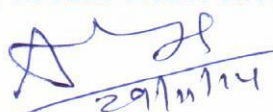


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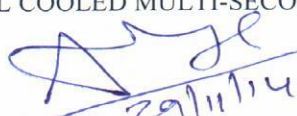

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Acronyms

ATP	:	Acceptance Test Procedure
CG	:	Central of Gravity
COC	:	Certificate of Compliance
CRGO	:	Cold Rolled Grain Oriented
DGA	:	Dissolve Gas Analysis
DP	:	Dye Penetration Test
EHV	:	Extra High Voltage
EMD	:	Earnest Money Deposit
ES	:	Electrostatic Screen
ETP	:	Electrolytic Tough Pitch
FRLS	:	Flame Retardant Low Smoke
GTP	:	Guaranteed Technical Particulars
IEC	:	International Electro technical commission
LD	:	Liquidated Damage
MCCB	:	Moulded Case Circuit Breaker
NEMA	:	National Electrical Manufacturers Association
NDE	:	Non Destructive Examination
ONAN	:	Oil Natural Air Natural
PRD	:	Pressure Related Devices
PVC	:	Poly Vinyl Chloride
QAP	:	Quality Assurance Plan
RHVPS	:	Regulate High Voltage Power Supply
RT	:	Radiography Test
WTI	:	Winding Temperature Indicator
XLPE	:	Cross Linked Poly Ethylene

Definitions

Customer	:	BARC, Mumbai
Purchaser	:	ECIL, Hyderabad
Vendor	:	Selected Party


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Electronics Corporation of India
Limited

(A Government of India
Enterprise)
Control and Automation Division (CAD-3
Building) ECIL Post, Hyderabad- 500 062, India.

Email: gvrao@ecil.co.in; dprao@ecil.co.in
Phone Nos: 040 – 27182242, 27182395

INSTRUCTION SHEET

Instruction to tenders indicating the tender number, last date and time for receipt of tender, place at which the tender can be submitted and the date/time and venue wherein the tenders will be opened.

Tender No. ECIL/PUR/CAD/1964-

- 1.0 Last date for receipt of both part-I
(Technical and Commercial bid)
And Part-II (Price bid) of the tender in sealed
Envelopes at the following address:

up to ^{2015.02.16}

**Senior Dy. General Manager
(purchase) Control And Automation
Division, Electronics Corporation of
India Limited, ECIL post, Hyderabad-
500062.**

- 2.0 DUE DATE FOR OPENING
OF PART-I OF THE TENDER i.e.,
(Technical and commercial bid)

^{2015.02.18}

- 3.0 Due date for receipt of price Revision, if any, and Opening of part-II (price bid) of the bidder will be decided by the ECIL and the same shall be intimated only to those Bidders whose offers are found acceptable in part-I. The Likely date of opening of Part-II (price bid) will be about one month from the date of opening of part-I.

- 4.0 Venue for opening of the tenders: PURCHASE Section, CAD-3 Building,
ECIL HYDERABAD-500 062

- 5.0 All communications in respect of this tender shall be addressed as indicated in clause 1.0 above.

- 6.0 The vendor shall submit clause wise compliance statement along with the part – I (Technical and commercial bid). Such Bids are only considered for evaluation.



TWO PART TENDER

SECTION-1

INVITATION TO TENDERER & PRE REQUISITE CONDITIONS

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1.1 Invitation to Tender:

The Electronics Corporation of India Limited (A Government of India Enterprise under Department of Atomic Energy) invites sealed tenders (Two part) for Design, Manufacturing, Testing, Delivery and Guarantee of 4 Nos. of 1650 kVA, 3-Phase, 50Hz, Oil cooled Multi-Secondary Transformers for REGULATED HIGH VOLTAGE POWER SUPPLY for KLYSTRON amplifier experiment as per specifications given in "Section 4" of the tender document. The conditions of contract, which will govern the contract pursuant to the tender, are as contained in section 2 of this tender document.

If you are in a position to quote for supply in accordance with the technical specifications indicated in section "4" to this tender document and as per conditions in section 2, please submit your offer in a manner and method specified hereinafter.

1.2 Qualifying Requirements:

The tenderers are requested to furnish complete information regarding their experience. The details of similar orders received and executed by the tenderers in recent years may also be furnished. The performance certificate from the concerned parties in respect of their previous vendors shall also be furnished in part one of the tender. This is necessary for qualification of tenderers having sufficient financial resources and relevant experience for award of the contract. Tenderers shall provide the supporting documents for the following:

1.	Vendor shall have in-house manufacturing facility for 66kV class or above class, power transformer (oil cooled). Vendor shall have own testing facilities to test these Transformers.
2.	Vendor shall have in-place certified quality management system (ISO 9001:2008) or established Quality Management System and this shall be verified during the potential vendor audit. This audit shall be carried out by ECIL/ Any representative during the pre-qualification stage.
3.	Vendor shall have a dedicated qualified team to carry out the job.
4.	Vendor shall have dedicated QA and QC team to implement the relevant codes and Standards.
5.	Vendor shall have demonstrated transformers with multi secondary (minimum 24nos) windings in 11kV class or beyond in the last 5 years.
6.	Annual Turnover for last three years shall be not less than INR 200 million

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Vendor shall submit all the relevant documentary evidence for the above clauses to substantiate their compliance.

1.3 Manner and Method for Submission of Offers:

- 1.3.1 All tenders in response to this invitation shall be submitted in TWO PARTS and in different envelopes. All Technical specifications and technical details along with commercial terms and conditions (except price) shall be included only in Part-I of the tender, which is herein-after, referred as part-I (Technical and Commercial). While all details relating to price and other related commercial terms and conditions of contract shall be included in part –II which is here in after referred to as part-II (Price).
- 1.3.2 Technical section of Part-I (Technical & Commercial bid except price): Part I shall contain/include Guaranteed Technical Particulars of all components, Technical Deviations if any with justifications, Explanations, Commercial deviations, Literature, Reference to earlier supplies submission and approval of drawings Manufacturing and delivery schedule, Inspection/Test procedure and Recommended spare parts. However the prices of recommended spare parts shall be furnished in part-II (Price).
- 1.3.3 Part-II(Price):All details relating to price, price break-up, formula of price variation/Escalation, applicability of taxes/Exercise duty, mode and terms of payment, mode of dispatch and all related commercial terms and conditions etc. Shall be included in Part- II (Price).
- 1.3.4 The Part-I (Technical & Commercial) and part-II (Price) shall be duly sealed separately and super- scribe with "Tender No 929549-----Part No 2014. 12.02----- last date of receipt 2015.02.16----- to reach on or before 2015.02.16 ***** and shall reach the purchaser as indicated in clause 1.0.
- The tenderer shall take special care not to mix-up price and other related commercial conditions with part-I (Technical and commercial).
- 1.3.5 The tender will co-relate the price and quantity schedule of terms in PART-II (Price bid) of the tender with the description of equipment indicated in Part – I (Technical Commercial bid except price). The price part shall be enclosed in the sealed envelope and super-scribed with the tender number.
- 1.3.6 Part-I (Technical & Commercial bid except price) in One Envelope and Part-II (price bid) in a separate Envelope shall be enclosed in a common ENVELOPE. This ENVELOPE shall be again sealed and super-scribed with the tender number and last date and time for receipt indicated in the instruction sheet document and shall reach the office of Purchase section, Control & Automation Division (CAD), CAD 3 Building, Electronics Corporation of India, ECIL P.O, Hyderabad-500062, Indicated in the Instruction Sheet of this document.


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1.4 Opening of tenders:

Tenders will be opened in two stages as under

I) Part-I (Technical and commercial) of the tender will be opened at ^{10:30 hrs} ***** hours on ^{18.02.2015} *****

II) Part-II (Price) of the tender will be opened at ^{10:30 hrs} ***** hours on ^{18.03.2015} ***** (Please also refer clause 3.0 and 4.0 of instruction sheet)

Both the tenders will be opened in the presence of tenderers, who wish to participate in the opening of the tenders or their authorized representatives. Tenderers who wish to participate in the opening of part-I and part-II may depute their representatives to the place indicated in clause 4.0 of the Instruction sheet. Part-II (price) will be opened only in the presence of technically and commercially acceptable tenderers

1.4.1 Technical Clarifications:

After opening of part-I (Technical & commercial) of the tender, if it becomes necessary for the purchaser to seek clarifications from the tenderers, the same shall be forwarded to the purchaser to reach on or before the due date fixed by the purchaser. In case any change in price or any modifications in commercial terms and conditions are effected by the tenderers based on technical clarifications or otherwise, justifications for such changes shall be furnished with the breakup of change in price applicable. The same shall be forwarded to the purchaser in duly sealed condition on or before the due date fixed by the purchaser.

1.5 Other Terms and Conditions:

1.5.1 Earnest Money Deposit (EMD):

EMD shall be paid either in the form of bank guarantee/DD for Rs 4.0 Lakhs along with the quotation. The earnest money of the unsuccessful tenderers will be return as soon as possible after the tenders are settled. No interest will be paid on the EMD. Tenderers without earnest money will be rejected.

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1.5.2 Terms of Price:

The successful tenderer shall pay and bear all freights and cost of expenses for loading, unloading and transporting the transformer to the destinations. The destination places for all transformers will be ECIL (Hyderabad) for carrying out integrated testing. After the completion of testing these transformers shall be transported to BARC, Mumbai for final Installation and Commissioning.

The ex-factory price and FOR destination price shall invariably be quoted. The FOR destination price will be the contract price.

Excise duty exception certificate will be provided by BARC.

1.5.3 Mode of Payment:

Payment for the delivery of the items will be made within a reasonable time on submission of bills in triplicate. Payment for the items approved by the purchaser on each delivery will be made to the Vendor at the rates stipulated in the purchase order as follows.

1. 80% of the contract price of each consignment delivered within 60 days after factory inspection and testing.
2. 20% of the contract price of each consignment on final inspection and tests at BARC.

1.5.4 Delivery:

Tenderers shall offer the shortest delivery possible. Tenderers shall also conform that tender is adhere to the promised delivery and also agreeable to the above clauses. The delivery must be completed no later than three months from the approval of the drawings (General Arrangement, Bill of Material etc.)

1.5.5 Warranty

36 months from the date of supply of last consignment

1.5.6 Security Deposit:

The successful tenderer shall before enters into an agreement deposit a sum equivalent to 5% of the value of the contract as security for the performance of the contract immediately after receipt of the purchase order. This BG shall be valid till the end of the contract.


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1.5.7 Short Closure

ECIL reserves the right to accept or reject any offer without assigning any reason whatsoever. The pre-qualified/Unsuccessful tenderers will not have any right to ask ECIL for further details of qualification and verification of other tenderers such as his experience, financial stability and other relevant matter etc., even after the price bid is opened and considered. The vendor will not have any right to question ECIL in considering again the qualification etc. of the tender. Also ECIL reserves the right to split the order to more than one successful tenderers by matching the L1 price if required.

1.5.8 Liquidated damages/Penalty:


In the event of any delay in supply beyond the stipulated delivery schedule, ECIL, at their option, LD will be recovered @ $\frac{1}{2}\%$ per week on the value of uncompleted work subject to a maximum 5% of the total order value

1.5.9 Risk Purchase:

In the event of any failure of the Vendor to comply with the purchase order terms, ECIL has a right to cancel the order and proceed with an alternate source. In the event of proceeding with such an alternate source, the default vendor shall be liable to bear the extra cost, which may incurred by ECIL.

1.5.10 Arbitration:

All disputes or differences whatsoever arising between two parties out of relating to the construction meaning and operation of effect of this contract or the breach of them shall be settled by arbitration in accordance with the rules of arbitration of the Indian council of arbitration is at Hyderabad jurisdiction.


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SECTION-2

GENERAL TERMS & CONDITIONS


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In addition to the general conditions of contract here in before set out, the following special conditions shall apply to contracts for the supply of transformer/accessories. These special conditions where they differ from general conditions shall override the later.

2.1 Responsibility for completeness

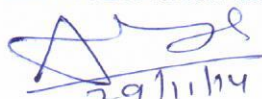
All the fittings or accessories which may not have been specifically mentioned in the specifications but which are essential and necessary for the satisfactory completion of the project and fulfilment of the contract shall be deemed to be included in the contract and shall be provided by the tenderer without any extra cost.

2.2 Rejection of defective items

If the item after acceptance be discovered to be defective, notwithstanding that such effects could have been discovered at the time of inspection or found to have failed to fulfil the requirements to the contract or developed defective after erecting within a period of 24 months from the date of erection, whether such erection is done by ECIL or by the Vendor. ECIL is entitled to give a notice on the Vendor setting forth details of such defects or failure and the Vendor shall replace with new items or alter the same to make it comply with the requirement of the contract at his own cost.

2.3 Inspection & Testing


1. Subsystems produced by each department of the tenderer shall undergo various in-process checks to ascertain the healthiness of the components and also shall meet the requirements of the specification. The reports shall be reviewed and certified by the quality assurance group. The Vendor shall submit the quality assurance plan along with the offer (Keeping in view of the requirements of the specification). The Quality plan and Manufacturing Inspection plan shall be subjected to acceptance by ECIL/Any representative and the changes as necessary to bring it in line with the requirements of the purchaser.
2. Routine tests, Type tests and special tests are indicated in section 4 of the tender document shall be carried out on the transformers as per relevant IEC standards at Vendor's premises.





SECTION-3

SCOPE OF SUPPLY


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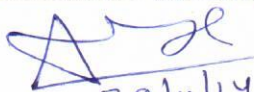
3.1 Scope of Supply/Work/Services:

- 1 The scope of work covers the following activities:
 - i. Design
 - ii. Engineering
 - iii. Manufacturing
 - iv. Inspection and testing at Vendors works
 - v. Packing
 - vi. Delivery of four Nos of 1650 kVA, 3-Phase, 11kV/ (960V x 50), Oil cooled, outdoor, Multi-secondary transformers" at ECIL, Hyderabad for Integration & Testing at 10% load and subsequently transporting to BARC, Mumbai Site.
 - vii. Erection, commissioning and handing over of all 1650 kVA, 3-Phase, 11kV/ (960V x 50), Oil cooled, outdoor, Multi-secondary transformers" at BARC Mumbai.
- 2 Scope of work includes all accessories required for the functioning of equipment. Equipment shall complete in all respects.
- 3 Scope of work also includes fixing of transformers on the rails/channels.
- 4 Vendor shall also engineer and supply necessary hardware involved taking care of interface with 11kV switchgear and protection from intrinsic and external faults. The Vendor shall indicate the recommended scheme in the quotation.
- 5 Spare parts and maintenance tools shall be supplied along with the material. The Vendor shall indicate the recommended tools in the quotation
- 6 Whether specifically called for in this specification or not, all the accessories required for the normal operation of equipment are deemed to be part of the Vendor's scope of supply.
- 7 It is not the intent of this specification to completely indicate all details of design and construction equipment. The equipment shall conform in all respects to high standards of engineering, design and workmanship. It shall be capable of performing in continuous commercial operation in a manner acceptable to ECIL, who will interpret the meaning of specifications and drawings. ECIL shall be entitled to reject any work or material, which in his judgment, is not in full accordance of the intent of this specification.
- 8 The scope of tender also includes submission of various documents covered in subsequent sections, analysis and calculation reports

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SECTION-4

TECHNICAL DESCRIPTION AND SPECIFICATIONS


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4.1 Applicable Codes and Standards

The design, material, construction, manufacturing, inspection, testing and performance of Multi-secondary transformers and accessories shall comply with latest edition (including amendments there to) of all currently applicable IEC standards, CBIP Manual, statutes, regulations and safety code in the locality where the equipment will be installed.

IEC 60051	:	Indicating instruments
IEC 60044	:	Current transformers
IEC 60060	:	High voltage test technique
IEC 60071	:	Insulation co-ordination
IEC 60076	:	Power Transformer
IEC 61378	:	Converter transformers
IEC 60137	:	Bushing for alternate voltage 1000V and above
IEC 60296	:	Unused mineral insulating oil for transformer and switchgear
IEC 60422	:	Mineral Insulating Oil in Electrical Equipment–Supervision and Maintenance Guide
IEC 60567	:	Oil-filled electrical equipment-Sampling of gases and analysis of free and dissolved gases-Guidance
IEC 60529	:	Degree of protection provided by enclosures (IP codes) IEC
60898	:	Electrical accessories– circuit breakers for over-current Protection for house hold and similar installations
IEC 60947	:	Low voltage switchgear and control-gear
IEC 60085	:	Electrical insulation– Thermal evaluation and designation
IEC 60616	:	Terminal and tapping marking for power transformers
IEC 60270	:	Partial discharge measurement
IEC 60099	:	Surge arrester
IEC 61181	:	Mineral oil filled electrical equipment
IS4253	:	Cork composite sheets: Part 2 Cork and rubber
NEMA-TR-1	:	NEMA standard publication for power transformer
ANSI/ASMEB16.34:	:	Valves – Flanged, threaded and welding end
ASTM-D117-02	:	Standard guide for sampling test methods and specifications for electrical insulating oils of petroleum origin

The design, engineering, material, construction, manufacture, inspection, testing and performance of transformers and associated equipment/accessories shall comply with all currently applicable statutes, standards, regulations and safety codes in the locality where the equipment will be finally installed at BARC Mumbai. Nothing in this specification shall be construed to relieve the VENDOR of his responsibility. Where no standards are available, the supply items shall be of good quality and workmanship and backed by test results. Any supply items which are bought-out by the VENDOR shall be procured from the MANUFACTURER approved by ECIL.

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- Equipment shall conform to the latest applicable standards and codes of practice as mentioned in this specification. In case of conflict between the standards, stringent specifications out of the standards shall govern, whereas in case of conflict between the standards and this specification, requirements of this specification shall govern.


Other international standards are acceptable, if they are established to be equivalent to or superior to the listed standards.


4.2 Application note

Multi-secondary transformers are used for modular high voltage power supply. Each secondary feeds a 6-pulse rectifier unit and outputs of the rectifier units are put in series to develop high voltage at output, refer annexure-I.


4.3 Transformer Specifications

1.	General	
	a) Application / Designation	Multi-secondary transformer to feed 6-pulse rectifier load
	b) Applicable standards	IEC 60076 and IEC 61378
	c) Installation	Outdoor
	d) No. of windings :	
	i. Primary	3- ϕ , Delta Connection, Single
	ii. Secondary	3- ϕ , Star connected-25, Delta connected- 25 (alternate).
	e) Type of Cooling	ONAN
	f) Tank	Conventional
	g) Duty	CW mode of operation
	h) BIL	75 kVp, 1.2/50 μ s (wave shape) (As per IEC)
2.	Rating	
	i. Primary winding (rated)	11kV \pm 10%
	ii. Secondary winding (no-load)	960 V
	a) Frequency	50 Hz \pm 3Hz


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	b) Rating for each winding (fundamental)	
	i. Primary winding	1650 kVA
	ii. Secondary winding	33 kVA each
	c) Percentage Impedance overall	8% (approx.)
	d) Efficiency at Full load and UPF	98%
	e) Regulation at Full load and UPF	2%
	f) Capacitance between adjacent secondary	~1nF
	g) Total harmonic distortion on no-load voltage	Less than 2%
3.	Winding Connections :	
	a) Vector group	Dy11 for 25 Secondary's
		Dd0 for 25 Secondary's
4.	System Data	
	a) System voltage	
	i. Primary normal / Highest	11kV / 12kV
	ii. Secondary normal / Highest	960 V / 1.1kV
	b) Fault level on Primary (11kV) system	26.2kA
	c) Withstand time for three phase short circuit at terminals	2 sec as per IEC-60076-5
	d) System earthing	11kV system is earthed
5	Core :	
	Material	CRGO
	Type	M4
	Thickness	0.27mm
	Core frame to tank body connection	External bushing on top of tank shall be provided for measurement of IR of core frame assembly. Connection from tank body to bushing shall be done through disconnecting link to facilitate measurement of IR without need of disconnection of connection at bushing terminal.


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6	Winding insulation and temperature limits:	Class A Temp. rise for Winding/Oil is 50°C/45°C above ambient of 40°C	
7	Connection of Transformer		
	a) Primary	Delta connected	
	b) Secondary		
	i. 25 Nos. Star connected	Star points shall made inside the transformer tank with proper insulation / isolation	
	ii. 25 Nos. Delta connected	Delta connected	
8	Winding Insulation Voltage :	Primary	Secondary
	a) One minute power frequency withstand voltage	28 kV AC rms	3 kV AC rms
9	Winding Isolation test		
	a) All Secondary's shorted to (Primary, Screen, Core, Transformer ground)	At 150 kV DC	
	b) One Secondary to (remaining all secondary's shorted, Screen, Core, Transformer ground)	5kV DC	
	c) Screen to (all secondary's shorted, Primary , Core, Transformer ground)	5kV DC	
10	Operating Condition		
	a) Temperature	Ambient Temperature 5°C - 50°C	
	b) Humidity	<95% Non-condensing	
11	Noise level	60dB As per NEMA TR-1	
12	Terminal Bushing details		
	a) Primary terminals	11kV class bushing on top of the transformer with Primary cable box.	
	b) Secondary terminals	Side wall of the transformer, suitable to DC voltage withstand test and support oil head, mechanical integrity as near to tank material.	
	c) Over load bushing ratings	120% of rated current As per IEC 354	


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13	Surge arresters	Suitable Metal oxide surge arrestors on each phase at Primary side
14	Current transformer on each Primary phase	
	a) Ratio	100 / 5 A
	b) CT particulars	5P10, 15VA
15	Details of external connection	
	a) Primary line end	Cables with terminations will be provided by End User
	b) Secondary line end	Shall be suitable for lugs required for connection of three core 1.1 kV class XLPE cable with FRLS.
16	Equipment Grounding connection	
	a) Transformer tank	2 Nos.
	b) Marshalling box	1 No.
	c) Primary cable box	1 No.
17	Marshalling and protective devices :	
	a) Buchholz relay	Reed type, suitable for seismic duty
	b) Winding temperature indicator (without mercury switch) with WTI CT	Dial (150mm size) type thermometer
	c) Oil temperature indicator (without mercury switch)	Dial (150mm size) type thermometer
	d) Magnetic Oil level gauge	Required & to be provided
	e) Pressure relief device	Required & to be provided with dual contacts
	Note: All these above contacts used for marshalling & protection of multi-secondary transformer shall have dual and isolated contacts.	
18	Miscellaneous :	
	a) Colour shade of final paint	Light Grey (RAL 7035)
	b) Wheel	4 Nos. flanged Bi-directional suitable for 2 rail system. Rail gauge can be decided during the design stage.(Drawings for the same will be approved accordingly)
	c) Vacuum withstand capacity	Main tank with bushing, fittings, radiator (if equipped) and accessories: Full vacuum
	d) Silica gel breather	To be provided
	e) Ladder	To be provided
	f) Conservator	Shall be fitted with air cell

g) Thermo syphon filter with circulating pump	To be provided with 2 Nos. of isolating valves
h) Rain hood for Buchholz relay, Pressure relief device & Magnetic oil - level gauge, Marshalling box	To be provided
i) Facility for fixing the transformer tank to foundations to arrest their movement during specified seismic acceleration	To be provided
j) Requisite quantity of paint for each Transformer for giving one additional coat of finishing paint at site and for touching up the external surface, Shall be supplied in sealed non-returnable containers	Minimum 5 Litres


4.4 Design

Vendor has to design the transformers as per above specifications. Additional considerations while Designing the transformers:

- Proper high voltage practices must be followed and incorporated in the design. Vendor has to ensure corona free performance of the transformer for all test voltages.
- It is expected that transformers will be designed for lower capacitance, winding to winding or winding to ground in general. In particular capacitance between adjacent secondary shall be ~1nF and individual secondary to screen ~100pF or less.
- Space constraints shall be considered for GA and interfaces.
- For conductor sizing, vendor must consider the regulation at FL and UPF.
- Efforts shall be made to minimize the %Z variation among the individual Secondary's.

4.5 General Construction features

- All material used shall be of best quality and of the class most suitable for working under the conditions specified and shall withstand the variations of temperature and atmospheric conditions without distortion or deterioration or the setting up of undue stresses in any part, and also without affecting the strength and suitability of the various parts for the work which they have to perform.
- Pipes and pipe fittings, screws, studs, nuts and bolts used for external connections shall be as per the relevant standards.



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- c) Nuts, bolts and pins used inside the transformers shall be provided with lock washers or lock nuts.
- d) Internal design of transformer shall ensure that air/gas is not trapped in any location.
- e) Materials in contact with oil shall be such as not to contribute to the formation of acid in oil.
- f) Labels, indelibly marked, shall be provided for all identifiable accessories like relays, switches, fans, current transformers etc. All label plates shall be of non-corrodible material.

4.6 Description

4.6.1 Magnetic core

- a) The magnetic circuit shall be constructed from cold rolled non-ageing, grain oriented silicon steel (M4) 0.27mm thick laminations
- b) The laminations shall be free of all burrs and sharp projections. Each lamination shall have an insulating coating resistant to the action of hot oil.
- c) The construction shall be of core type for all transformers.
- d) The insulation structure for the core to bolts, core to tank, core to clamp plates and clamp plates to tank shall be such as to withstand a voltage of 2kV for one minute in air at factory and at site. In order to ensure prevention of multiple core earthing, core isolation test at 2kV for 1 minute shall be done during pre-commissioning stage. To facilitate above, the core earthing has to be brought outside the tank with bushing (3.3kV) or any other provision shall be made for measurement of core IR without disturbance to oil system or exposing the oil to atmosphere and tank opening requirement.
- e) All steel sections used for supporting the core shall be thoroughly shot/Grit blasted, after cutting, drilling and welding.
- f) The design of the magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthed clamping structure and production of flux component at right angles to the plane of laminations which may cause local heating.
- g) The finally assembled core with all the clamping structures shall be free from deformation and shall not vibrate during operation.
- h) The core clamping structure shall be designed to minimize Eddy current loss and bolt less design is preferable.
- i) The construction of the core with step-lap arrangement is recommended for low loss/noise.
- j) The core shall be provided with lugs suitable for lifting the complete core and coil assembly.
- k) Material Origin: M/s. Nippon Steel Corporation, Japan-M/s. AK Steel, USA-M/s. Thyssen Krupp, Germany, M/s. Posco, Viz STAL, Russia.
- l) Lamination must be produced by CNC controlled cut to length line facility.


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- m) Purchaser may visit the lamination facility for quality checks, verifying the origin of material from the roll.

4.6.2 Internal Earthing

- a) All internal metal parts of the transformer, with the exception of individual laminations and their individual clamping plates, shall be earthed at one point only.
- b) The core shall be insulated from base of the tank. The magnetic circuit shall be connected to the clamping structure at one point only. The top clamping structure shall be connected to the tank by a copper strap. The bottom clamping structure shall be earthed by one or both of the following methods:
 - i. By connection through vertical tie-rods to the top structure
 - ii. By a connection to the top structure on the same side of the core as the main earth connection to the tank.
- c) Core frame to body connections shall be done by providing 3.3kV bushing on top of tank. A drawing furnishing the details of the internal earthing design shall be included.

4.6.3 Primary & Secondary winding

- a) The vendor shall ensure that proper hygiene is maintained during manufacturing process at each level. The bidder shall furnish details of the facilities available at his works along with the bid.
- b) Windings shall be subjected to shrinking and seasoning process, so that no further shrinkage occurs during service. Suitable measures shall be taken to contain possible shrinkage in service.
- c) Coils shall be supported at frequent intervals either by means of wedge type insulation spacers permanently secured in place or by means of synthetic resin bonded paper cylinders. These coil supports shall be so arranged to ensure proper oil circulation. To ensure permanent tightness of winding assembly, the insulation spacer shall be dried and compressed at high pressure before use.
- d) Allow voltage windings for use in the circular coil concentric winding shall be wound on a preformed insulating cylinder for mechanical protection of the winding in handling and placing around the core.
- e) Varnish application on coil windings may be given only for mechanical protection and not for improvement in dielectric properties. In no case varnish or other adhesive be used which will seal the coil and prevent evacuation of air and moisture and impregnation by oil.
- f) Coil clamping rings shall be of non-magnetic metal or of a suitable insulating material.
- g) Brand new materials used in the insulation and assembly of the windings shall be Class- A. The materials shall be insoluble, non-catalytic and chemically inactive in the hot transformer oil, and shall not soften, ooze out, shrink or collapse or be otherwise


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affected under the operating conditions.

- h) Windings and connections shall be braced to withstand shocks during transport, short circuits and seismic forces. Permanent current carrying joints between sections of the windings and leads shall be welded or brazed properly. Mating faces of bolted connections shall be appropriately finished and prepared for achieving good, long lasting, electrically stable and effective contacts. Clamping bolts for current carrying parts inside oil shall be made of oil resistant material which shall not be affected by acidity in the oil. Steel bolts, fused, shall be suitably treated.
 - i) Windings shall be of high conductivity annealed copper (electrolytic grade). The conductor shall be transposed at intervals in order to minimize eddy currents and equalize the distribution of currents and temperatures along the windings.
 - j) The terminals of all winding shall be brought out of the tank through bushings for external connections. Star point of the 25 numbers star connected Secondary's to be terminated inside transformer tank with proper insulation.
 - k) Winding leads shall be arranged symmetrically to achieve progressive potential rise among different secondary windings.
 - l) Short circuit withstand capability of the winding shall be proved by calculations / Simulation as per referred standard for method of calculation.
 - m) Measures shall be taken to distribute the switching surges uniformly along the winding.
 - n) Each transformer will have independent Secondary windings. Refer annexure-II
 - o) Each secondary terminal of the transformer shall be terminated to MCCB.
- Note: MCCB's will be supplied by ECIL as a free issue material.

4.6.4 Core and Coil Assembly

- a) The completed core and coil assembly shall be so assembled that the axis and plane of the outer surface of the coil stack shall not deviate from the vertical plane by more than 10mm.
- b) The core and coil assembly shall be so securely fixed in the tank that shifting will not occur during transport or short circuits.
- c) The completed core and coil assembly shall be dried in vacuum at not more than 0.5mm of mercury absolute pressure and shall be immediately impregnated with oil after the drying process to ensure the elimination of air and moisture within the insulation. Vacuum may be applied in either vacuum oven tank or in the transformer tank. Solvent based vapour phase dry out shall be preferred. Bidders shall clearly bring out in his quotation the method of drying of the windings.
- d) The frame work and clamping arrangements shall be securely earthed in accordance with clause 4.7.2 above.

4.6.5 Electrostatic screen (ES)

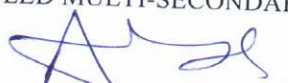
ES will be placed between Secondary coils and Primary coil. ES will be made of ETP copper/SS in the form of cylinder of suitable thickness; edges of the cylinder must be rounded to limit the electric stress. Axial cut to be provided in the cylinder to prevent short circuit loop. Height of screen cylinder must exceed 50mm at top & bottom of the coil stack. Refer Annexure-II.

ES shall be isolated from Primary winding and Secondary windings with 5kVDC, screen terminal shall be brought out from the tank on 3.3kV class bushing for external connection to ground.

4.6.6 Transformer Tank

- a) Tank shall be made from good commercial grade low carbon steel and shall be of welded construction. Material grade and welding electrode must be in compliance with ASME-II
- b) Vendor shall submit following documents to ECIL for approval before starting tank fabrication
 - i. Welding procedure specification
 - ii. Welder qualification test according to process qualification record
 - iii. Dye penetration test and Radiography test procedures


Documents shall be prepared and reviewed as per ASME level-III.
- e) Vendor shall submit test reports for 20% Dye penetration test (DP) and 20% Radiography test (RT) to ECIL, test locations must be duly marked.
- e) Tank together with radiators, bushings, and other fittings shall be designed to withstand without permanent distortion for the following conditions:
 - i. Mechanical shocks during transport
 - ii. Short circuit forces
- f) Tank together with radiators, bushings, and other fittings shall be tested to withstand without permanent distortion for the following conditions:
 - i. Full vacuum of 760 mm of Hg for filling with oil by vacuum.
 - ii. Internal gas pressures of 35kPa with normal head of oil or 2 times the normal head of oil whichever is lower.
 - iii. Leak testing with pressure – A pressure of at least 30kPa over the normal liquid pressure shall be applied and maintained for 8 hours. Typically, this is applied either rushing a liquid column or gas pressure in the conservator. Thereafter, the entire transformer shall be visually inspected for leaks. For tanks that are specifically designed to be flexible for liquid expansion, leak and life time tests need to be agreed.
- g) The external surface of the top tank cover shall be suitably sloped to avoid accumulation of water. The internal surface of top cover shall be shaped to ensure efficient collection and direction of free gas to the Buchholz relay.
- h) Man holes with bolted covers of adequate sizes shall be provided for easy access to the winding or bushing terminal without opening tank cover. Handles shall be provided on


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- the covers to facilitate lifting. Bidder shall decide location and size of the man holes.
- i) Adequate space shall be provided at the bottom of the tank for collection of sediments. Sludge valves at bottom most point of tank to be provided for easy flush out of sludge during maintenance.
 - j) The transformer base shall be designed to permit skidding of the complete transformer unit in any direction, when using plates or rails.
 - k) The material used for gaskets shall be as per IS-4253. Gaskets for tank and manhole covers, bushings and other bolted attachments shall be so designed that the gasket will not be exposed to weather. If gaskets are compressible, metallic stops shall be provided to prevent over-compression. The gasket material shall be arranged in a manner that it shall not deteriorate due to operation of transformer up to a temperature equal to the hot spot temperature.
 - l) Tank shall be provided with required valves.
 - m) Tank shall be provided with PRDs (Pressure Release Devices) which shall operate at a pressure below the test pressure for the tank and radiators. It shall be mounted directly on the tank.
 - n) Side wall of the tank shall accommodated Secondary terminals.
 - o) Tank stiffeners shall be provided for general rigidity and these shall be designed to prevent retention of water.
 - p) All bolted connections shall be fitted with weather proof, hot oil resistant, resilient gasket in between for complete oil tightness. If gasket is compressible, metallic stops/other suitable means shall be provided to prevent over compression. All gasket joints shall be designed, manufactured and assembled to ensure long-term leak and maintenance free operation. Groove provided to accommodate round nitrile rubber cord for rectangular openings shall be milled.
 - q) To prevent transformer movement during earth quake, suitable clamping devices shall be provided for fixing the transformer to foundation.
 - r) Each tank shall be provided with suitable number of lifting lugs (Minimum four Nos.) of adequate size to lift the complete transformer with oil filled without structural damage to any part of the transformer. Adequate factor of safety shall be considered. The lifting lugs shall be so arranged and located as to be accessible for use when the transformer is loaded on the transport vehicle. Lifting attachments welded must be 100% inspected using NDE before and after lifts.
 - s) Vendor shall submit the Surface preparation and painting procedures to ECIL for approval. Vendor must consider the highly corrosive nature of the environment
 - t) Inside of tank shall be painted with varnish/hot oil resistant paint.
 - u) The painted surface shall be tested for paint thickness. The painted surface shall pass the cross hatched adhesion test and impact test as acceptance tests and Salt spray test and Hardness test as type test as per the relevant ASTM standards. The following standards shall be followed during the painting process

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Standard No	Standard Description
IS: 101	Method of test for ready mixed paints & Enamel
IS: 151	Ready mixed paint, spraying, finishing, stoving, enamel
IS: 1303	Glossary of terms relating to paint
IS: 2106	Part XVIII, salt mist test, environmental test
FTMS: 141a	Paint, varnish & related materials
ASTM: D- 3276	Paint Inspectors
ASTM: D-376	Measuring coating thickness


4.6.7 Oil

- EHV grade transformer oil shall be used with minimum breakdown voltage as received shall be 30kV (rms) and after filtration minimum breakdown voltage shall be 60kV(rms).
- The characteristic of EHV grade transformer oil shall be furnished along with quotation & the characteristics of oil shall be as per IS: 335
- Oil shall be suitable for site condition and temperature variation without any additional heating.
- Entire quantity of oil shall be from one manufacturer only.
- Oil sample shall be drawn before and after heat run test and shall be tested for Dissolved Gas Analysis (DGA). Samples for DGA shall be taken from sampling device within 24 hours prior to commencement of temperature rise test and immediately after this test same shall be tested again as per approved test plan. The acceptance norms with reference to various gas generation rates during the temperature rise test shall be as per IEC61181/ CIGRE Guidelines. 2.5% spare oil of this transformer shall be supplied along with transformer.

4.6.8 Bushing

- Primary bushing shall be oil less type mounted on top of the transformer.
- Secondary bushing shall provide on side wall of the transformer refer annexure-III for preferred terminal arrangement.
- There shall be sufficient clearance between Secondary bushing and cable duct to withstand DC isolation voltages.
- Terminals must be protected for corona discharge.
- Suitable bushings to be provided by the manufacture as per the current rating

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- f) On Primary bushing, Metal oxide surge arrestors of reputed make conforming to IEC60099-4, one number per phase shall be provided.


4.6.9 Current Transformer


- Current transformer shall be provided on each Primary terminals.
- Vendor shall include wiring of CT secondary leads in conduits/using armoured control cable up to the marshalling box.
- Name plate for CT shall be mounted on the transformer tank adjacent to the terminal box.

4.6.10 Fitting and Accessories

The following minimum fittings and accessories shall be provided:

- Each tank shall be provided with a minimum of four jacks (with pads) in accessible position to enable the transformer filled with oil to be raised or lowered. Each jacking pad shall be designed to support with an adequate factor of safety for at least half of the total mass of the transformer filled with oil allowing in addition for maximum possible misalignment of the jacking force to the centre of the working surface. Suitable haulage holes shall be provided
- Earthing pads:
Two earthing pads of copper or other non-corrodible material shall be welded at the bottom corners of the transformer tank. Similar earthing pads on marshalling box, Primary cable box.
- Terminal marking and rating plates shall be as per the IEC60076 & IEC61378 and relevant drawings.
- Conservators:
 - The conservator shall be of sufficient volume to maintain the oil seal from them in minimum temperature to maximum of 5°C to 80°C with oil level varying within the minimum and maximum visible levels.
 - Filling plug and drain valve shall be provided
 - Magnetic type oil level gauge with low-level alarm contacts shall be provided.
 - De-hydrating filter breather shall be provided. Conservator shall be fitted with a dehydrating filter breather.
 - Conservator shall be positioned so as not to obstruct any electrical connection to transformer.


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- vi. Valve pipe shall rise towards the oil conservator, through the Buchholz relay, at an angle of not less than 5 degree.
- g) A thermo-syphon filter with isolating valves, necessary piping, supports etc. shall be provided for all transformers, for keeping dryness/improving the dryness of the transformer insulation by natural circulation of oil through filters.
- f) For thermometer protecting covers shall be provided.

4.6.11 Valves

- a) Conductive material like graphite shall not be used for packing/lubrication of valves. All hardware used shall be cadmium plated/electro galvanized.
- b) Each transformer tank shall be provided with the physical isolation of maintainable parts without drain following valves:
 - i. Buchholz relay shutoff valves– 01 Nos.
 - ii. Conservator drain valve– 01 Nos.
 - iii. Gas collecting valve– 01Nos.
 - iv. Transformer oil drain valve– 01 Nos.
 - v. Radiator shut-off valve (top & bottom)- As per approved scheme.
 - vi. Fill and Filter valve– Top and bottom
 - vii. Sampling valve at top& bottom-As per approved scheme.
 - viii. Drain connection valve at bottom wall of the tank– as per approved scheme. ix. Thermo-syphon filter shut-off valve - As per approved scheme
 - x. Breather isolating valve- As per approved scheme
 - xi. Adequate number of air release vents as per approved scheme


4.6.12 Under Carriage

The under-carriage of the transformer tank shall have provision for detachable steel flanged wheels. Flanged wheels (4Nos.) shall be spaced to allow movement on rails (2rail system) with suitable rail gauge. Wheels shall be provided with suitable bearings which will resist rust and corrosion and shall be equipped with fittings for lubrications. The Wheels will be swivelled after jacking the transformer and they shall be lockable in the two positions.

4.6.13 Marshalling Box

Marshalling boxes shall be of outdoor weather-proof construction with degree of protection for enclosure as IP55 or better. All trip and alarm contacts must be dual with isolation shall be provided in the marshalling box, five set of extra contacts shall be provided.


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4.6.14 Wiring and Cabling

All power, control and instrument cable shall be of 1.1kV grade, PVC insulated, FRLSPVC inner and outer sheathed. Heat resistant wires/cables shall be used for wiring/cabling on the transformer tank and they shall be run in suitable conduits firmly clamped onto the transformer tank.

4.6.15 Space Heater

3-phase strip type four space heaters with blower of adequate capacity shall be provided inside marshalling box, Primary & secondary termination sides. Heater shall be equipped with thermostat for automatic operation suitable site operating conditions for eliminate dew point (condensation) formation inside marshalling box.

4.7 Manufacturing

Vendor can initiate the manufacturing of the transformers after approval from ECIL. A mutually agreed stage wise inspection shall be followed during the manufacturing of the transformers. Test certificates, as per relevant IEC/IS standards for the bought-out item like CRGO, copper, steel, transformer oil and other insulating material shall be submitted to the ECIL upon arrival of the material.

ECIL/Any Representative shall perform visual inspection of following material/processes as per approved documents and schedule:

1. Lamination
2. Core making
3. Coil making
4. Core-coil assembly
5. Tanking process
6. Transformer assembly in the tank

Vendor must ensure the uniformity, good surface finish, hygiene and excellent workmanship.

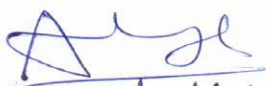
Qualified technical person shall be allotted for testing purpose. All test equipment shall be kept ready with dually calibration. All relevant test formats as per QP shall be kept ready. Temperature and vacuum chambers shall be dually calibrated.

Stage wise inspection will be carried out by ECIL /Any representative.

ECIL /Any representative reserve the right to reject the material/component or hold the manufacturing process if found not suitable.

4.8 List of essential spares:

The Vendor can quote the essential spares required. However it will be finalized after discussion with the qualified vendor.


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4.9 Handling and markings

To facilitate handling, the longitudinal and transverse axes and centre of gravity (CG) for transport of the main unit shall be clearly marked.

4.10 Inspection and Testing:

4.10.1 General

The over-all requirements for material tests, stage inspection and final testing etc., in respect of equipment covered in this contract shall be as per specifications. The routine tests, acceptance tests, special tests and type-tests are covered in this section. Inspections and tests for raw material, semi-finished or assembly stage to be detailed in the dedicated Manufacturing and Inspection Plan provided by the Vendor.

The purchaser reserves the right to demand repetition some or all types of tests in the presence of his representative. For this purpose the bidder shall quote unit rates for carrying out each type of test.


The purchaser shall conduct the entire mentioned test as per IEC-60076 & IEC61378. Any stringent requirement due to revision in latest standard shall be applicable.


If there are changes in the components or in the design/type already type tested and the design/type offered against this specification, the purchaser reserves the right to demand repetition of tests without any extra cost before commencement of supply. The bidder shall bring out in his offer all such changes made in components, materials, design etc. as the case may be and likely effects of such changes on type qualification.

Transformers is to be tested as per IS:2026/IS-11171 or IEC-72

Tests for main equipment categorized as follows:

Description of test	Applicable standard
Type test	IEC 60076 & IEC 61378
Routine test	IEC 60076 & IEC 61378
Special test	IEC 60076 & IEC 61378
ECIL specific test	Extension of IEC prescription


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4.10.2 Details of Tests for Transformers :

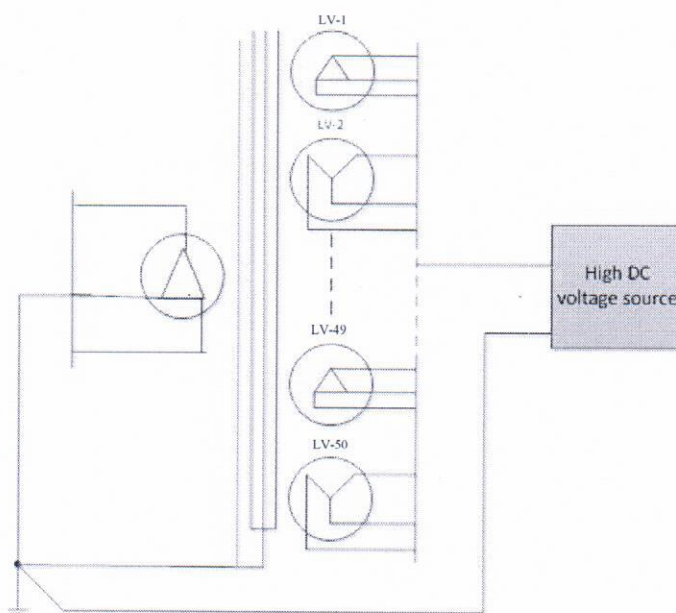
Sr. No	Test	Applicable standard	Test type	To be conducted on
1.	Measurement of Winding resistance for Primary and all Secondary windings and corrected to 75°C	IEC 60076-1 Cl. 10.2	Routine	100 %
2.	Measurement of voltage ratio and check Voltage vector relationship for all windings	IEC 60076-1 Cl. 10.3	Routine	100%
3.	Measurement of Impedance voltage / short circuit impedance for all Secondary's and randomly selected individual LVs	IEC 60076-1 Cl. 10.4	Routine	100%
4.	Measurement of Load loss	IEC 60076-1 Cl. 10.4	Routine	100 %
5.	Measurement of No load loss and excitation Current at 90%, 100 % & 110%	IEC 60076-1 Cl. 10.5	Routine	100 %
6.	Measurement of Insulation resistance and PI (10 min/1 min) value (2.5kV and 5kV)	IEC 60076-1 Cl. 10.1.3	Routine	100 %
7.	Temperature rise test	IEC 60076-2&IEC 61378	Type	1 Nos.
8.	Power frequency separate source withstand Test	IEC 60076-3 Cl. 11	Routine	100 %
9.	Induced overvoltage test	IEC 60076-3 Cl. 11	Routine	100 %
10.	Separate source DC voltage withstand test a) All secondary's shorted to (Screen, Primary , Tr. ground) 150kVDC b) One secondary to (remaining all secondary's shorted, Primary, Tr. Ground) 5kVDC c) Screen to (all secondary's shorted, Primary, Core, Transformer ground) 5kVDC	Purchaser Specific	Routine	100 %
11.	Partial discharge test	IEC 60076-3 Cl. 12.3	Routine	100 %
12.	Measurement of capacitance and Tan delta	IEC 60076-1 Cl. 10.1.3	Special	100 %
13.	Measurement of Noise level	IEC 60551/NEMA	Special	100 %
14.	Magnetic balance test with low voltage single Phase supply	-	Routine	100 %



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15.	Core isolation test	-	Routine	100 %
16.	Sweep frequency response analysis	IEC 60076-18	Routine	100 %
17.	DGA on transformer before and after temperature rise test	IEC 61181	Special	1 Nos.
18.	Full vacuum of 760mm of Hg	IEC 60076-1	Routine	100 %
19.	Internal gas pressure of 35kPa with normal Head of oil or 2 times the normal head of oil whichever is lower.	IEC 60076-1	Routine	100 %
20.	Leak testing with a pressure of at least 30kPa over the normal liquid pressure shall be applied and maintained for 8 hours. Typically, this is applied either rushing & a liquid column or gas pressure in the conservator. Thereafter, the entire transformer shall be checked. Checked visually inspected for leaks.	IEC 60076-1	Routine	100 %
21.	Test on transformer oil	As per relevant IEC standard	Routine	100 %
22.	Voltage gradient test (Refer Annexure-III)	Purchaser (ECIL) Specific	Routine	100 %
23.	Simulation for marshalling operation	-	Routine	100 %
24.	Visual and dimensional checks as per approved drawings	-	Routine	100 %

DC separate source voltage withstand test

The test shall be performed as per IEC 60060-3, test voltage of 150 kV DC shall be applied for 10 Minutes in configuration shown below



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4.11 Submission of test report

Vendor must submit test reports 2 copies (Hard and Soft both) in proper format to purchaser.
Vendor has to submit the Instruction manual for installation, commissioning & maintenance.

4.12 Installation at site

- i. Delivery of four Nos of 1650 kVA, 3-Phase, 11kV/ (960V x 50), Oil cooled, outdoor, Multi-secondary transformers". at ECIL, Hyderabad for Integration & Testing at 10% load and subsequently transporting to BARC, Mumbai Site .
- ii. Erection, commissioning and handing over of all 1650 kVA, 3-Phase, 11kV/ (960V x 50), Oil cooled, outdoor, Multi-secondary transformers" at BARC Mumbai.

4.13 Testing at site and final acceptance


The following tests on transformers shall be performed by the Vendor at site at the time of erection and commissioning. Typical checks to be carried out at site are listed below:

4.13.1 Preliminary checks

1. Check for any physical damage, in particular of support insulators and bushings.
2. Check tightness of all bolts, clamps and connecting terminals.
3. Check cleanliness of secondary terminations, marshalling panels, enclosure, etc.
4. Check for clearances.
5. Check earthing of transformer supporting structure.
6. Check that the transformer is correctly installed with reference to its phasing and properly aligned with respect to interconnecting cable duct.
7. Check for proper termination support of Primary and control cables, and provision of cable glands for the same.
8. Check welding/bolting to embedded parts/floor of the building.

4.13.2 Installation checks

1. Installation at BARC, Mumbai
2. Proper levelling of the transformers.
3. Site cleaning.
4. Termination of control cable for marshalling operations with the breaker panel (cable will be laid by the purchaser).
5. Proper support for termination of 11kV cable to the Primary terminals.
6. Ground connections (Earthing strips shall be made available by the purchaser).



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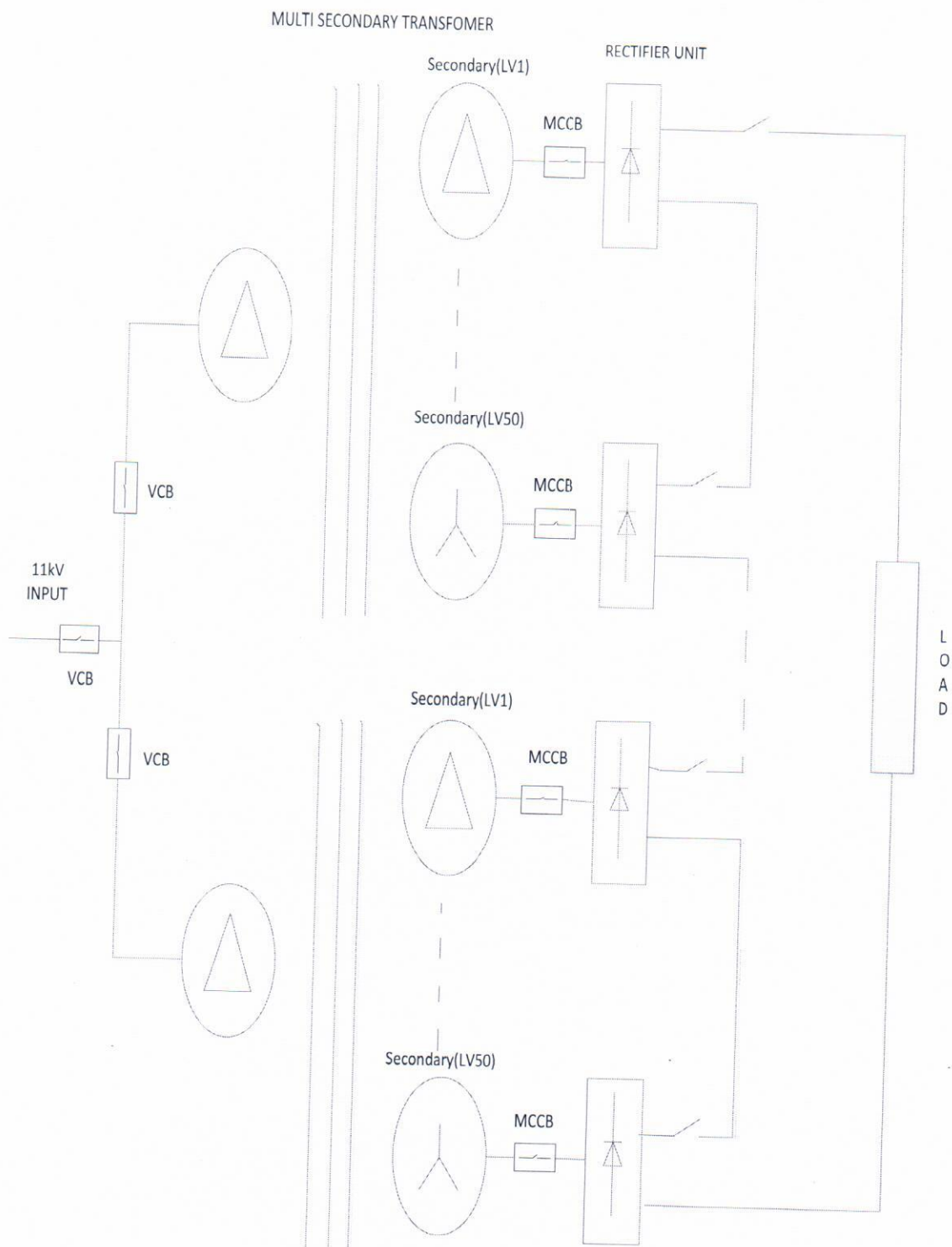
4.13.3 Pre-commissioning test

1. Measurement of Insulation resistance at @ 5kV for Primary winding and 2.5kV for all Winding to earth, between windings and control wiring.
2. DC voltage withstand test for all secondary's shorted to Primary and ground.
3. Low voltage charging of the transformer and observing voltage induced in the secondary Windings.
4. No load charging of the transformers at rated primary voltage.

Qualifying above transformers shall be considered as accepted.

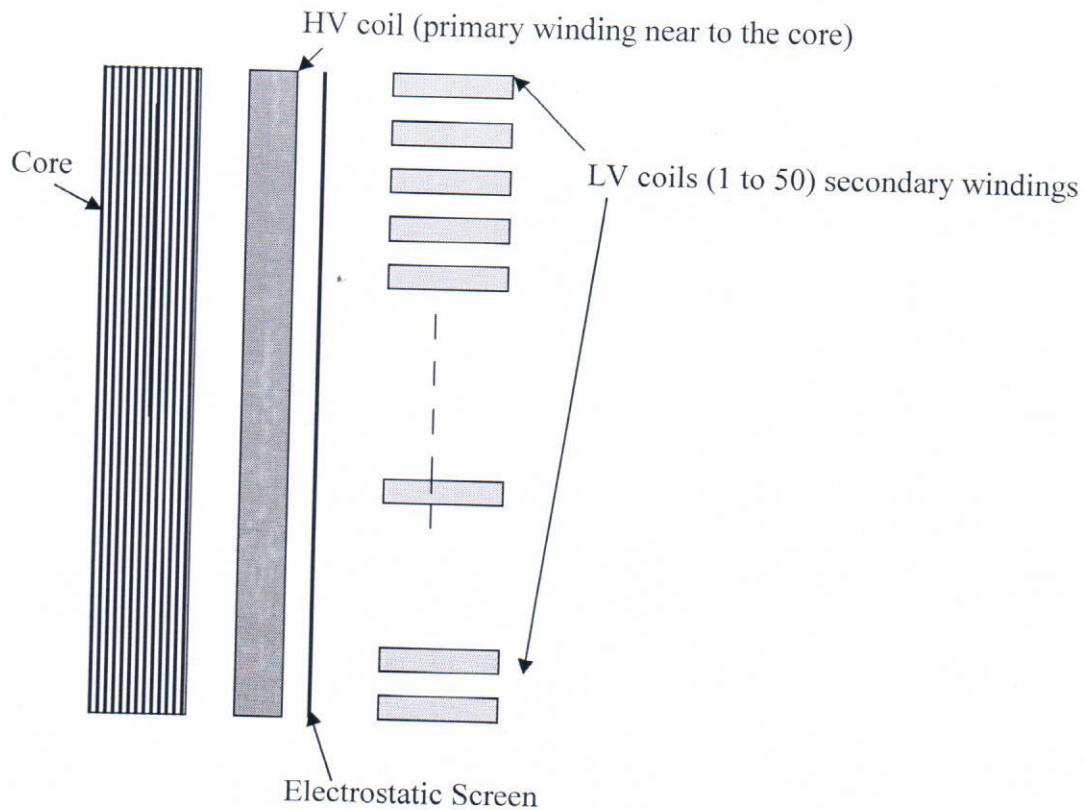

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Annexure-I to section 4: Topology for Multi-secondary transformer connection



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Annexure-II to section 4: Schematic for winding placement




Note:


1. Primary winding may be split into parallel groups to control the impedance of individual secondary winding.
2. Coil conductor shall be rectangular (edge full rounded) or circular.
3. Each secondary terminal of the transformer shall be terminated to MCCB.

Note: MCCBs will be supplied by ECIL as a free issue material.

Isolation level to be tested for Primary, Secondary coils/screen


Coil	Test voltage
All Secondary's together to Screen + Primary+ Core+ tank	150kVDC
Adjacent Secondary's,	5kVDC
Electrostatic screen to Primary + Secondary+ Core+ tank	5kVDC
Primary to All Secondary's+ Screen +core+	28kV rms


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SECTION-5

QUALITY PLAN OF TRANSFORMERS


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	ELECTRONICS CORPORATION OF INDIA LIMITED Control and Automation Division	RHVPS Rev.0
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(a) INTRODUCTION

The objective of the “QUALITY PLAN” is to ensure that the product quality requirements and customer requirements are accurately determined and satisfactorily complied.

PURPOSE:

The purpose of this document is to implement the methodology to be adopted and ensure that the quality policy adopted for design, procurement, manufacturing, factory inspection and testing, shipping release, testing at site to meet ECIL quality requirements as per the guide lines prescribed in the subsequent sections. Actions necessary to ensure quality assurance will include:

- Design reviews and verifications
- Identify and validate software usage
- Adequate and appropriate documentation and records
- Vendor qualification, limited on-site reviews
- Procedures/Instructions as needed
- Surveillance and assessment activities
- Controlled measuring and test equipment
- Documented worker qualifications and training
- 100%visual, surface and 20% volumetric inspection and testing as appropriate
- QA representative consultations are required

(b) Structure for Quality Plan

Vendor shall submit a detailed quality plan specific to the job as per the following format.

5.1 Scope

[This section shall describe the scope of work to be covered by this Quality Plan]

5.2 Quality Management

2.1 Description of Quality Management System of the organization:


[Provide certifications of recognized Quality Standards and valid date of the certifications, if any]

2.2 Detailed the breakdown of responsibilities within the organization:

[Add the organization flow chart]

2.3 Identify the different (external) organizations involved:

[Add the relationship flow chart between different organizations]


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2.4 identify within the different organizations involved the key individuals responsible for:
[Ensuring that the activities performed in connection with the particular contract are planned, implemented and controlled and their progress monitored,
Communicating requirements peculiar to the contract to all affected organizations,
Resolving problems that may arise at interfaces between the organisations involved]

2.5 Identify any access restrictions of ECIL to the premise of the vendor or its subcontractors that may apply:

5.3 Contract Review

[Indicate how, when and by whom contract requirements are to be reviewed and the review recorded]

5.4 Documents

[Show how, when and by whom documents will be controlled, and what kinds of documents will be submitted to ECIL]

5.5 Design

[Indicate, if an organization performs design activities for the contract;
how, when and by whom design will be controlled, including:

- when, how, and by whom the design process is to be carried out, controlled and documented,
- The arrangements for the review, verification and validation of design output conformity to design inputs requirements.

Where applicable, indicate the extent to which the ECIL will be involved in design activities, such as participation in design reviews and design verification.

Reference applicable codes, standards and regulatory requirements.

A list the computer programs to be used and indicate how, when, and by whom they will be controlled. Otherwise "not applicable"


5.6 Procurement

[Show how, when and by whom procurements will be controlled.

Any important Items or activities that are to be purchased or subcontracted.

(Proposed) vendorss or subcontractors.

Relevant Quality Assurance Requirements and the methods to be used to satisfy regulatory requirements, which apply to, purchased or subcontracted products.


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5.7 Identification and control of items

[Where traceability is a requirement or necessary for the adequate control of the work, define its Scope and extent, including;
How affected items are to be identified?
How contractual and regulatory traceability requirements are identified and incorporated into working documents?
What records relating to such traceability are to be generated and how and by whom they are to be controlled?]

5.8 Manufacture

[Indicate how processes, manufacture, assembly, inspections and tests will be controlled.
Where appropriate, introduce or refer to:
Relevant documented procedures and work instructions.
The methods to be used to monitor and control processes.
Criteria for workmanship.
Use of special and qualified processes and associated personnel.
Tools, techniques and methods to be used.]

5.9 Inspection and testing


[Show how, when and by whom inspection and test would be controlled, including;
Any inspection and test plan to be used, and how and by whom they are reviewed and approved.
How and by whom inspection and test reports are reviewed and approved?
Acceptance criteria to be applied.
Acceptance of purchased or subcontracted items.
Any specific requirements for the identification of inspections and tests status

5.10 Measuring and Test Equipment

[Indicate the control system to be used for measuring and test equipment specifically used in connection with the contract, including:
- Identification of such equipment,
- Method of calibration,
- Method of indicating and recording calibration status.]

5.11 Handling, Storage, Packing, Shipping and Delivery

[Show how, when and by whom handling, storage, packing, shipping and delivery will be controlled:
- How contract requirements for handling, storage, packaging and shipping are to be met,


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- How the item will be delivered to the specified site in a manner that will ensure that its required characteristics are not degraded.]

5.12 Records

[This section should indicate:

How records are to be controlled, including how legibility, storage and retrievability will be satisfied

What records are to be kept

What records are to be supplied to the ECIL, when and by what means

How and by whom the records are reviewed and approved prior to inclusion in the deliverables handed over to the ECIL

What form the records will take (such as paper, microfilm, tape, disc or other medium) and in what language the records will be provided.]

5.13 Deviation and Non-Conformities

[Indicate how, when and by whom deviations and non-conformities will be processed including those originating from vendors and subcontractor.]

5.14 Training and Qualification


[Address any specific training requirement for personnel and how such training is accomplished and recorded.]


5.15 Assessment

[Indicate how, when and by whom the implementation and effectiveness of the Quality Plan will be monitored.]

5.16 Reference and Others *(If any)*

[A list of documents referenced in this Quality Plan]


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SECTION-6


FORMAT FOR SUBMISSION OF TECHNICAL & COMMERCIAL BID


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6.1 Guaranteed Technical Particulars (GTP):

Following guaranteed technical particulars shall be completed by the VENDOR and submitted along with the technical part of the bid:

S. No.	Parameter Description	Data
1.	Name of the manufacturer:	
2.	Manufacturer's type:	
3.	Transformer application/designation:	
4.	Quantity:	
5.	Type of construction:	
6.	Full load rating:	kVA
7.	Whether specified loading pattern considered	Yes / No
8.	3 phase unit:	Yes / No
9.	Rated voltages: Primary winding: Secondary winding: (no-load)	kV $\pm 10\%$ V
10.	Cooling:	
11.	Ratings of windings: Primary winding: Secondary winding:	kVA kVA for each Secondary
12.	Number of windings: Primary winding: Secondary winding: Winding connection Primary winding: Secondary winding:	
13.	Vector group	
14.	Rated percentage impedance at rated current: a) Primary -Secondary winding: b) Resistance of primary per phase at 75 °C: c) Resistance of secondary per phase at 75 °C:	% ohm ohm
15.	Rated frequency:	Hz $\pm 3\%$
16.	Indoor/outdoor installation:	



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17.	Winding insulation test voltages: Impulse withstand voltage (1.2/50 μ sec wave): Primary winding: Induced over voltage withstand test voltage: Primary winding: Secondary winding: Power frequency short duration withstand test voltage:	kV(pk) kV(rms) kV(rms)	
	Primary winding: Secondary winding:		kV(rms) kV(rms)
18.	Guaranteed maximum temperature rise at 1650 kVA, rated voltage applied to primary and ONAN cooling: a) Oil by thermometer: b) Winding by resistance: c) Ambient temperature considered: I. Expected maximum temperature rise at 1650 kVA, 110% voltage applied to primary and ONAN cooling: A. Oil by thermometer: B. Winding by resistance: II. Expected maximum temperature rise at rated kVA (1650 kVA), 90% voltage applied to primary and ONAN cooling: A. Oil by thermometer: B. Winding by resistance:	$^{\circ}$ C $^{\circ}$ C $^{\circ}$ C $^{\circ}$ C $^{\circ}$ C $^{\circ}$ C $^{\circ}$ C	
19.	Tank cover conventional/bell shaped:	Conventional / Bell shaped	
20.	Bushings: a) Make: b) Type: c) Rated voltage class: kV(rms) d) 1.2/50 μ sec impulse: kV(pk) e) One minute power frequency withstand test voltage: kV(rms) f) Short circuit capability kA g) Min. clearance in air: mm h) Min. creepage distance: i) Total: mm ii) Protected: mm	Primary	Secondary
21.	Surge arrester a) Type b) Rated current c) Nominal discharge current		
22.	Guaranteed load loss at rated current at 75 $^{\circ}$ C winding temperature:	kW	


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23.	Guaranteed no-load losses at 100% rated voltage and frequency:	kW
24.	Magnetizing current at rated voltage and frequency:	A
25.	Core i. CRGO sheet metal grade: ii. Method of core clamping: iii. If boltless clamping indicate type of tape used & procedure in brief:	
26.	Transformer flux level: i. Max. flux density: a) when rated voltage:	web/m ²
	b) when 110% rated voltage:	web/m ²
	ii. Withstand duration of transformer for combined voltage and frequency fluctuations which produce over fluxing of: a) 110 %: b) 120 %:	sec. sec. Yes/No
	iii. Maximum inrush current (if less than 10times the rated current)	
27.	Current density: i. Primary winding: ii. Secondary winding:	A/mm ² A/mm ²
28.	Wheels: i. Plain/Flanged: ii. Unidirectional/Bidirectional: iii. Quantity: iv. Gauge (S):	mm
29.	Whether Radiators are provided? Type of radiator:	Yes / No
30.	Vacuum withstand capacity: i. Main tank & accessories: ii. Radiators (in equipped):	mm of Hg mm of Hg
31.	Dial size of magnetic oil level gauge:	mm
32.	WTI provided with all accessories including CT, capillary tube, etc. In primary	Yes / No
33.	Dual contact provided for Alarm and Trips for all accessories	Yes / No


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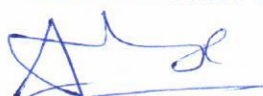
6.3 Schedule for document submission, manufacturing and delivery:

Sl. No	Description	Scheduled period
1.	Flow chart showing the detailed activities in manufacturing/testing (i.e., from receipt of LOI to Installation & Commissioning), Detail QP	2 weeks after LOI
2.	Engineering data :Design data, parameter calculations and analysis (if any) Mech./Elec. Drawings: General arrangement, Front, Rear and side elevation, Cable entry, earthing terminals, Grounding arrangements, Bill of material of Items used, Type/Part No. make etc., Manufacturing and inspection plan.	8 weeks after LOI
3.	Manufacturing/ Factory testing and shipment to site	14 weeks after approvals of drawings/documents/QP/ MIP
4.	End documents: As built drawings of GA, BM, test procedure, test certificate, manuals, QP etc.	Along with shipment
5.	Erection, Commissioning and site testing	2 weeks after delivery at site

Note:

- Vendor shall submit the GA, BM drawings, test procedure for purchasers approvals before manufacturing.
- Vendor shall intimate the time & place in advance to the purchaser of his participation in testing as indicated in QP.

Signature, designation and date along with the seal of the company

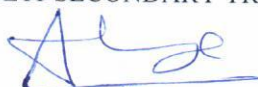

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6.4 Manufacturer's experience:

The TENDERER shall furnish here a list of all similar jobs executed by him to whom a reference may be made by the PURCHASER in case the PURCHASER considers such a reference necessarily.

Sl. No	Description of work including quantity	WO/PO no. and date	Value of work	Delivery date as per PO	Actual date of delivery	Contact address

Signature, designation and date along with the seal of the company

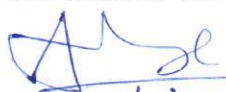

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6.5 Manufacturer's General Particulars:

General particulars of proposed manufacturer:

Sl. No	Item	Details
1.	Name	
2.	Address	
3.	E Mail and website details	
4.	Name and designation of the officer to whom all reference shall be made for expeditious coordination	
5.	Details of foreign collaboration, if any	
6.	Place of manufacture and assembly	
7.	Current registration number	
8.	Details of service facilities (after sales)	
9.	Whether sufficient spares are available in stock?	

Signature, designation and date along with the seal of the company


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6.6 Schedule of Technical deviations:

All deviations from the technical specification shall be filled in by the TENDERER clause by clause in this schedule.

Section	Clause number	Deviation

The TENDERER hereby certifies that the above mentioned are the only deviations from the technical specifications.

Signature, designation and date along with the seal of the company


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Sl. No	Brief description	Qty.	Unit price Ex- works in Rs	Unit price F.O.R --- Site in Rs	Total price in Rs
1.	1650kVA, 11kV/(960V x 50) Oil cooled Transformer as per section-4	4nos.			
2.	Testing Charges for Type and special test (with breakup)				
3.	Lump sum charges for installation, commissioning, site acceptance works for 4 nos. Transformers (2 sets) at ECIL- Hyderabad	For 4nos.			
4.	Lump sum charges for installation, commissioning, site acceptance works for 4 nos. Transformers (2 sets) at BARC-Mumbai	For 4 nos.			
5.	Special tools if required (list of tools to be submitted).				
6.	Recommended spares such as oil, special bushings, surge arrestors, sealing/gaskets, silica gel breather, air cell etc. Mention cost and shelf life of each spare separately for purchaser's selection				

Note:

For all items quoted above, the F.O.R. site prices on door deliver basis by road transport without Transshipment shall be included. Ex-works price without the bidder responsibility for safe delivery to site may not be acceptable.


All prices shall be indicated in Rs, both in figures and in words.


Bidder shall categorically confirm that charges towards testing and erection & commissioning are firm. No price variation will be acceptable on these accounts.

Designation: __ Seal of company:

Signature : _____

Date : _____


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SECTION-7

FORMAT FOR SUBMISSION OF PART II (PRICE BID)


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Sl. No	Brief description	Qty.	Unit price Ex- works in Rs	Unit price F.O.R --- Site in Rs	Total price in Rs
1.	1650kVA, 11kV/(960V x 50) Oil cooled Transformer as per section-4	4nos.			
2.	Testing Charges for Type and special test (with breakup)				
3.	Lump sum charges for installation, commissioning, site acceptance works for 4 nos. Transformers (2 sets) at ECIL- Hyderabad	For 4nos.			
4.	Lump sum charges for installation, commissioning, site acceptance works for 4 nos. Transformers (2 sets) at BARC-Mumbai	For 4 nos.			
5.	Special tools if required (list of tools to be submitted).				
6.	Recommended spares such as oil, special bushings, surge arrestors, sealing/gaskets, silica gel breather, air cell etc. Mention cost and shelf life of each spare separately for purchaser's selection				

Note:

For all items quoted above, the F.O.R. site prices on door deliver basis by road transport without Transshipment shall be included. Ex-works price without the bidder responsibility for safe delivery to site may not be acceptable.

All prices shall be indicated in Rs, both in figures and in words.

Bidder shall categorically confirm that charges towards testing and erection & commissioning are firm. No price variation will be acceptable on these accounts.

Designation: __ Seal of company:

Signature : _____

Date : _____


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