatic position indication of circuit breaker. | | | | | | | | | | | | |
| One | Three position control switch for the circuit breaker with pistol grip handle. | | | | | | | | | | | | |
| Four | Indicating lamps for the following : <table border="0" style="margin-left: 20px;"> <tr> <td style="padding-right: 10px;">i)</td> <td>Circuit breaker 'ON'</td> <td style="padding-left: 20px;">Red.</td> </tr> <tr> <td>ii)</td> <td>Circuit breaker 'OFF'</td> <td>Green.</td> </tr> <tr> <td>iii)</td> <td>Circuit breaker 'Auto-Trip.</td> <td>White.</td> </tr> <tr> <td>iv)</td> <td>Circuit breaker spring charged.</td> <td>Amber.</td> </tr> </table> | i) | Circuit breaker 'ON' | Red. | ii) | Circuit breaker 'OFF' | Green. | iii) | Circuit breaker 'Auto-Trip. | White. | iv) | Circuit breaker spring charged. | Amber. |
| i) | Circuit breaker 'ON' | Red. | | | | | | | | | | | |
| ii) | Circuit breaker 'OFF' | Green. | | | | | | | | | | | |
| iii) | Circuit breaker 'Auto-Trip. | White. | | | | | | | | | | | |
| iv) | Circuit breaker spring charged. | Amber. | | | | | | | | | | | |
| One | Flush switch board mounting, 144 mm square pattern, moving iron AC Ammeter of Class.1 accuracy, suitable for 5 Amps. CT secondary current suitably scaled. | | | | | | | | | | | | |
| One | Ammeter phase selector switch to indicate phase currents in all the three phases and off position. | | | | | | | | | | | | |
| One | 3 phase, 4 wire, Static HT-Trivector meters of class 0.5S accuracy. | | | | | | | | | | | | |
| One | Four Pole IDMTL non directional inverse time combined over current & earth fault relay with | | | | | | | | | | | | |

instantaneous attachment with stabilizing resistance.

- One IDMTL non-directional earth fault relay with instantaneous attachment with stabilising resistance.
- One High speed trip relay.
- One. Continuous supervision relay for trip circuit healthy check both in closed and open position of circuit breaker.
- One Test terminal block 3 phase 4 wire.
- Five Auxiliary relay for transformer trouble.

FOR TRANSFORMER 2 :

Equipments for Transformer 2 shall be identical to Transformer 1 with following additions :-

- Three Indicating lamps for the following :
 - i) VT supply indication (3 nos.) Red, Amber, Blue
- One Flush switch-board mounting, 144mm square pattern, moving iron AC voltmeter of class.1 accuracy suitable for 110V phase to phase VT secondary, suitably scaled.
- One Voltmeter phase selector switch to indicate phase to phase and phase to ground voltages of all the three phases.

FOLLOWING EQUIPMENTS SHALL ALSO BE PROVIDED ON THE C/R PANEL IN COMMON FOR BOTH CIRCUITS.

- One 24 way Annunciation windows complete with Annunciator relays for indicating 8 trip/non-trip alarms individually.
- One Set of 3 control Push buttons for 'Accept' Reset and 'lamp Test' of above annunciation scheme.
- One Bell for Non trip alarm
- One Hooter for trip alarm

- One D.C. under voltage relay.
- One Space heater with switch.
- One 230V A.C. flourcent tube with door switch.
- One 3 Pin Socket with switch 15Amp. rating.
- One 2 Pin Socket with switch 5 Amp. rating.

2. 33KV CONTROL RELAY PANEL FOR CONTROLLING TWO FEEDER
CIRCUIT BREAKERS.
TYPE-B

The C/R Panel shall accomodate equipments for two feeders. Each Circuit shall occupy space on front of panel on either side of vertical centre.

EACH OF THE TWO CIRCUITS SHALL HAVE FOLLOWING EQUIPMENTS:

- One -Section of painted and overlaid mimic diagram for one main + one auxiliary Bus arrangement with symbols.
- Four Semaphore indicators for automatic position indication of isolators and earth switch.
- One Semaphore indicator for automatic position indication of circuit breaker.
- One Three position control switch for the circuit breaker with pistol grip handle.
- Four Indicating Lamps for the following :-
 - i) Circuit Breaker `ON' - Red
 - ii) Circuit Breaker `OFF' - Green
 - iii) Circuit Breaker `Auto-trip'-White.
 - iv) Circuit Breaker Spring charged -Amber.
- One Flush switch Board mounting 144mm square pattern moving iron A.C.Ammeter of Class-1 accuracy suitable for 5 Amps CT secondary suitably

scaled.

- One Ammeter phase selector switch to indicate phase currents in all the three phases and off position.
- One 3 Phase, 4 wire, Static HT Tri-vector meter of class 0.5S accuracy.
- One Four Pole IDMTL non directional inverse time combined over current & earth fault relay with instantaneous attachment.
- One High speed trip relay.
- One Continuous supervision relay for trip circuit healthy Check both in closed & open position of circuit breaker.
- One Test terminal block 3 phase 4 wire.

FOLLOWING EQUIPMENTS SHALL ALSO BE PROVIDED ON THE C/R PANEL IN COMMON FOR BOTH CIRCUITS :

- One 8 way Annunciation windows complete with Annunciation relays for indicating 8 trip/non trip alarm individually.
- One Set of 3 control push buttons for 'Accept' reset and Lamp 'Test' on above annunciation scheme.
- One 230V A.C. incandescent bulb with door switch.
- One Bell for Non trip alarm
- One Hooter for trip alarm
- One Space heater with switch.
- One 3 Pin Socket with switch 15 Amp rating.
- One 2 Pin Socket with switch 5 Amp rating.

ANNEXURE-I

33 KV CURRENT TRANSFORMER
FOR HV SIDE OF 33 KV TRANSFORMER
(RATIO : 240-120-60/5-5A)

NO OF CORES	CORE NO.	APPLICATION	RATED BURDEN	CLASS OF ACCURACY	MAXIMUM INSTRU- MENT SECURITY FACTOR.	MIN. ACCU- RACY LIMIT FACTOR
2	1.	BACKUP PROTECTION	40 VA	5P	-	15
	2.	METERING	30A	0.5S	5	-

33 KV CURRENT TRANSFORMER
FOR 33 KV FEEDER
(RATIO : 300-150/5-5A)

NO OF CORES	CORE NO.	APPLICATION	RATED BURDEN	CLASS OF ACCURACY	MAXIMUM INSTRU- MENT SECURITY FACTOR.	MIN. ACCU- RACY LIMIT FACTOR
2	1.	BACKUP PROTECTION	40 VA	5P	-	15
	2.	METERING	30A	0.5S.	5	-

ANNEXURE-II

INSTRUMENT RANGES 33 KV

S. NO.	INSTRUMENT	: 33 KV SIDE : FEEDER PANEL :	: 33 KV SIDE : TRANSFORMER : PANEL :

1	AMMETER	: 0-300 A :	: 0-240 A :
2	VOLTMETER	: - :	: 0-40 KV :

ANNEXURE . III

TECHNICAL PARTICULARS OF VOLTAGE TRANSFORMERS
PROPOSED TO BE UTILISED AT VARIOUS SUB-STATIONS.

		DETAILS OF VTs.	
S.NO.	PARTICULARS	33 KV	
1	Type	:	Outdoor
2	Rated primary voltage.	:	$33KV/\sqrt{3}$
3	No. of secondary winding.	:	Two
4	Winding.I	:	$110/\sqrt{3}$ V
	Winding.II	:	$110/\sqrt{3}$ V
5	Rated burden :	:	:
	Winding.I	:	100 VA
	Winding.II	:	100 VA
6	Accuracy class.	:	:
	Winding.I	:	0.5, 3 p
	Winding.II	:	3 p
7	Maximum ratio error with rated burden & 5% normal primary voltage.	:	:Within limits specified by IS:3156 for accuracy class indicated.
8	Maximum phase angle error with rated burden & 5% normal primary voltage.	:	:Within limits specified by IS:3156 for accuracy class indicated.
9	Oil	:	:Transformer oil conforming to IS:335.
10	Temperature rise of 1.2 times rated voltage with rated burden.	:	:Within limits specified by IS:3156.
11	Rated voltage factor and time.	:	:1.2 continuous. :1.5 for 30 seconds.
12	Temperature for 11 above.	:	:Within limits specified by IS:3156.