Purchase Indent

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP, NOIDA
Engineering Management

Project	PI No	PI Date	Rev No	Rev Date	GeMAR&PTS REPORT ID	Item Available on GeM
LTHPL LANCO TEESTA (NHPC)	45I2200299	26-Mar-22	0		GEM/GARPTS/15032022/G3T7S7ZQGUSL	Not Available

Main Equipment: WAVE TRAPS

Emergency: N

Est.Category: G (20-30 L)

Tender Type: CUSTOMER APPROVED TENDER

Comments [if any] by TBEM:

Equipment Details

SN	Material Code	Equipment	HSN Code	Phy Unit	Qty	Plan Dt	Comments
1.000	TB9452140053	SUPPLY- WAVE TRAPS : 220KV, 1 MH, 40KA FOR 1S, 2000A SINGLE PHASE WAVE TRAP		NO	4.00		
2.000	TB9452140142	SUPPLY- WAVE TRAPS : 220KV, 1 MH, 40KA FOR 1S, TERMINAL CONNECTOR LINE SIDE		SET	4.00		
3.000	TB9452140154	SUPPLY- WAVE TRAPS : 220KV, 1 MH, 40KA FOR 1S, TERMINAL CONNECTOR STATION SIDE		SET	4.00		
4.000	TB8452140056	SPARES- WAVE TRAPS : 220KV, 1 MH, 40KA FOR 1S, 2000A SINGLE PHASE WAVE TRAP		NO	1.00		
5.000	TB8452140141	SPARES- WAVE TRAPS : 220KV, 1 MH, 40KA FOR 1S, TERMINAL CONNECTOR LINE SIDE		SET	1.00		
6.000	TB8452140152	SPARES- WAVE TRAPS : 220KV, 1 MH, 40KA FOR 1S, TERMINAL CONNECTOR STATION SIDE		SET	1.00		

Prepared By:Puneet Chawla 26/3/22

Checked By:Ranajit Dey 26/03/22

Approved By:VIVEK KAPIL 26.3.22

TECHNICAL PRE QUALIFICATION REQUIREMENT

Name of Project : - 4x125MW Teesta-VI HEP

Name of Customer : - LTHP Ltd. (A wholly owned subsidiary of NHPC Ltd.)

Name of Consultant : - NHPC Limited

Name of Item : - 220kV Wave Trap

TECHNICAL PRE QUALIFICATION REQUIREMENT
a) The bidder should have manufactured, type tested and supplied Wave Trap for 220kV or higher voltage level earlier during the last ten (10) years ending on 31.12.2019. b) The equipment so manufactured should have been in successful operation at least at three power station/ installations. c) Should be an ISO certified company.

SUPPORTING DOCUMENTS TO BE ATTACHED		
Sr	**Required Criteria**	**Supporting Documents to be submitted by bidder along with technical bid**
1	Manufacturing	Approved Drawings / GTP / Approved Quality Plan / Factory Inspection Test Report e.t.c
2	Supply	PO / Dispatch clearance / LR / Material Receipt certificate at site / installation or commissioning certificate e.t.c
3	Type Test	TTR approval from customer / Type Test Report etc.
4	Successful operation	Satisfactory operation means certificate issued by the Employer/Utility certifying the operation without any adverse remark.
5	ISO certified company	ISO document

Notes (General points):

1. Consideration of offer shall be subject to customer's approval of bidder's, if applicable.

2. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self- attested English translated document should also be submitted.

3. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder to perform the contract, should the circumstances warrant such assessment

in the overall interest of BHEL.

4. After satisfactory fulfilment of all the above criteria / requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

PREPARED BY REVIEWED BY APPROVED BY

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
NOIDA

DOCUMENT NO.	TB-415-316-010	Rev 00	Prepared	Checked	Approved
TYPE OF DOC.	TECHNICAL SPECFICATION	NAME	PC	RD	VK
		SIGN			
TITLE		DATE	15.03.2022	15.03.2022	1.03.2022
WAVE TRAP		GROUP	TBEM		
		WO No.			

CUSTOMER	LTHP Ltd. (A wholly owned subsidiary of NHPC Ltd.)
Consultant	NHPC Limited
PROJECT	4x125MW Teesta-VI HEP

Contents

Remarks: Bidder to note that data and details of Guaranteed Technical Particulars & Design documents shall not be reviewed during Technical Evaluation/ Review, hence compliance of Guaranteed Technical Particulars in line with Technical Specification shall be bidder's responsibility.

Rev	Date	Altered	Checked	Approved	
Distribution				To	
				Copies	

Contents

SECTION 1

SCOPE, PROJECT SPECIFIC TECHNICAL REQUIREMENTS & BILL OF QUANTITIES

1. SCOPE

This technical specification covers the requirement of design, manufacture, testing at works, proper packing & dispatch of Wave Trap complete with accessories as per contract. No deviation from the requirements specified in various clauses of this specification shall be allowed. A certificate to this effect shall have to be furnished along with the offer.

The fitments offered shall be of LTHP/NHPC approved make or its subsequent approval from LTHP/NHPC shall be bidder's responsibility, with no commercial implications to BHEL. If any of the make offered by the bidder is not acceptable to M/s LTHP/NHPC, the bidder has to supply alternate LTHP/NHPC approved make, meeting the specification, with no commercial implications to BHEL.

This section covers the specific technical requirements of the equipment (*Wave Trap*). This constitutes minimum technical parameters for the above item as specified by the BHEL/ LTHP/NHPC. The offered equipment (*Wave Trap*) shall also comply with the Section-2 (Equipment Specification Under Scope of Supplies) of this specification and Section-3 (Project Details and General technical requirements for all equipment under the Project)

Note: The terms used in this specification namely, "Employer/Purchaser" refers to LTHP/NHPC, "Contractor "refers to BHEL & "Sub-contractor" refers to successful bidder.

The specification comprises of following sections:

Section-1	:	Scope, Project Specific Technical Requirements & Bill of Quantities
Section-2	:	Equipment Specification under scope of Supplies
Section-3	:	Project Details & General Technical Requirements (For All Equipment under the Project)
Section-4	:	Schedule of Guaranteed Technical Particulars
Section-5	:	Check List
Annexures		Annexure A- Schedule of Technical Deviations Annexure B- Compliance Certificate to Technical Specification

The following order of priority shall be followed. In case of conflict between requirements specified in various documents, the more stringent one shall be followed. BHEL/ LTHP/NHPC concurrence shall, however, be obtained before taking a final decision in such matters.

1. Statutory Regulations
2. Section-1
3. Section-2
4. Section-3

Bidder shall furnish list of conflicts/ ambiguities/ deviations, if any, along with their technical offer and also furnish the basis that is considered for submitting technical offer. BHEL/ LTHP/NHPC will resolve listed conflicts prior to award. In case of ambiguity, bidder shall inform BHEL of their

interpretation. In case bidder fails to convey the same prior to award, BHEL/ LTHP/NHPC decision on interpretation shall be considered final if need arises during the execution. No additional cost or extra time on account of conflicts/ ambiguities/ deviations shall be admissible.

In general, no deviation from the requirements specified in various clauses of this specification shall be allowed and hence, a certificate to this effect shall have to be furnished along with the offer (Annexure-B), however bidder shall furnish list of conflicts/ ambiguities/ deviations (Annexure-A), if any. Any conflicts/ ambiguities/ deviations mentioned elsewhere in technical offer shall not be reviewed.

The equipment (*Wave Trap*) is required for the following project:

Name of the Customer:	**LTHP Ltd. (A wholly owned subsidiary of NHPC Ltd.)**
Consultant:	**NHPC Limited**
Name of Main Contractor:	**Bharat Heavy Electricals Limited**
Name of the Project:	**4x125MW Teesta-VI (HEP)**

The scope of supplies shall be as per commercial terms and conditions enclosed separately with the notice inviting tender/ enquiry.

2. CODES & STANDARDS

The design, manufacture and testing of the various equipment covered under this specification shall comply with the requirements of the latest edition of the relevant IEC/IS/IEEE/ISO standards only. Preference for latest IEC standards for particular equipment / system shall be governed over IEEE/ IS/ ISO standards. Further rules, guidelines and standard laid down by international/ national agency shall be applicable in this specification.
The wave traps shall conform to the requirements specified in IEC 60353.

3. SPECIFIC TECHNICAL REQUIREMENTS

Technical requirements for the equipment (*Wave Trap*) shall be as per Section-2. Specific requirement is follows:

Sl. No.	Technical Parameters	Particulars
(i)	System operating voltage	220kV
(ii)	Maximum operating voltage of the system (r.m.s)	245kV
(iii)	Rated frequency.	50Hz
(iv)	No. of phase.	3
(v)	System Fault level	40kA for 1 sec
(vi)	Min. Creepage Distance	25mm/kV
(vii)	Type of tuning	Broad Band
(viii)	Rated blocking bandwidth	50-500 kHz**
(ix)	Capacitance of CVT	4400pF
(x)	Rated inductance at 100kHZ	1mH
(xi)	Rated continuous current	2000A

**** If required, two tuning ports to be offered to meet design requirement.**

4. BILL OF QUANTITIES

SN	Description	Unit	Total Qty
1.	220kV, 2000A , 1 mH , 40kA for 1sec, 1ph pedestal/suspension mounted Wave Trap	No.	05
2.	Terminal Connectors for line side of 220kV Wave Trap	Set	05
3.	Terminal Connectors for station side of 220kV Wave Trap	Set	05

NOTE:

1. The quantity of Line trap might change by ±25% at contract stage. BHEL reserves the right to delete the above line item at contract stage.
2. The final details of terminal connectors of the line traps will be furnished to the successful bidder.
3. The line trap shall be mounted on a tripod structure formed by 3(three) insulator stacks arranged in triangular form/ suspension mounted.
4. The insulators /structure are not in scope of equipment supplier/bidder.
5. The necessary hardwares (Nuts, Bolts and washers) for mounting the Line trap shall be in scope of supply of Equipment supplier/bidder.
6. The mounting (pedestal/suspension) of the Line trap will be informed at the contract stage.

5. TECHNICAL PRE-QUALIFYING REQUIREMENT:

Please refer document: ***Annexure_TQR***

6. OTHER GENERAL REQUIREMENTS

Manuals – Required receipt, storage, installation, testing, commissioning manuals covering all equipment of Wave Trap shall be supplied by bidder as per project requirement. OEM manual / OEM certified manuals are to be provided for

a. Storage and preservation manual
b. Safety manual
c. Erection Manual
d. Testing and commissioning manual
e. Operation & Maintenance manual
f. Repair process / procedure manual for equipment / system

7. TYPE & ROUTINE TEST:

7.1. TYPE TESTING FOR Wave Trap

1. All equipment being supplied shall conform to type tests as per technical specification and shall be subject to routine tests in accordance with requirements stipulated under respective sections.

2. The reports for all type tests as per technical specification shall be furnished by the bidder

along with equipment / material drawings. However, type test reports of similar equipments/ material already accepted in LTHP/NHPC shall be applicable for all project with similar requirement. The type tests conducted earlier should have either been conducted in accredited laboratory (accredited based on ISO / IEC Guide 25 / 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by LTHP/ NHPC or representative authorized by LTHP/NHPC or representative of accredited test lab or reputed consultant.

The type test reports submitted shall be of the tests conducted within last 10 (ten) years prior to date of bid opening. In case the test reports are of the test conducted earlier than 10 (ten) years prior to date of bid opening, the bidder shall repeat these test(s) at no extra cost to BHEL.

3. In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the Technical Specification or any/all type tests not carried out, same shall be carried out without any additional cost implication to the Purchaser.
The bidder shall intimate the BHEL/NHPC/LTHP the detailed program about the tests at least two (2) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies. Further, in case type tests are required to be conducted/repeated and the deputation of Inspector/Purchaser's representative is required, then all the expenses shall be borne by the bidder.

8. DRAWINGS & DOCUMENTATION

8.1. Documents to be submitted along technical bid

Bidder shall furnish following documents during tendering stage itself for information purpose. The same shall be reviewed and commented during contract stage only. (Bidder to please note, deviations if any needs to be submitted in schedule of technical deviation only. Deviations submitted elsewhere in bid document / in any calculations shall not be considered.)

Sr No.	Name of Documents	
1	SCHEDULE OF GUARANTEED TECHNICAL PARTICULAR (as per attached format)	
2	List of Type Test Reports	Details of Test object, test name, Test Lab, Report number & report date.
3	Any other calculation / design document as applicable in line with technical specification and / or relevant section of IEC / IS etc.	

8.2. Drawings / documents required for engineering manufacturing clearance

The drawings/ documents, as follows shall be used for providing engineering manufacturing

clearance of the equipment (Wave Trap) and furthermore, it shall be used for delay analysis, if any from bidder. The successful bidder is required to submit drawings and documents that shall cover but not limited to the following:

Sl.	Description of Drawing
1	General Arrangement Drawings of Wave Trap & Terminal connectors
2	Guaranteed Technical particulars of Wave Trap & Terminal connectors
3	Type Test Report as per relevant IEC Standards
4	Model Quality Assurance plan

9. QUALITY PLAN

The successful bidder shall submit Quality Assurance Plan in line with reference QAP attached in Section-2 for the equipment (Wave Trap) with in-process inspection methods, tests, records, etc. for BHEL/ LTHP/NHPC approval. LTHP/NHPC hold points will also be included in the plan, which shall be mutually agreed by the BHEL/ LTHP/NHPC. In case bidder has reference Quality Assurance Plan agreed with LTHP/NHPC, same shall be submitted for specific project to BHEL/ LTHP/NHPC approval. There shall be no commercial implication to BHEL/ LTHP/NHPC on account of Quality Plan approval.

Superior quality control system shall be adopted to assure high product quality. Raw materials of the best commercial grade quality and high reliability shall be used in the manufacture of the equipment (Wave Trap). All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved quality plan. The supplier shall perform all tests necessary to ensure that the material and workmanship conform to the relevant standards and comply with the requirements of the specification.

During fabrication/manufacturing or assembly, the equipment shall be subjected to inspection by BHEL/NHPC/LTHP or by an agency authorized by the owner to assess the progress of work as well as to ascertain that only quality raw material is used.

Note-Inspection and testing shall be done as per technical specification. However, any other test not mentioned but required as per relevant IEC/IS shall also be performed.

10. PACKING AND DISPATCH

1. All equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and outdoor storage (for a minimum period of 2 years) at site till the time of erection. While packing all the materials, the limitations from the point of view of availability of transportation facilities in India should be taken into account. The Bidder shall be responsible for any loss or damage during transportation, handling and storage.
2. The Bidder shall include and provide for security, protection and packing the equipment so as to avoid loss or damage during transport by any mode.
3. All packing shall allow for easy removal and checking at site. Wherever necessary, proper arrangement for attaching slings for lifting shall be provided. All packages shall be

clearly marked for with signs showing 'UP' and 'DOWN' side of boxes, and handling and unpacking instructions as considered necessary. Special precautions shall be taken to prevent rusting of steel and iron parts during transit and storage. Gas seals or other methods proposed to be adopted for protection against moisture during transit shall be to the satisfaction of the purchaser.

4. The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols i.e. FRAGILE, HANDLE WITH CARE, USE NO HOOKS etc.
5. Each package delivered under the contract shall be marked by the Bidder at his expense and such marking must be distinct (all previous irrelevant marking being carefully obliterated). Such marking shall show the description and quantity of contents, the name of consignee and address, the gross and net weights of the package, the name of Bidder with a distinctive number of mark sufficient for purpose of identification. All markings shall be carried out with such materials as to ensure quickness of drying, fastness and legibility.
6. Each Package shall contain a note quoting specifically the name of the Bidder, the number and date of contract or order and the name of office placing the contract, nomenclature of the stores and include a schedule of parts for each complete equipment giving the parts number with reference to the General Arrangement/ Assembly drawing and the quantity of each part, drawing number and tag numbers.
7. All equipment/ material shall be suitably packed for transport, carriage at site and outdoor storage during transit. The Bidder shall be responsible for any damage to the equipment during transit. The contents of each package shall bear marking that can be readily identified from the package list and packing shall provide complete protection from moisture, termites and mechanical shocks etc.
8. Any material found short inside the packing cases shall be supplied by the Bidder without any extra cost.
9. Notwithstanding anything stated in this clause the Bidder shall be entirely responsible for any loss, damage or depreciation to the stores.
10. The packing, marking and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract and, subject to any subsequent instruction ordered by the Employer consistent with the requirements of the Contract as per relevant Clause of Section 2 & Section-3.

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TEESTA H. E. PROJECT, STAGE-VI

9	Rated normal current	2000 A
10	Control voltage DC	220 +10 % / -20%V
11	Auxiliary AC supply , 3 phase	415 ±10% V
12	Partial discharge of switchgear assembly at highest voltage for equipment, pc	< 10 except surge arrestor
13	Terminal connector :	Suitable for Quad moose conductor/ aluminium pipe/ Equivalent STACIR(AW)
	Surge Arresters	
1	Type	Gapless metal Oxide heavy duty station type
2	Rated arrestor voltage	216 kVrms
3	Rated nominal discharge current (8/20 micro second wave shape)	10 kA
4	Partial discharge at highest voltage (1.05 x COV)	< 50 pC
5	Minimum thermal capability	5 kJ/kV
6	Continuous operating voltage (COV) at 50°C	168kVrms
7	Line Discharge Class	III
8	Accessories	Discharge counter with leakage current meter with protection class IP 66
9	Steel Parts	Galvanized
	Capacitance Voltage Transformers	
1	Purpose	Protection, synchronising and metering
2	No of core per CVT	3
3	Voltage ratio	(245/√3) kV/ (110/√3) V/ (110/√3) V/(110/√3) V
4	Accuracy class	0.2/3P /3P
5	Voltage factor	1.5 for 30 s 1.2 for continuous
	Wave Trap	
1	Inductance of main coil	1.0 mH

BHEL R.O.D. Lodhi Road New Delhi-3

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2	Rated continuous current	2000 A
3	Rated short time current	40 kA for 1 sec
4	Rated blocking band width	50 – 500 KHz
5	Normal discharge current and protective device connected across main coil	10kA
6	Minimum resistive component of blocking impedance	600 ohms
7	Tapping loss	Less than 2.6 dB
8	Type of tuning	Broadband
9	Type of installation	Suspension
	~~Disconnector with Earth switch~~	
10	~~Type~~	~~3 phase gang operated~~
11	~~Operation~~	~~Motor as well as manual~~
12	~~Rated withstand Voltage~~	
i	~~Power Frequency~~	~~As per System requirement~~
ii	~~Lighting Impulse (Peak)~~	~~As per system requirement~~
iii	~~Rated capacitive current make and break capacity~~	~~0.5~~ A
~~13~~	~~Earth Switch~~	
i	~~Making Capacity kA (peak)~~	~~100 kA~~
ii	~~Rated short time current~~	~~40 kA~~
	~~Current Transformers~~	
i	~~Current ratio~~	~~2000- 1000-500A/1A~~
ii	~~Accuracy class~~	~~PS~~
iii	~~No. of cores~~	~~2~~

~~6.4 Performance Guarantee~~

~~5. OUTDOOR ROTYARD EQUIPMENT~~

~~6-4~~

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TEESTA H. E. PROJECT, STAGE-VI

The 245 kV outdoor pot yard equipment along with all auxiliaries and accessories shall be capable of performing intended duties under specified conditions. The Contractor shall guarantee the reliability and performance of the individual equipment as well as of the complete system.

6.5 Design and Construction

6.5.1 Standards

The system and equipment shall be designed, built, tested and installed to the latest revisions of the following applicable standards. In the event of other standards being applicable they will be compared for specific requirement and specifically approved during detailed engineering for the purpose:

S.No.	Standards	Description
1	IEC 62271-All Parts	Common specifications for high-voltage switchgear and control gear standards
2	IEC 60353	Line traps for AC power systems
3	IEC 61869	Capacitive Voltage transformers
4	IEC-60099-4	Metal-oxide surge arresters without gaps for AC systems
5	IEC-62004	Conductor
6	IEC-61089	Conductor

6.5.2 Capacitance voltage transformers

The capacitance voltage transformers shall conform to IEC 61869. The CVTs shall be used for protection, metering and synchronizing. The CVTs shall also be used to connect the carrier equipment to the high-voltage lines. The CVTs shall be oil-filled and self-cooled. They shall be single-phase units with three secondary winding consisting of coupling capacitor dividers and auxiliary electromagnetic transformers.

The three secondary winding shall be used for synchronising and metering, protection-I, protection-II. The CVT secondary shall be terminated in a marshalling box which will have at least 30 TBs, graded protection for each cable between MB & distant panel.

6.5.3 Surge arresters

The surge arrestor shall be of hermetically sealed, gap-less station type and the live part shall comprise of non-linear metal oxide resistor without spark gap. The surge arrester shall be complete with discharge counter, leakage current meter, pressure relief device, insulator sub-base and supporting structures. The grading ring of each complete arrestor for proper stress distribution shall be providing if required for attaining on the

relevant technical parameters. Surge arrestor shall be compliance of CB duty cycle O-0.3s-CO-3 min- CO. Connection between surge arrestor and surge monitor shall be through a two meter (Minimum) long insulated copper rod/ strip of minimum cross section of 75 sqmm.

The surge monitor shall be IP66 class, 6 digit cyclometer at least 5 counts/sec. Healthy condition, warning, substantial leakage of surge arrestor should be clearly identifiable.

6.5.4 Wave traps

The wave traps shall be broadband type designed to carry rated continuous current without any injurious effects. The wave traps shall conform to the requirements specified in IEC 60353. The inductance of main coil shall not differ by more than + 1 % from rated inductance specified. A shunt tuning device shall be provided and shall consist of an assembly of passive components forming a tuned circuit which, when shunt connected with main coil of wave trap, shall result in the wave trap having negligible impedance over the required portion of the frequency band used for power line carrier systems.

A protective device shall be provided for shunt connection across the main coil of the wave trap to protect against the effects of transient over voltages. Corona ring shall be provided to meet corona and radio interference performance.

In case the wave trap is pedestal mounted the scope shall cover 3 nos. solid core insulators, pedestal and support structures

6.5.5 Connectors

The connectors used in the pothead yard shall be made of Aluminium alloy not to cause corona, radio and audible noise, interference in the HV installations. The connectors shall conform to NEMA 107 and tested accordingly to have maximum noise level not exceeding 54dB. The fasteners shall conform to IS 3506 and having minimum mechanical strength of class 70. The tensile strength/electrical characteristics of the hardware shall be in accordance to NEMA CC1 publications

6.5.6 Disconnector with Earth switch

Disconnectors shall comply with the general requirements of IEC 62271-102.

220 kV Disconnectors & earth switch shall be 3 phase gang operated e, with 220 V DC motor operated mechanism as well as manual operating mechanism. Sufficient auxiliary contacts shall be provided for indications (local & remote), safety interlocking schemes and the performance of various control & protection schemes. Disconnector and earth switch shall be electrically and mechanically interlocked. The earth switch shall be capable of discharging trapped charges of associated line. Earth switch shall be class B in respect of induced current switching and class E2 for short circuit making capacity as defined in IEC 62271-102

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TEESTA H.E. PROJECT, STAGE-VI

6 OUTDOOR POT YARD EQUIPMENT

6.1 Guaranteed Technical Particulars

Item / Clause No.	Parameter	Unit	Employer's Requirement	Bidder's confirmation/seal/ signature
14	**Wave Trap**			
14.1	Applicable Standard	-	IEC 60353	Confirmed
14.2	Rated inductance at100kHZ	mH	1	Confirmed
14.3	Rated blocking band-width	-	50-500 KHz	Confirmed
14.4	Normal discharge current and protective device connected across main coil	kA	10	Confirmed
14.5	Minimum resistive component of blocking impedance	ohms	600	Confirmed
14.6	Tapping loss	dB	<2.6	Confirmed
14.7	Type of tuning	-	Broadband	Confirmed
15	**Potyard Structure**			
15.1	Standard	-	IS 802, IS 808, IS 875	Confirmed
16	**Connectors**			
16.1	Applicable standard	-	NEMA 107	Confirmed
16.2	Material	Alluminium alloy	Alluminium alloy	Confirmed
16.3	Maximum noise level	dB	54	Confirmed
16.4	Applicable standard for fastners	-	IS 3506	Confirmed
16.5	Min. mechanical strength of fastners	-	Class 70	Confirmed
16.6	Tensile strength/electrical characteristics of hardware	-	NEMA CC1 publications	Confirmed
17	Complete Compliance of Specification	-	Yes	Confirmed
~~18~~	~~**Disconnector**~~			
~~18.1~~	~~Standard~~	-	~~IEC 62271-102~~	~~Confirmed~~
18.2	~~Rated continuous current~~	A	~~2000~~	~~Confirmed~~
18.3	~~Minimum make and break capability for capacitive current~~	A	~~0.5~~	~~Confirmed~~
~~18.4~~	~~Total operating time (closing or opening cycle)~~	-	~~As per accepted international practice~~	~~Confirmed~~
19	~~**Grounding Switch**~~			
~~19.1~~	~~Standard~~	-	~~IEC 62271-102~~	~~Confirmed~~
19.2	~~Rated short-circuit making current (peak)~~	kA	~~100~~	~~Confirmed~~
~~19.3~~	~~Total operating time (closing or opening~~ cycle)	-	~~As per accepted international practices~~	~~Confirmed~~
~~19.4~~	~~- fast acting time~~	-	~~As per accepted international practices~~	~~Confirmed~~
~~20~~	~~**Current Transformer**~~			
~~20.1~~	~~Standard~~	-	~~IEC 61869~~	~~Confirmed~~
~~20.2~~	~~Current ratio~~	-		
	~~Line bay~~	-	~~2000-1000-500/1A~~	~~Confirmed~~
~~20.3~~	Accuracy ~~class~~	-		
	~~For~~ protection	-	~~PS~~	~~Confirmed~~

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Bidder's Seal and Signature of Authorized Representative

Sahadev Khatua
Chief Executive Officer
LTHPL, Sikkim

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LINE TRAP

1 Line trap shall be broad band tuned for its entire carrier frequency range. Resistive component of impedance of the line trap within its carrier frequency blocking range shall not be less than 450 ohms for 765kV/400 kV system and 570 ohms for 220kV and 132 kV systems.

2 Line trap shall be provided with a protective device in the form of surge arrestors which shall be designed and arranged such that neither significant alteration in its protective function nor physical damage shall result from either temperature rise or the magnetic field of the main coil at continuous rated current or rated short time current. The protective device shall neither enter into operation nor remain in operation, following transient actuation by the power frequency voltage developed across the line trap by the rated short time current. The lightning arrestor shall be station class current limiting active gap type. Its rated discharge current shall be 10 kA. Coordination, however, shall be done by taking 20 kA at 8/20 micro-sec. discharge current into account. Bidder has to furnish full justification in case the use of gap-less metal oxide arrestor is recommended by them.

3 The lightning arrestor provided with the line trap of each rating shall fully comply with the requirements of IS: 3070 Part-I/IEC-60099-I Part-I. It shall conform to type tests as applicable and type test certificate for the same shall be submitted by the Bidder.

4 The lightning arrestor provided with the line trap shall be subject to routine and acceptance tests as per IEC-60099-1 (Part-I).

5 The line trap on 765kV & 400 kV lines shall show no visual corona discharge at a voltage of 508kV (rms) and 320 KV (rms) power frequency falling voltage. Suitable corona rings may be incorporated in the line trap. Radio interference voltage for 420/245/132 kV shall not exceed 500 micro volts at 280/163/97 kV (rms) respectively. For 765kV, RIV shall not exceed 1000 micro volts at 508kV (rms).

6 Line trap shall be equipped with the bird barriers.

7 Line trap shall conform to IEC 60353 (latest) fulfilling all the technical requirements. The rated short time current for 1 Second shall be 31.5/40/50/63 kA as per requirement. The mH. rating shall be 0.25/0.5/1.0 mH depending on frequency plan.

8 The Bidder shall indicate continuous current rating of the line trap at 65 deg. C ambient.

9 Reports for the following type tests on each type of line trap shall be submitted as per clause Section-III

i) Measurement of Inductance of the main coil.
ii) Measurement of temperature rise.
iii) Insulation test.

iv) Short time current test.
v) Corona Extinction Voltage test (procedure for this shall be mutually agreed).
vi) Radio Interference Voltage measurement test (procedure for this shall be mutually agreed)

10 The Bidder must enclose with his bid the reports of type and routine tests conducted on similar equipment earlier as per IEC-60353.

11 Welding

All the welding included in the manufacture of line traps shall be performed by personnel and procedure qualified in accordance with ASME-IX and all the critical welds shall be subject to NDT as applicable.

12 Line Trap Mounting

i) The Line Trap shall be suitable for outdoor pedestal or suspension mounting and shall be mechanically strong enough to withstand the stresses due to maximum wind pressure of 260 kg/square meter.
ii) For pedestal mounting, each line trap shall be mounted on a tripod structure formed by three insulator stacks arranged in a triangular form. All the accessories and hardware, mounting stool including bolts for fixing the line trap on insulators shall be of non-magnetic material and shall be supplied by the Bidder.
iii) For suspension mounting, Bidder shall be required to coordinate the mounting arrangement with the existing arrangement. Non-magnetic suspension hook/link of adequate length and tensile strength to provide necessary magnetic clearance between the line trap and suspension hardware shall be supplied by the bidder.

13 Terminal Connectors

i) The line traps shall be suitable for connecting to 4" IPS Aluminium tube or 3" IPS Al. tube or ACSR single/twin/Quad bundle conductor with horizontal or vertical take off. Necessary connector shall be supplied by the Bidder.
ii) Terminal Connectors shall conform to IS:5561.
iii) No part of clamp or connector (including hardware) shall be of magnetic material.
iv) Clamps and connectors shall be designed corona controlled. Visual Corona extinction voltage shall not be less than 508kV (rms) & 320kV (rms) for 765kV and 420kV respectively. All nuts and bolts shall be suitably shrouded.
v) Radio interference Voltage for 420/245/132 kV shall not exceed 500 microvolts at 280/163/97 kV (rms) respectively. For 765kV, RIV shall not exceed 1000 micro volts at 508kV (rms).
vi) Clamps/connectors shall be designed for the same current ratings as line trap and temperature rise shall not exceed 35 deg. C over 50 deg. C ambient. No current carrying part shall be less than 10 mm thick.

vii) Clamps/connectors shall conform to type test as per IS:5561. Type Test reports shall also be submitted for following additional type tests :
a) Visual Corona Extinction Test
b) Radio Interference Voltage Measurement

viii) Bidders are required to submit alongwith their bid typical drawings clearly indicating the above mentioned features of the line traps, line trap mounting arrangement and terminal connectors. For suspension mounted line traps, Bidder shall submit drawings showing single point as well as multipoint (normally 3 point) suspension arrangements.

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SECTION- 3

PROJECT DETAILS AND GENERAL SPECIFICATIONS

3.0 GENERAL

This section stipulates the General Technical Requirements under the Contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipment and services covered under other sections of tender documents and are not exclusive. However, in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall prevail.

3.1 PROJECT DETAILS

Name of the Project:	**Teesta-VI H.E. Project (4x125 MW)**
Name of the Customer:	**LTHP LTD. (A wholly owned subsidiary of NHPC Ltd.)**
Name of Consultant :	**NHPC**

Teesta (stage-VI) H.E Project is the last of the six projects in cascade development hydro power potential of Teesta River in the state of Sikkim. Teesta-VI Project is located in south (District) of Sikkim. It is a run of river scheme, with a barrage proposed across River Teesta at Sirwani about 100km downstream of L D Kazi Bridge, near Singtam village on singtam-Dikchu Road. Barrage site is located about 4 km from Singtam. The river has been diverted through the completed barrage bays on the left side to facilitate construction of the remaining barrage and Desilting Basin and all other components (Head Regulator Intake, De- silting Basin, Tunnel intake, head Race Tunnel, Surge shaft, pressure shaft, MIV cavern, power House, Transformer cavern, Tail Race Tunnel and pot Head yard) which are on the right bank of river Teesta. Power House site will be near Subin khore 27.5 km from Singtam and about 31.5 km from Barrage site by road. A gross head of 116 m between the HRT intake site and the power house site is to be utilized for power generation.
It is a run of the river scheme for power generation. The power house will have an installed capacity of 500 MW (4x125MW) and the annual energy production is estimated to be 2400 MU with 95% machine availability.

3.2 Location of Project:

The approximate distance of Project Barrage site from different important towns is as below:

From Singtam to Barrage Site	4.0 kms (approx.)
From Rangpo to Power House Site	12.5 kms (approx.)
From Singtam to Silliguri	95 kms (approx.)
Fronr Barrage site to Silliguri	99 kms (approx.)
From Power House site to Silliguri	67 kms (approx.)
From Silliguri to Kolkata	577 kms

3.3 Salient Features:

Location:

• Country	India
• State	Sikkim
• District	South
• River	Teesta
• Nearest Village	Singtam
• Dam site Near	Sirwani
• Latitude	27 deg 14'42" N
• Longitude	88 deg 29'15" E
• Nearest Rail Head	Silliguri, West Bengal, lndia
• Nearest Airport	Bagdogra, West Bengal, India

Hydrology:

• Catchment Area at diversion site	4558 Sq. Km
• Rain fed catchment	2295 Sq. Km
• Snow catchment	2263 Sq. Km.
• Average Annual Rainfall	2544 mm
• Maximum Temperature	37 deg
• Minimum Temperature	8 deg
• Maximum Relative Humidity	96.4%
• Minimum Relative Humidity	5.8%
• Standard Project Flood	11600 Cumec (SPF)
• Average annual yield	11861 Mcum

POWER HOUSE COMPLEX:

• Location	Right Bank
• Type	Underground
• Installed capacity	500 MW
• Number and capacity of units	4 Nos. of 125 MW each
• Size of Power House Cavern	142.75m x t8.5m x 52.44 m high
• Size of Transformer cum GIS Cavern	128mx14.5mx21 m high
• Service bay level	EL 248.34 m
• Type of turbine	Francis, vertical axis
• C/L of turbine	EL 235 m
• Rated head (Weighted Average Head)	105 .4 m
• Type of switchgear	GIS (Indoor)
• Size of pothead yard	100 m (L) x 30 m (w)

3.4 Seismic Zone

The project is situated in a hilly seismic area and falls within Zone-IV of the seismic zoning Map of India. The forces being caused by earthquake including hydraulic loads which may occur additionally shall be taken in to account for computations. More over vertical and

horizontal acceleration shall be combined in the most unfavourable way. For horizontal and vertical accelerations, a factor of 0.15 g and 0.075 g respectively shall be assumed. Stresses resulting after including these loads shall not exceed permissible stresses.
The Contractor shall design all equipment supplied under this contract to satisfy the seismic criteria. The Contractor shall submit to the Employer the method of calculation and relevant codes he intends to use for this purpose.
ln addition to the above, the IS-1893 shall be adopted for seismic design. Hydrodynamic forces due to seismic conditions shall be considered on HM or EM equipment in addition to hydro static loads.

3.5 Transportation and Storage

The Contractor shall inform himself fully as to all relevant transport facilities and requirements, loading gauges and other limitations and shall ensure that the equipment as prepared for transport shall conform to such limitations. The Contractor shall also be responsible for obtaining from the Indian railway or highway authorities any permit that may be required for the transport of loads exceeding the normal gauges.
The Contractor shall provide means for all unloading and reloading for all consignments of plant; both during transport to Site and on the Site. Consignments shall be unloaded immediately on arrival at Site. The Contractor is required to take the necessary steps in order to provide the carriage, special supporting structures for heavy loads, etc. All parts of the plant shall be brought, as far as possible, to their final place of erection. The Contractor shall construct their own storage facilities at site.
The warehouses shall be weatherproof, with good ventilation and solid floors. The floors of the warehouses and storage areas shall be designed to carry the loads imposed on them by the stored parts. The following parts shall be stored inside enclosed warehouses:

Bolts, pins, packing, tools, insulation materials, electrical parts with electrical devices attached, electric motors, instruments, welding material and equipment, all small parts and all parts of the plant which already have been finally painted.

lf large parts are stored in the open air, they shall be provided with weather resistant and fire-resistant covers. Electrical parts, which are not packed suitably and those so packed, but whose packing has been damaged shall be kept in suitable places from the moment of storage to the moment of installation. All insulation materials which will be taken from the warehouse for installation and which are stored temporarily in the station shall be protected from weather or humidity. All the equipment shall be stored as per standard storage and preservation instructions etc. of the suppliers. Dehumidifiers shall be installed in store/enclosed area as per direction of Engineer-in-charge.

3.6 Transport Limitation

For shipments, the Manufacturer shall pack the items to meet size and weight restrictions of the Indian railways and road systems. Shipments from Manufacturer's work (in case offshore consignments) shall travel to Port of entry - lndia, from where these will be transported, after necessary port clearances etc., by the Contractor to nearest rail head for the Project, and

further transported to site. However, in certain cases the Contractor may be required to transport the materials from Port of entry to Project site directly by road transport. For onshore consignments, the Contractor shall be responsible in all respects for transportation of all material and equipment up to the project site.

The Contractor shall consult with the concerned authorities in railways and highways to ensure that his packaging will be such as to permit him to transport the plant and equipment within such imposed limits. The Contractor shall arrange to deliver the maximum sized sub-assemblies consistent with safe and convenient transport.

All materials and equipment etc. arrived at nearest railhead for the Project will be unloaded from rail wagons and reloaded on to road transport for shipment to project site by the Contractor. All components shall be so designed and constructed as would enable easy assembly of components at works and at the same time permit easy transportation. The weighs and sizes of the components/packages shall be within the permissible transport limits for the project site.

3.7 Main features of Project

The project shall comprise of following major components:

i) Four units of 125 MW each at generator terminal at rated condition,

ii) An underground Power house housing four (4) main inlet valves of butterfly biplane lattice type in MIV cavern, (4) vertical-shaft generating units, each composed of a Francis turbine directly coupled to a synchronous generator and other related auxiliaries in power house cavern,

iii) A Transformer cavern having 13 nos. 11/220/√3kV single phase generator transformers,

iv) A 245kV GIS hall in Transformer cavern for installing 245kV GIS,

v) A 245 kV outdoor pothead yard for evacuation of generated power through 220kV transmission lines.

vi) installed Capacity - 500 MW

vii) No. and size of Units - 4 units of 125 MW each

viii) Generation voltage – 11kV

ix) Transmission voltage – 220kV

x) Type of Power House – Underground

xi) Type of Switchyard - Indoor type GIS

xii) GSU Transformer - 13 nos. 51 MVA, Single Phase, 50 Hz, 11/220/√3kV OFWF/ ODWF type

xiii) Method of connection between Transformer and GIS - GIB

3.8 Operating Requirement, Specification

The equipment/system to be supplied under this contract shall be suitable for continuous operation under varying grid parameters as allowed in latest "lndian Electricity Grid Code" and "lndian Electricity Rule". The equipment supplied shall also be compliant with latest Central Electricity Authority-Technical Standards for Construction of Electrical Plants and Electric Line Regulations and latest CERC norms at the time of supply of equipment.

The equipment/system shall be designed to operate continuously without any problem under +/-10 % voltage variation and +/-5% frequency variation, Temperature rise/ variation limit for equipment shall be determined considering the above variation. Frequent start/stop

requirement of all equipment for daily operation shall be taken into consideration while designing.

3.9 Auxiliary voltages

The electrical equipment like switchboards, MCCB, Surge Protection Devices, motors, contactors, relays, luminaries, heaters, switches, sockets, Terminal Blocks, Power outlets etc. should be rated for any of the following voltages:

A) AC power

Three-phase system with grounded neutral for feeding 3-phase and 1-phase equipment (connected between phase and neutral), type TN-C 415/240V +/-10% and 50Hz +/-5%. All motors and other electrical apparatus should be designed to work continuously under +/-5% frequency variation and +/-10% voltage variation.

B) DC power

i) 220V +/- (Plus/minus) 10% DC Systems, ungrounded, with earth fault detection for the supply to main control circuits for high and medium voltage switchgear, protection circuits and to other larger essentials loads,

ii) Other voltage systems eventually needed, shall be generated from the above systems by means of dc/dc converters, inverters etc.

3.10 Performance Guarantee

The Contractor shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment systems covered in these specifications.

The Contractor shall demonstrate all the guarantees covered herein during functional guarantee/ acceptance tests.

3.10.1 SYSTEM PARAMETERS

S. No.	Description of parameters	220 kV System
1.	System operating voltage	220 kV
2.	Maximum operating voltage of the system(rms)	245 kV
3.	Rated frequency	50 Hz
4.	No. of phase	3
5.	Rated Insulation levels	
i)	Full wave impulse withstand voltage (1.2/50 microsec.)	1050 kVp
ii)	Switching impulse withstand voltage (250/2500 micro sec.) dry and wet	-
iii)	One minute power frequency dry withstand voltage (rms)	-
iv)	One minute power frequency dry and wet withstand voltage (rms)	460 kV
6.	Corona extinction voltage	156 kV
7.	Max. radio interference voltage for frequency between 0.5MHz and 2MHz	1000 micro-Volt at 156kV rms
8.	Minimum creepage distance (25mm/kV)	6125 mm
9.	Min. clearances	
i)	Phase to phase	2100 mm
ii)	Phase to earth	2100 mm
iii)	Sectional clearances	5000 mm
10.	Rated short circuit current for 1 sec. duration	40 kA

11.	System neutral earthing	Effectively earthed

3.10.2 Control and Monitoring

The system shall be controlled and monitored by the SCADA system. The details of "Control and Monitoring System" and "Protection System" are covered under separate package EM-I.

It shall be the responsibility of the Contractor to make all necessary provisions required to achieve seamless and compatible interfacing of control and monitoring systems of all equipment with plant SCADA system.
Provisions of all transducers/ sensors, instruments, gauges for mechanical parameters (temperature, pressure, flow, vibration, etc.) and electrical parameters (current, voltage, frequency, power, MVAR, KWH, etc.) and spare contacts of relays, breakers, isolators push buttons, control/selector switches etc. from various equipment for monitoring, alarm, annunciation, control function etc. through plant SCADA system are in the scope of this contract.

For connecting marshalling box/junction box with various equipment in field, multi-pin plug connecter system shall be used, if feasible. The contact carriers shall have two capacitive PE connects each to give the proper earthing to the system and it shall be suitable for electrical data equivalent to 250V/10A. The contact type shall fulfil the requirement of IEC 60 352/ DIN EN 60 352. The contact carriers shall be covered by housing made up of polyamide 6.6 of V0 in flammability class in accordance with UL 94 and fulfil the requirement of lP65 at least. The housing shall be directly sealable on the mounting wall without the need of any kind of wall mounting base. The complete arrangement shall be highly reliable even under harsh conditions, due to high degree of protection."
It shall also be possible to control locally the main elements of the system from local control cubicles. Local control shall be performed in a standalone manner independent of SCADA system, and all information (faults, alarms, measurements, status) necessary for such control shall be displayed locally. Provision of control selector switch for selection of control through Local Control Cubicle, Unit Control Board / Local Control Board and plant SCADA system shall be made in Local Control Cubicles and Unit Control Boards / Local Control Boards.
lf the system consists of redundant subsystems, the priority of operation of such subsystems shall be selectable, either from SCADA system or locally.

3.10.3 Power supply for control and monitoring

A reliable surge protected power supply shall be provided for powering the electronic circuits of the equipment component. The power supply shall be from two independent DC station battery source, one as primary and other as secondary. Switchover from primary to secondary will follow automatically on failure of primary and return to the primary source automatically following restoration of primary supply. The primary source of supply and the charger of the battery should be protected with surge protection device. The surge arrester should be pluggable type and should have indication to show its life.
The power supply shall include redundant converter (dc-dc) connected to station battery source uch that failure of any regulated output voltage shall cause instantaneous transfer to a redundant converter without affecting normal operation of the equipment component in any

way. Contacts shall be provided to alarm on power supply failure and local indication shall be provided to identify the failed functional block, The Contractor shall provide full details of the proposed power supply system for approval by the Employer.
ln case AC supply is required for any control function, same shall be sourced from two on line UPS, with one main and other standby and with automatic change over facility.

3.10.4 Colour Schedule

Colour standard references to major equipment/ system shall be as mentioned in Annexure. The interior of all cubicle and panels shall preferably have a matt white finish unless specified otherwise.

3.11 Electrical equipment enclosures

3.11.1 General

Unless otherwise specifically called for or described in these Contract documents all electrical appliances shall conform to the applicable IEC Publications.
The cubicles and enclosures shall be of protection class lP 40 or higher according to their location. For outside installation and area which are humid, corrosive, and prone to dripping and/ or spray of water, the protection class of cubicles shall be lP 65. Cubicles housing electronic cards/modules such as of unit control boards/local control boards, digital governors, static excitation equipment shall be of Protection class of lP 5X.

Cables shall have at least 1100 V PVC insulation except for 220V DC and tele-metering or communication system equipment for which 650V and 300 V ratings respectively are acceptable.
Wring shall terminate at terminal blocks al one side only. Where tap connections are required, they shall be made on terminal blocks. Wiring shall be neatly arranged and laid in wire ways accessible from the front door. The wire ways shall not be filled more than 70 %. Each cubicle shall be provided with an earthing bar (PE) of sufficient cross section carrying any possible fault current without undue heating. All metallic parts of the cubicle not forming part of the live circuits, all instrument transformer terminals to be earthed and other earthing terminals as well as all cable screens and PE-wires shall be connected to the earthing bar.
All internal equipment and wiring shall be neatly and clearly marked as indicated on the schematic and wiring diagrams- internal wiring and cables shall be marked with sleeve type engraved marking. Marking system and marking material shall be subject to approval by Employer' identification of the respective conductors shall be in accordance with the requirements of IEC publication 60204. ln cable, having five conductors or more the individual conductors shall be numbered throughout the entire length. ln cables having less than five conductors colour coding in accordance with IEC Recommendations 60204 shall be used.

3.11.2 Terminal blocks

Control circuits and power circuits shall be completely separated by use of divided or separate terminal blocks.

The screw type modular Terminal Block should be manufactured as per IEC-60947-7-1. The insulating material of Terminal Block should be of polyamide 6.6 meeting VO/V2 in flammability Class as per UL94. All metal parts including screws should be of copper alloy. The Terminal Block should be suitable for mounting on both 'DIN' as well as 'G' Type rail. All the metal parts should be captive and touch proof. The Terminal Block should have screw locking design so that it can withstand vibration level up to 59 and also prevent accidental loosening of conductors. The terminal blocks shall also have necessary accessories like end clamp, separation plates elc. Terminal block for CT shall be provided with shorting and disconnecting arrangement. Test terminal block for CT and PT with plug shall also be provided in all protection and measuring circuit
also provided in panel.
Unless otherwise specified terminal blocks shall be suitable for connecting the following conductors on each side.

All circuits except CT/ PT circuits	Minimum of two of 2.5 sq. mm copper flexible
All CT/ PT Circuits	Minimum of 2 nos. of 6 sq. mm copper flexible

Al least 20 % spare terminals shall be provided on each panel/ cubicle/box and these spare terminals shall be uniformly distributed on all terminals rows.

3.11.2.1 Protection requirement

For short circuit and overload protection of power and control circuits, air circuit breakers, moulded case circuit breakers or MCBs shall be used. Outlets from AC (and DC) distribution panels are protected in their respective panels.

3.11.2.2 Switches, Lamps & Instruments

General
Control switches, indicating lamps and instruments shall be arranged so that all parts are readily accessible for servicing without the necessity to remove other devices, terminal blocks or excessive amount of wiring.
All control switches and indicating devices mounted in cabinets and enclosures shall be visible with the doors closed.
Identification nameplates shall be provided for all control switches, indicating instruments and lamps, in accordance with clause "Nameplates".
Instruments and controls shall be located so that their dials, indicators and nameplates are clearly readable. Data for all instruments to be provided, including type, size, scale range, electrical ratings, nameplate and name of manufacturer, shall be furnished. Steel panels shall be provided for group mounting of the instruments.
All instruments shall be of an approved type and shall match, insofar as practicable, the other instruments with which they are associated; their dial type, scaled markings and units, type of connection and mounting, shall be co-coordinated. All piping and tubing required for

instruments shall be furnished and installed. All instruments and control switches shall be furnished with necessary auxiliaries, i.e. resistors, shunts etc.

3.11.2.3 Control and Selector switches

The switches and push buttons shall be provided with ample contact ratings, suitable cam or block arrangements necessary for the control functions on 230 V AC or 220V DC circuits. The control switches used in mimic diagrams shall be of discrepancy type with built in lamp indication.
Control and Selector switches shall be rotary type with escutcheon plates clearly marked to show the function and positions. The switches shall be of sturdy construction suitable for mounting on panel front. Switches with shrouding of live parts and sealing of contacts against dust ingress shall be provided.
Circuit breaker control switches shall have three positions and shall be spring return to "NEUTRAL" from "CLOSE" and "TRIP" positions and shall have pistol grip handles. They shall have at least two (2) contacts closing in close position, and two (2) contacts closing in trip position unless specified otherwise.
Ammeter and voltmeter selector switches shall have four stay out position with adequate number of contacts for three phase 4 wire system. These shall have oval handles. Ammeter selector switches shall have make before break type contacts to prevent open circuiting of CT secondaries. Contacts of the switches shall be spring assisted and shall be of suitable material to give a long trouble free service.

3.11.2.4 Push buttons

Push-buttons shall be of spring return, push to actuate type. Their contacts shall be rated to make, continuously carry and break 10A at 230V AC and 0.5A at 220V DC.
All push buttons shall have one normally open and one normally closed contact, unless specified otherwise. The contact faces shall be of silver or silver alloy.

All push buttons shall be provided with integral escutcheon plates marked with its function. The colour of the button shall be as follows:

Green : Breaker Close
Red : Breaker Open
Black : For overload reset

3.11.2.5 Indicating and signalling lamps

Each indicating and signaling lamp shall have a removable cap, which can be inscribed with wording and shall not be affected with the heat of the lamp.
Indicating lamps are preferably of LED type & low watt consumption and shall be replaceable from the front of the panel. The indicating and signaling lamps shall be of the same size and type.
Lamps shall be provided with series resistors, preferably built-in the lamps assembly.
The lamps shall have escutcheon plates marked with its function, wherever necessary.

Lamps shall have translucent lamp-covers of the following colours, as warranted by the application.

Red : ACB's/MCCB's close
Green : ACB's/MCCB's open
White : Auto trip
Amber : For all healthy conditions e.g. control supply
Voilet : Circuit breaker spring charged
Blue : For all alarm conditions (e.g. overload) Also for "SERVICE" & "TEST" positions indicators

Indication lamps should be located just above the associated push buttons/control switches. All indicating lamps shall be suitable for continuous operation at 90% to 110% of their rated voltage.

3.11.2.6 HRC Fuses

HRC-Fuses shall have visible operation indicators.

HRC-Fuses shall be mounted on fuses carriers, which are mounted on fuse bases. Wherever it is not possible to mount fuses on carriers, fuses shall be directly mounted on plug-in type of bases. In such cases one set of insulated fuse pulling handles shall be supplied with each switchgear.

HRC-Fuse rating shall be chosen by the tenderer depending upon the circuit requirements.

3.11.2.7 Indicating instruments and Meters

Instruments mounted on panels, shall be of the semi flush type back connected, matching pattern, shape, and of approved finish to present neat and fitting appearance consistent with functional requirements Mechanical quantity measuring instruments which are directly mounted on equipment shall have circular dials and shall be properly supported and guarded against accidental injury/breakage. These shall be placed in convenient locations.
The instruments shall accurately measure and indicate the quantity under all conditions of operation with minimum instrument errors. Changes in ambient temperature within the range prevailing at site shall not affect the accuracy Contact making instruments shall have contacts suitable for 240 V AC or 220 V DC circuits.
The reading scales on the dials shall be in metric units only and range shall be such that the normal operating values of the quantities are indicated in the middle 3rd of the scale. The dials pointer etc. shall be designed to facilitate accurate reading by minimizing parallax and glare from instrument window and by providing clear bold dial markings. The size of dial and length of the scales of the indicating instruments shall be large enough to suit the requirements. The scale plates of panel mounted indicating instruments shall have a permanent white mat finish with black graduations and the pointer shall also be of the black colour. Instruments mounted on panels shall be of flush type and shall be back connected. All

instruments on a switchgear panel shall be of matching pattern, shape and finish so as to present a pleasing appearance consistent with the functional requirements.

All instruments shall conform to relevant International or national applicable standards. These shall be subjected to tests prior to dispatch. The instruments shall be shock, vibration and moisture proof. The electrical instruments shall withstand dielectric test of 2000 V RMS to ground for one (1) minute as per standards.

The coils of electrical instruments shall be designed for continuous operation at 110% of the full load current at instrument potential. The coil rating of the measuring instruments shall be coordinated with those of the associated instrument transformers (i.e. CTs, PTs, etc.) by the supplier. The VA burden of the instruments shall be as low as possible. The meters shall be of the first grade in respect of accuracy classification.

Energy meter shall be suitable for 3-phase, 4-wire unbalanced system and shall comply generally with the relevant standard. All instruments shall be tested in accordance with the requirements of relevant standards.

3.11.2.8 Integrating instruments

The Wh and VArh meters shall be of the semi-flush-mounted type. Each meter shall be connected to terminal blocks suitable for opening and short-circuiting for testing purposes. The meter cases shall be dust-tight and with removable covers. The meters shall be three-phase, three elements, equipped with an impulse contact mechanism, potential free for remote metering purposes, and shall be suitable for continuous operation from secondary of potential transformers and from secondary of current transformers, with transformer ratios and connections indicated on the contract drawings.

The meters shall be provided with primary-rated, direct reading registers, with five or more digits and a suitable multiplier. The meters for the outgoing lines shall be of the two-way type and all meters shall have mechanism to prevent negative registration.

The meters shall have built in over-voltage protection and isolation according to IEC Publication 60521. The tolerance ambient temperature range of the meters shall be 0 to 45 degrees C.

The protection class of the Wh meters shall be 0.2 and the VArh meters 0.2 according to IEC Publication 60687.

3.11.2.9 Measuring converters

The converters shall be suitable for direct connection to the secondary circuits of the potential and current transformers used, or other sensors, each as they apply. The converters shall be static type, having all accessories to provide an output signal of 4-20 mA, filtered DC.

For the measuring converters the following minimum requirements shall be fulfilled:

- Current transducers shall be single-phase, of accuracy class 0.2 or better.
- Voltage transducers shall be single-phase of accuracy class 0.2 or better.
- W and VAR transducers shall be two elements, three-phase. Accuracy class of the transducers shall be 0.2 or better.

3.11.2.10 Measuring transformers

All current and voltage transformers shall be completely encapsulated cast resin insulated type suitable for continuous operation at the temperature prevailing inside the switchgear enclosure, when the distribution board is operating at its rated condition and the outside ambient temperature is 40 deg.C.
All instrument transformers shall be able to withstand the thermal and mechanical stresses resulting from the maximum short circuit and momentary current ratings of the associated switchgear.
All instrument transformer shall have clear indelible polarity markings. All secondary terminals shall be wired to a separate terminal on an accessible terminal block where star-point formation and earthing shall be done.

All VTs shall have readily accessible HRC current limiting fuses on both primary and secondary sides. The class of insulation should be E or better.

The parameter & rating of CTs & PTs are minimum requirement & tentative only. Contactor shall submit the calculations for selection of CT/PT for approval to purchaser. Potential transformer secondary windings shall be rated 110 / V3 V Current transformer secondary windings shall have a rated current of 1A / 2.5A / 5A.

3.11.2.11 Nameplates Labels and Cautionary signs

Each major and auxiliary item of equipment shall have a nameplate permanently affixed thereto, or as directed, showing in a legible and durable manner the serial number, name and address of the manufacture, rated capacity, speed, electrical characteristics, and other significant information, as applicable.
The module identification plate shall clearly give the feeder number and feeder designation wherever applicable. For single front switchboards, similar panel and board identification labels shall be provided at the rear also.
All name plates shall be of non-rusting metal or 3-ply lamicoid with white engraved lettering on black back-ground, inscriptions and lettering sizes shall be as per their standard practice. Suitable plastic sticker labels shall be provided for easy identification of all equipment, located inside the panel/module. These labels shall be positioned so as to be clearly visible and shall give the device number, as mentioned in the module wiring drawings.
Caution and warning signs must be displayed in English, Hindi and local language. Identification plates and instruction plates shall preferably be bilingual i.e. English and Hindi/ local language.

3.11.2.12 Motors

All electric motors for driving various equipment shall conform to relevant standards viz. IEC, BS or IS as applicable. The motor rating, torque characteristics, speed etc. shall be selected to suit the duty requirements.
Type of starter for motors shall be duly approved by the purchaser during detailed engineering. The detailed design calculation for selection of type of starters is to be submitted for approval. The priority for type of starters shall be in the following order:
1. Variable frequency drive

2. Soft starter
3. Star delta/ auto –transformer
4. Direct on-line starter

The enclosure of each motor shall be of the type best suited for the service conditions of the motor. The motor insulation shall be resistant to moisture, oil or oil vapour and the motors in general shall be so designed as to suit the tropical climate. Varnished cambric or glass insulation class F shall be used for connection from the windings to the terminals.

The terminal box shall be closed conduit box type conveniently located, and shall have means for terminating the external wiring for outdoor use. The motor terminals shall be of the stud type totally enclosed. Eye bolts or lugs shall be provided for lifting.

Space heaters to avoid condensation shall also be provided. Special type of motors, not adequately covered by these specifications, shall be offered for any special application, but these shall be subject to the approval of purchaser.

3.11.2.13 Space heaters

Space heater shall be provided in the Distribution Boards, Control & Protection panels, Motor Control panels etc. The space heaters shall be suitable for continuous operation on 240V AC, 50 HZ single phase supply, and shall be automatically controlled by thermostats. Necessary isolating switches and fuses shall also be provided.

3.11.2.14 Auxiliary relay, contacts and devices

All relays and timers in protective circuits shall be flush mounted on panel front with connections from the inside. They shall have transparent dust tight covers removable from the front. All protective relays shall have a draw out construction for easy replacement from the front. They shall either have built-in test facilities, or shall be provided with necessary test blocks and test switches located immediately below each relay. The auxiliary relays and timers may be furnished in non-draw out cases.

All AC auxiliary relays shall be suitable for operation with VTs and CTs secondaries.

DC auxiliary relays shall be designed for 220V DC unless otherwise specified and shall operate satisfactorily between 80% and 110% of the rated voltage. Relays shall have adequate thermal capacity for continuous operation in circuits in which they are used.

All protective relays and timers shall have at least two potentially free output contacts. Relays shall have contacts as required for protection schemes. Contacts of relays and timers shall be silver faced and shall have a spring action. Adequate number of terminals shall be available on the relay cases for applicable relaying schemes.

Suitable number of auxiliary contacts or auxiliary relays shall be provided with each VCB's / ACB’s for indication, remote indication, annunciation and automatic changeover and interlocking scheme.

All protective relays, auxiliary relays and timers shall be provided with hand reset operation indicators (flag) for analysing the cause of operation.

3.11.2.15 Welding & NDT

Preparation of base material

Members to be joined by welding may be cut to shape and size by mechanical means such as shearing, machining, grinding, or by gas or arc cutting, to suit the conditions. Edges shall be shaped according to ASME requirements. Design of welded joints and selection of weld filler metal shall be in accordance with approved standards and shall allow thorough penetration and good fusion of the weld with the base metal. The edges of surfaces to be welded shall be sound metal free of visible defects such as laminations or defects caused by cutting operation at least 30 mm back from the edge of the weld, and free from rust, oil, grease, and other foreign matter.

The establishment of welding procedures, welder's qualifications shall conform to the requirements of the ASME Boiler and Pressure Vessel Code Section VIII and IX. The approved copy of the WPS & WPQR in accordance with the ASME requirements shall be submitted to the purchaser for review and record.

3.11.2.16 Field welding

Filler material required for field-welded joints shall be furnished by the Contractor. The Contractor shall perform all welding work at site in accordance with the applicable WPS. Only qualified welders shall be used for undertaking welding as per the applicable WPS.NDT shall be performed as per the approved drawings.

Preparation for field welding

All cutting, chamfering, and other shaping of metals necessary for the field connection shall be done as far as possible in the shop. Adequate temporary bolted field connections shall be provided to hold the assemblies rigidly and in proper alignment during shop and field assembly.

To ensure proper alignment during field erection, a minimum of two dowels shall be provided for each field connection between subassemblies. The holes shall be drilled and the dowels fitted at shop assembly after the subassemblies have been satisfactorily aligned. All stipulations for welding, structural work and other, shall be applied to fieldwork as well as to shop work, except where otherwise stated.

3.11.2.17 Painting

All the equipment furnished and installed by the Contractor shall be completely painted for final use, with the exception of those parts or surfaces that are expressly designated as unpainted. Surfaces to be painted shall receive the preparatory treatment and required number of coats. The Contractor shall perform all painting work in the shop, before shipment, followed by a final coat of paint at site after installation as per the standard procedure.

All materials, supplies, and articles furnished shall be the standard products of recognized reputable manufacturers. Colour schedule of equipment supplied shall be finalized during detailed design stage.

3.11.2.18 Galvanization

Unless otherwise specified, all structural steel including ladders, platforms, hand rails and the like and all exterior and interior steel surfaces of outdoor Works, as well as bolts and nuts

associated with galvanised parts shall be hot-dip galvanised, electrolytically galvanised or sherardized, as may be appropriate to the particular case.

A) Material:

For galvanising, only original blast furnace raw zinc shall be applied, which shall have a purity of 98.5%. The thickness of the zinc coat shall be:

i) For bolts and nuts, approx. 60 micrometre.

ii) For all other parts, except for hydraulic steel structures or parts intermittently or permanently submerged in water, approx. 70 micrometre.

B) Galvanising of hardware:

Bolts, nuts, washers, locknuts and similar hardware shall be galvanised in accordance with the relevant standards. Excess smelter shall be removed by centrifugal spinning.

C) Straightening after galvanising:

All plates and shapes, which have been warped by the galvanising process, shall be straightened by being re-rolled or pressed. The material shall not be hammered or otherwise straightened in a manner that will injure the protective coating. Materials that have been harmfully bent or warped in the process of fabrication or galvanising shall be rejected.

D) Repair of galvanising:

Material on which galvanising has been damaged shall be re-dipped unless the damage is local and can be repaired by soldering or by applying a galvanising repair compound; in this case, the compound shall be applied in accordance with the manufacturer's instructions. Soldering shall be done with a soldering iron using 50/500/o solder (tin and lead). Surplus flux or acid shall be washed off promptly and the work shall be performed so as not to damage the adjacent coating or the metal itself, Any member on which the galvanised coating becomes damaged after having been dipped twice shall be rejected.

3.11.2.19 Pumps

All pumps forming part of the generating units and other plant and equipment shall be of high performance requisite type (viz. centrifugal, rotary etc.) and rating, of reputed make, and shall be directly coupled to their driving motors. The pumps shall be of self-priming type and with proper sealing systems and protection.

The materials of construction of pumps in general shall suit the service conditions. The materials of construction of the pumps handling water, such as drainage & dewatering pumps, turbine top cover drainage pumps etc. shall be resistant to abrasive effects of silt in such water. The pumps shall operate quietly without undue noise and vibration in their full operating range of head and flow. They shall be easy to maintain.

3.11.2.20 Embedded parts, Anchor Bolts and Fasteners

All embedded anchor bolts, rods, pipes, welding plates and support plates shall be provided by contractor. Anchor bolts shall consist of a threaded steel rod installed inside a pipe sleeve

to provide lateral adjustment after the sleeve is embedded. The threaded end of the rod shall be provided with two steel nuts and two steel washers to permit leveling and anchoring the equipment prior to grouting.
Approved types of expansion or chemical anchors shall be used where practicable for small equipment.

3.11.2.21 Rust Prevention and Protection during Transit: -

Bright steel parts including all machined surfaces shall be given a thick coat of tar or tallow or any other approved rust resisting paint in plain colour to prevent rusting during shipment and transport.

3.11.2.22 Civil Works

Civil foundations for equipment of the generating units and other plant and equipment will be prepared by the Purchaser in accordance with the basic design data to be supplied by the Contractor.
The Contractor shall provide design for foundations and install the concrete inserts/embedment; support steels and/or components for foundation /supports purpose, shall do any chipping / levelling works, denting / painting etc.

3.11.3 Erection, Testing, Commissioning and performance of Guarantee Tests

3.11.3.1 Testing and inspection

Materials used for construction of major & important sub-assemblies shall be thoroughly shop tested and inspected by the Contractor at his own expense prior to dispatch. Shop test shall comprise of routine test & type tests.
The shop tests and inspections shall be as spelt out in individual equipment specifications as dealt in succeeding sections but shall not be limited to the same. Any other tests and inspection not specifically listed but are otherwise considered essential and advisable shall also be conducted.
The Bidders shall furnish schedule of the shop tests and inspections on materials and equipment. Important tests/inspections shall be subject to witness by the purchaser for which the Contractor shall give sufficient advance notice. In case purchaser is unable to witness shop tests/inspections, the Contractor shall be so intimated and the tests/inspections may then be carried out in the absence of the Purchaser.

Equipment on which tests and inspections have been duly witnessed and approved by the Purchaser may be dispatched by the Contractor. Equipment on which tests and inspections have not been witnessed by the purchaser shall be dispatched only after the shop tests and inspection Certificates have been approved by the Purchaser.

3.11.3.2 Dimensional Checks and Visual Inspection

Dimensional checks shall be performed on all major parts, components and partial assemblies, especially when close tolerances and fits are involved (tolerance of shafts,

between stationary and moving parts, connecting dimensions for the assembly with other supplies, etc.). If the dimensional checks show discrepancies in measurement, which may affect the fit, assembly or dismantling of the respective part or component, the same have to be corrected correspondingly. Such correction or modification shall, however, in no way lead to sacrifices with respect to reliability of operation or inter-changeability, and shall be performed only after the agreement of the Owner has been obtained. If the correction or modification cannot be carried out in accordance with the terms mentioned above, the part or component concerned may be subject to rejection. Faulty machine parts or equipment shall by no means be delivered.

3.11.3.3 Functional Tests

Functional tests on partial assemblies and/or complete assemblies shall be carried out as much as possible already in the manufacturer's workshops. Such tests shall be performed as far as possible under operation-like conditions.
When requested by the Owner, the functional tests shall be repeated until full proof has been obtained that the functioning of the assemblies will comply with the requirements of the Contract Documents.

3.11.3.4 Erection, commissioning & field tests

The Contractor has to do all the work related to assembly, erection, testing and commissioning complete in all respects. All necessary tools, plants, labour, materials including consumables for performing installation, testing and pre-commissioning shall be provided by the Contractor.
The Contractor shall submit the necessary data/information, layout and foundation/support drawings well in advance. The Contractor shall provide and install the concrete inserts/embedment, support steels and/or components for foundation/supports purpose as per approved erection drawings and coordinate the activities with civil contractors to keep his activities in synchronism with civil work. All installation for foundation shall be verified and accepted by the Engineer.
The Contractor shall use anchor fasteners for installation of piping, fixtures, mountings, conduits, cabling, panels etc. Minor Chipping of concrete is permitted. However, taking support from reinforcement bars shall not be allowed.

3.11.3.5 Installation procedure

The Contractor shall submit six copies of all detailed programs and the procedures to be adopted for erection / installation, testing and commissioning well in advance, before start of erection activities/ installation.
The installation procedure shall also have a section “site quality assurance plan” containing erection data sheets / site protocols for various components. These sheets should specify site measurements/ inspections required to be made for ensuring proper installation.

3.11.3.6 Cable laying

Wiring between equipment enclosures shall be made with cables, laid in trenches and/or cable trays and in cable conduits. The Contractor shall submit for review to the Engineer a cable route layout-showing location of trenches, conduits and trays. All material for cable laying such as cable trays supports and fastening material shall be furnished and placed by the Contractor. Cables shall be properly fastened and marked where they enter enclosures by either cable clamps or nipples.
Cables in horizontal cable trays shall be fastened properly with clamps or plastic strips. Power and control cables shall be placed in separate trays or conduits. Cables shall be clearly marked at each terminal point and appropriate intermediate locations as per Standard.

Conduits shall be of heavy gauge rigid steel, hot-dip galvanized, cut square reamed, threaded and screwed tight at all joints.
Conduit entrances to pull boxes and switches shall have double lock nuts & insulating bushings. No running thread shall be used.
Flexible metallic conduit shall be used for connection to equipment, which are subject to vibration, and also for connection to level/limit/pressure switches.

3.11.3.7 Field inspection

The Contractor shall permit Engineer to perform inspections of the assembly which will include a complete verification of the assembly of all parts as to their levels, clearances, pertinent fits, alignments and quality of workmanship. The field supervisor of the Contractor shall provide Engineer with three (3) copies of all the clearances, tolerances and data of all pertinent fits, alignments and levels, so that the latter may repeat the Contractor's measurement, if desired.
Unless otherwise specified, any rejection based on the inspection will be reported to Contractor within fifteen (15) days.

3.11.3.8 Field tests

All field tests including tests during installation, pre-commissioning, commissioning, performance and field acceptance tests shall be conducted by the Contractor, in the presence of representative of the Employer. Procedure to be adopted for conducting these tests shall be submitted well in advance, before start of relevant testing, for approval of the Employer.
The equipment / system shall be deemed to be commissioned and ready for trial run only after successful operation for a test service period specified in sub clause "Performance Testing". In the event of any failure this period shall be repeated for any number of times till the successful operation as described above is achieved.
All test equipment and instruments shall be furnished by the Contractor and will remain the Contractor's property after the fulfilment of all field tests.
Any defects or leaks disclosed in the tests shall be duly mended/ repaired to meet the desired function and retested. All necessary materials and labour for performing all the above tests shall be provided by the Contractor.
The Contractor shall prepare written test certificates in a form agreed upon by the Contractor and Employer of all tests results and hand them over to the Employer in due time.

The design, location and approval tests of anchoring rings for the fixing of lifting apparatus necessary for assembly and dismantling of equipment and plant accessories shall be the responsibility of the Contractor.

3.11.3.9 Taking over of facilities

Taking over" means that the Facilities (or a specific part thereof where specified) have been completed operationally and structurally and put in a tight and clean condition, and that all work in respect of pre-commissioning of the Facilities or such specific part thereof has been completed and commissioning has been attained as per Technical Specifications. The contractor shall make formal request for taking over the facility to the EIC.

3.11.3.10 Operation acceptance

The operational acceptance by the Employer of the Facilities (or any part of the Facilities where the Contract provides for acceptance of the Facilities in parts), which certifies the Contractor's fulfilment of the Contract in respect of Functional Guarantees of the Facilities (or the relevant part thereof) in accordance with the provisions of Specification.

3.11.3.11 Consumables, oils and Lubricant

The Contractor shall deliver to the Owner all equipment complete with initial fill of fluids, grease or lubricants, transformer oil, Nitrogen, SF6 gas and other used gases in non-returnable drums / containers and replace any quantity used up or lost during installation and testing.
The oil used for the lubrication and oil pressure systems for the turbine, governor, shutoff valve and generator shall be preferably of the same type.

Supply

The Contractor shall furnish the following:
(i) All oil for initial filling of all equipment supplied, plus additional oil equivalent to the first filling requirement of one unit.
(ii) Grease if required for initial filling of all of the equipment, plus 10% additional.
(iii) Gases for initial filling of all equipment supplied, plus 10 % additional quantity.
(iv) Flushing fluids to flush and clean all systems.

3.11.3.12 Submission of Drawings, Documents, Manual, software, Calculations, Safety Margin Details etc.

All drawings and documents shall be submitted to purchaser in hard form as well as in editable soft form. Bidder shall submit Six (6) number hard copies along with copy in electronic form media of the documents & drawings to purchaser for reference / review / approval. A comprehensive list of all such drawings/documents planned to be submitted for reference/approval shall be provided beforehand to the purchaser.

At the time of completion of contract, the Contractor shall submit ten (10) copies along with five (5) copies in electronic form in DVD media, of approved and as built drawings together with operation and maintenance manual.

Loading drawings

For all larger pieces of Works which, due to their dimensions and/or weight and transport limitations, will require special means for their transportation, the Contractor shall submit binding loading drawings indicating dimensions, weights, etc., of the respective pieces of Works and the necessary trailer for its transportation to the site.

Foundation drawings

If a piece of works requires its own foundation or needs a special area for installation, the contractor shall submit drawings indicating all pertinent dimensions, static and dynamic loads, etc. They shall include all essential details required for proper design and construction of the foundations and/or buildings.

In addition, they shall include openings, sleeves, slopes and the arrangement of any supporting structure, i.e. base-frames or other steel constructions for permanent fixing or erection purposes.

If conduits are to be installed in the foundations, the relevant information such as diameter, length, and purpose shall be indicated on the drawings.

Arrangement drawings

All arrangement drawings shall be drawn to scale. The General Arrangement Drawings shall show the physical arrangement of Works (constructions, machines, complete switchgears, control panels, instrument cubicles, etc.), civil constructions (buildings, rooms, foundations, ducts, etc.) and reserved areas (for pipes, cables, lines, etc.) in relation to each other and to agreed co-ordinates and boundaries. Such drawings shall be prepared for the whole plot, for separate plots and for each building (building, hall, room, ducts and trenches, etc.).

Outline drawings

The Outline Drawing shall show all elements and the main dimensions of individual components where necessary in plan view, cross-section, side and top views. If reasonably possible such dimensions can be shown on Arrangement Drawings.

Design drawings

The Design Drawings shall include the shop drawings, assembly drawings, erection drawings, piping diagrams and piping arrangement drawings, etc., showing the dimensions, design and data of all constructions, apparatus and Works to be furnished under this Contract. The drawings shall - where applicable - substantially conform to the Contract Drawings and shall show:

- 3-D Assembly drawings for major components in hard and soft form.
- Details of manufacturing and treatment of major single work pieces specially manufactured for this Contract
- Assembly of the Works in plan and elevation with main dimensions Sub-assembly of the principal components of the Works with overall dimensions, adjustment and clearance tolerances, numbers of corresponding detail drawings
- Sub-assemblies in which the Contractor proposes to ship the Works
- All necessary details of the parts connecting to the Works supplied by others

- Location and sizes of auxiliary connections for oil, grease, water, air, electrical power etc.
- Location and size of the instruments and accessories provided
- Methods of lubrication and sealing
- Instructions for heat treatment, pressure tests, surface preparation and anticorrosive protection
- Full details of parts for which adjustment is provided or which are subject to wear
- Method and sequence of installation, field joints, erection and lifting devices, jacks, grout plugs, anchoring details, etc., if not shown on foundation drawings.

Installation drawings

The construction, mechanical, electrical and I & C Installation Drawings shall provide detailed information on the disposition of the various items of a system (e.g. lighting fixtures, socket outlets, connection boxes, transmitters, actuators, loudspeakers, telephones, pipes, valves, pumps, compressors, etc.) and of the piping and wiring respectively included in the installation or assembly. They shall be based on dimension drawings of cubicles, rooms, buildings or areas containing the Works.

Diagrams

Single-line diagrams

This is a simplified diagram of the essential electrical Works and their interconnections. Each circuit shall be represented by a single line only. It shall contain all required technical information of the Works represented, e.g. voltage, current, capacity, short-circuit level, ratios, voltage variations, positive and zero sequence impedances, measuring transformer and protection relay indices, interlocking, kind of switch drive, code designation, etc. as applicable.

Circuit diagrams

The Circuit Diagrams shall show the power circuits in all the phases with the main apparatus as well as the pilot circuits (measuring and control circuits). It shall show in full the functioning of part or all installations, Works or circuits with all required technical details.

Block diagrams

The Block Diagrams shall be used to show in a simplified manner the main inter - relationships between the elements of a system by means of symbols, block symbols and pictures without necessarily showing all the connections. The symbols used for the individual kinds of components, e.g. servomotors, computing modules, etc., shall clearly be explained on the diagram or on an attached legend.

Logic diagrams

The Logic or Functional Diagrams shall be used for representation of logic and sequence controls and interlocking by showing only binary logic elements and their effect on the various process equipment disregarding their electrical realisation. Logic function elements (AND, OR, NOR, NAND, STORAGE, etc.) shall be used for processing and combining binary signals.

Terminal diagrams

Such diagrams shall be prepared for any type of terminal box, marshalling rack, control cubicle, switchboard, etc., and shall show the terminals (properly numbered) and the internal and/or external conductors (wires or cables) connected to them.
The terminal diagram of each individual switchboard, terminal box, panel, etc., shall contain, but not be limited to the following information:

Protection co-ordination diagrams
These diagrams shall show in a graphical manner separately for each power supply circuit:

- A simplified single-line diagram of the circuit with technical data of all instrument transformers and relays
- Co-ordinated tripping curves of related protection devices
- Setting of the protection devices.

Emergency shutdown diagram
This diagram shall show the sequential steps and interdependencies during emergency closure.

Flow Charts
Flow charts shall be used for representing sequence of events for start / stop / shut down of the machine including associated equipment and auxiliaries.

Manuals
The following manuals covering all equipment of EM works shall be supplied as per the time schedule in both editable soft and hard form: -

Sr.No.	Manual Description
1.	Storage and preservation manual
2.	Safety manual
3.	Erection Manual
4.	Testing and commissioning manual
5.	Operation manual
6.	Maintenance manual
7.	Long term storage manual for Generator Transformer
8.	Long term storage manual for boxed up component / equipment.
9.	Repair process / procedure manual for equipment / system

As built drawing to be provided incorporating changes made during erection, testing and commissioning.

Drawing & Document Submission Schedule
Drawings & documents submission schedule of the EM package with the categorization (i.e. Approval / reference) & tentative submission date shall be submitted to purchaser.

Preliminary list of drawings under various categories have been prepared and appended at Section 1 of the Technical Specification.

3.12 DRAWINGS & DOCUMENTS TO BE SUBMITTED BY THE SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT

One set of soft copies of all the approved drawings, documents including as built drawings shall be furnished by the Bidder to the Owner / Consultant in compact discs.

White prints or other non-reproducible drawings can be mailed folded. Blue prints shall generally not be used.
All drawings, prepared by the Bidder shall be as per IS: 696. Supplier's standard drawings are exempted from the above size limitation, unless his "standard" includes drawings of very large size or length. There shall be sufficient reference notes on the drawings to permit identification of all the drawings which are required for a proper understanding.

Bills of material and drawings shall be cross-referenced for easy identification.
All drawings shall be dimensioned in the metric system. Where drawings are usually made in the British (or other) system, they shall also have metric system dimensions in parentheses or below dimension line. Titles and written notations shall be in English. If the original is in another language it shall carry English translation. The translations will appear immediately on the drawings. Attached lists of translated words shall not be accepted.

Drawings and bills of material shall be identified by a numbering system to be mutually agreed later on. Any additional identification numbers or symbols that the Bidder selects to use for his own purposes are permissible so long as Owner's number is the prime means of identification.

The scale of the drawing shall be shown clearly in the title block of the drawing. Wherever possible, scales of drawings shall be:-

1:1	1 : 2.5	1 : 5	1 : 10	1 : 20	1 : 25
1:50	1 : 100	1 : 200	1 : 300	1 : 500	
1: 1000	1 : 2000	1 : 5000			

All reproducible must be made from original drawings.
All revised drawing shall clearly indicate the number, date and subject to each revision. All the revisions carried out in the drawings shall be clearly identified and marked.
Drawing list shall be kept up-to-date, incorporating all new additions, cancellations and changes, and will be reissued periodically with Progress Report.
General arrangement drawings shall be submitted for approval to the Owner/ Consultant prior to the commencement of detail engineering by the Bidder. These drawings shall show to scale all major equipment including electrical equipment and building outlines and overall dimensions as well as tie-in dimensions and clearances shall be clearly indicated. Approved arrangement drawings shall be used as basis for design and preparation of detail drawing to be prepared by the Bidder. The Bidder shall furnish all the necessary drawings, data etc., of the plant/equipment with appropriate "Status" stamp in adequate no. of copies as indicated below:

S. No.	DESCRIPTION	TENDER STAGE	CONTRACT STAGE FOR APPROVAL	FINAL DOCUMENTATION	
			Prints	Prints	CDs
1	Drawings and Data Sheets	1	6	10	05
2	Drawings "As Built "	-	-	10	05
3	Type Test Reports	1	6	10	05
4	Erection Manuals	-	6	10	05
5	Operation and Maintenance Manuals	-	6	05	08
6	Manufacturing Quality Plan	1	6	10	-
7	Field Quality Plan	1	6	10	-
8	Inspection Test Reports	-	-	10	-

3.12.1.1 QUALITY ASSURANCE PROGRAMME

The Bidder shall follow Quality Assurance Programme to ensure that the equipment and services under the scope of contract whether manufactured or performed at the Bidder's works or at his sub-vendor's premises or at the project site or at any other place of work are in accordance with the technical specifications. Such programme shall be outlined by the Bidder and be submitted along with the bid. The QA programme shall be generally in line with IS/ISO- 9001 and generally cover the following:

- ORGANISATION STRUCTURE FOR THE MANAGEMENT AND IMPLEMENTATION OF THE PROPOSED QUALITY ASSURANCE PROGRAMME
- QUALITY SYSTEM MANUAL
- DESIGN CONTROL SYSTEMS
- DOCUMENTATION AND DATA CONTROL SYSTEMS
- QUALIFICATION/EXPERIENCE OF BIDDER'S KEY PERSONNEL.
- PROCEDURE FOR PURCHASE OF MATERIAL, PARTS, COMPONENTS AND SELECTION OF SUB-VENDOR'S SERVICES INCLUDING VENDOR ANALYSIS, SOURCE INSPECTION, INCOMING RAW-MATERIAL INSPECTION, VERIFICATION OF MATERIALS PURCHASED, ETC.
- SYSTEM FOR SHOP MANUFACTURING AND SITE ERECTION CONTROLS INCLUDING PROCESS, FABRICATION AND ASSEMBLY.
- CONTROL OF NON-CONFORMING ITEMS AND SYSTEM FOR CORRECTIVE ACTIONS AND RESOLUTION OF DEVIATIONS.
- CONTROL OF CALIBRATION AND TESTING OF MEASURING / TESTING EQUIPMENT.
- SYSTEM FOR QUALITY AUDITS.
- SYSTEM FOR IDENTIFICATION AND APPRAISAL OF INSPECTION STATUS.
- SYSTEM FOR AUTHORISING RELEASE OF MANUFACTURED PRODUCT TO THE PURCHASER.
- SYSTEM FOR TRANSPORTATION /DELIVERY, HANDLING, STORAGE AND PRESERVATION.
- SYSTEM FOR MAINTENANCE OF RECORDS.

GENERAL REQUIREMENTS - QUALITY ASSURANCE

All materials, components and equipment covered under scope and its technical specifications shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme agreed mutually.

Minimum Quality Assurance Test Requirement (QATR) to be followed during Manufacturing and Field erection indicating requirement of various tests / inspections, on major equipment / items, to be carried out as stipulated in technical specification and standards mentioned therein, are attached hereto and are part of bidding documents.

Clarification, if any, on these quality assurance test requirement, raised by bidder shall be discussed and resolved during pre-bid meeting.

After the award of contract, the contractor shall submit the detailed Manufacturing & Field Quality Assurance Plans for complete equipment / material during detailed engineering for approval and acceptance by LTHP Ltd./Consultant in line with technical specification, Quality Assurance – General & Test Requirements and detailed engineering.

Manufacturing Quality Assurance Plans shall detail out for all the components and equipment & various tests/inspection, to be carried out in conformity with relevant latest IEC/IS/ISO etc., quality practices and procedures to be followed by Contractor's / Sub vendor's Quality Control Organization, the relevant reference documents, standards and acceptance norms etc. during all stages of material procurement, manufacture, assembly and final testing / factory acceptance tests.

The Field Quality Assurance Plans shall detail out the various tests/inspection to be carried out in conformity with relevant latest IEC/IS/ISO, quality practices and procedures etc. to be followed by the contractor's / sub-contractor's site Quality Control Organisation during various stages of site activities from receipt of material/equipment at site till final commissioning/ acceptance/handover.

All major items/ equipment/ components to be manufactured in house as well as procured from sub-vendors (Bought out Items, BOI) to be listed in the bid. Bidder shall submit Quality Assurance Plan submission schedule in the bid for above listed items in attached Format (duly filled in the format F-060-05 Issue 2.0 Rev. 00, Total 1 Page) in line with L2 Schedule.

For components / equipment / Bought out Items procured by the contractor for the purpose of the contract, the Contractor's purchase specifications and inquiries shall call for quality plans to be submitted by the sub-vendors.
The quality plans called for from the sub-vendors shall detail out, during the various stages of manufacture and installation, the quality practices and procedures followed by the sub-vendor's quality control organisation, the relevant reference documents/standards used, acceptance level, inspection of documentation raised, etc.

Such quality plans of the successful sub-vendors shall be finalized with the LTHP Ltd./Consultant in line with requirement mentioned above and such approved Quality Plans shall form a part of the purchase order/contract between the contractor and his sub-vendor.

Within three weeks of the release of the purchase orders /contracts for such bought out items /components, a copy of the same without price details but together with the detailed purchase specifications and other related documents such as data sheet, drawings, quality plans and delivery conditions shall be furnished to the LTHP Ltd./Consultant by contractor along with a report of the Purchase Orders placed, on the monthly basis, so far for the contract.

The Quality Plans shall be submitted on electronic media e.g. CD or E-mail in addition to hard copy, for review and approval of LTHP Ltd./Consultant. After approval, the same shall be submitted in compiled form on CD-ROM by contractor.

For all spares, replacement items and additional similar items, the quality requirements/Quality Plans as agreed for the main equipment supply shall be applicable.

All material of construction shall be as per technical specification / approved drawings / GTP.

Contractor's Plant internal standards must be traceable to acceptable International / National standards & salient points of difference (if any) shall be clearly stated with submission of plant standards. The contractor shall furnish copies of reference documents, plant standards, acceptance norms, test and inspection procedure etc. as referred in Quality Plans along with Quality Plan to LTHP Ltd./Consultant. These Quality Plans and reference documents/standards etc. will be subject to approval of LTHP Ltd. without which manufacturer shall not proceed. These documents shall form a part of the contract.

Tests on components and sub-assemblies shall be carried out at various stages of manufacturing, till the product undergoes the final tests in conformity with the relevant standards.

The Customer Hold Points (CHPs), identified in approved quality plan, i.e. testing checks which shall be carried out in the presence of the LTHP Ltd./NHPC, beyond which the work will not proceed without written consent of LTHP Ltd.'s authorized representative.
The contractor / sub-vendor shall carry out routine test on 100% items at his works. The quantum of check / test for routine and acceptance test by LTHP Ltd./Consultant shall be generally as per criteria / sampling plan defined in referred standards. Wherever standards have not been mentioned, quantum of check / test for routine / acceptance test shall be as agreed during detailed engineering.
The quantum of check when specified in percentage (%) / sampling basis shall be treated as per lot per sub-vendor. When the quantum of check is indicated to in whole no., then same quantum of check shall be applicable to each sub-vendor supplying the same equipment.

For sub-vendors identified during pre-award stage for submission of vendor details/ credentials (category "DR"), contractor shall submit documents in format F-060-01 after

placement of award in the manner as specified as under prior to any procurement and within a month after placement of award or a period as agreed at the time of pre-award discussions.

The proposed sub-vendors should be registered vendors of the bidder and must have proven experience for successful operation for similar equipment / items / processes as mentioned elsewhere in technical specification.

Before assigning any portion of work to the sub-vendor, other than one specified and duly accepted in the contract, the contractor will take prior approval of BHEL/ LTHP Ltd./NHPC.

Normally no request for change of sub-vendors or inclusion shall be entertained by LTHP Ltd./NHPC. But in exceptional circumstances, if the request for change of sub-vendors or inclusion is found reasonable and justified, then the same shall be entertained and the decision of LTHP Ltd./NHPC in this respect shall be final and binding. The time consumed for the change / inclusion of sub-vendors shall not be excluded from the stipulated time of the completion of the contract. This change shall not relieve the contractor from the responsibility to complete the work within stipulated time in any manner.

The contractor's proposal shall include sub-vendor's facilities established at the respective works, the process capability, process stabilization, Q.C. system followed, experience list etc. along with his own technical evaluation of sub-vendor. (Format F- 060-01 issue 2.0 rev. 01, Supplier / Sub-vendor Assessment Sheet, Total 14 pages).

However, whenever felt necessary, sub-vendor assessment will also be carried out by LTHP Ltd./Consultant in accordance with the above procedure and by factory visits; for existing/proposed vendors/sub-vendors. This approval shall not relieve the contractor from any obligation, duty or responsibility under the contract & LTHP Ltd./NHPC shall not be responsible for any complications arising between the contractor and his subcontractor(s) / sub-vendor (s) and / or any other liabilities.

LTHP Ltd./Consultant reserves the right to carry out quality audit and quality surveillance of the system and procedures of the contractor / or their sub-vendor. The contractor shall provide all necessary assistance to enable LTHP Ltd./Consultant to carry out such details & surveillance including Quality Manuals, if required by LTHP Ltd./Consultant.

All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirement of ASME section-VIII/IX or other International equivalent standard acceptable to LTHP Ltd./Consultant. All welding/brazing procedures shall be submitted to LTHP Ltd./Consultant/BHEL for review / verification prior to carrying out the welding/brazing. However, wherever required by the LTHP Ltd./Consultant, tests shall be conducted in presence of LTHP Ltd.'s authorized representative.

All Brazers, Welders and welding operators employed on any part of the contract either in Contractor/his sub-vendor's works or at site or elsewhere shall be qualified as per ASME section-VIII/IX or other equivalent Standards acceptable to LTHP Ltd./Consultant.

Unless otherwise proven and specifically agreed with LTHP Ltd./Consultant, welding of dissimilar material and high alloy materials shall be carried out at shop only.

All non-destructive examination shall be performed in accordance with written procedures as per International Standards. The NDT operator shall be qualified as per SNT-TC-IA (of the American or Indian Society of non-destructive examination). NDT shall be recorded in a report, which include detail of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of correlation of the test report with the job.

All material used for equipment manufacture including castings and forgings, etc. shall be of tested quality as per relevant codes/standards. Details of results of the tests conducted to determine the mechanical properties; chemical analysis and details of heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or agreed details.

Contractor shall submit Field Welding Schedule for field welding activities like field welding location, numbers, welding procedure to be used, requirements, codes and NDT requirement along with all supporting documents, like welding procedures, heat treatment procedures, NDT procedures, etc. to LTHP Ltd./Consultant for review at least ninety days before schedule start of erection work at site.
Any other statutory requirements as applicable for the equipment / systems shall also be complied with.

The inspection calls shall be placed at least 06 weeks in advance for overseas inspections excluding India and 15 days in advance for inspections within India.
Before submitting the inspection call to LTHP Ltd./NHPC for witnessing the Customer Hold Points (CHP's) and/or requesting LTHP Ltd./NHPC for issuance of Material Dispatch Clearance Certificate (MDCC) based on Test Certificate (TC) review / Certificate of Conformance (COC), the contractor shall ensure that all Drawings / documents / GTP / technical data sheet, relevant to respective CHP / MDCC requirement, has been duly approved /accepted / noted by LTHP Ltd./NHPC.

Contractor shall ensure readiness of offered equipment by all means, before raising such call to LTHP Ltd./NHPC to attend CHP inspections. In case, LTHP Ltd./NHPC engineer (s) on reaching at a place of inspection found that material is not ready for inspection due to whatsoever reason, the complete inspection expenditure of LTHP Ltd./NHPC engineer(s) as per actual shall be chargeable to the contractor.

Only calibrated testing & measuring instruments shall be used while performing tests during manufacturing and erection, testing & commissioning at site by the contractor. Copy of the calibration certificates will be submitted to LTHP Ltd./Consultant by the contractor during inspection as an evidence.

Non-conformities observed during manufacturing, shop testing, handling, packaging, transportation, storage, preservation, erection, testing & commissioning are required to be

intimated by the contractor. The acceptance/rejection of the non-conformities will be at the discretion of LTHP Ltd./NHPC.

Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the acceptance of LTHP Ltd./NHPC. Action taken in accordance with decision of disposal of non-conformity for repair / rework / modification of the item / equipment and to prevent re-occurrence. The corrective and preventive action may involve modification of item / equipment, change in procedure and system etc. to achieve quality improvement at all stages and levels.

Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the LTHP Ltd./NHPC to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets, drawings etc.

No material shall be dispatched from the manufacturer's works before the same is duly accepted, subsequent to pre dispatch/final inspection including verification of records of all previous tests/inspection by LTHP Ltd./NHPC and duly authorised for Dispatch by issuance of Material Dispatch Clearance Certificate (MDCC).

The test reports of type tests conducted as per contract, in line with requirement stipulated in the technical specification / quality plan should be got accepted from LTHP Ltd./Consultant before final inspection / issuance of MDCC.

All materials used or supplied shall be accompanied by valid and approved material certificates and tests and inspection reports. These certificates and reports shall indicate the heat numbers or other such acceptable identification numbers of the material. The material certified shall also have the identification details stamped on it to ensure physical correlation and traceability of material vis-a-vis test certificate. Such identification no. shall remain same and verifiable for all stages of manufacturing and installation.

3.12.1.2 QA DOCUMENTATION

The contractor shall be required to submit the QA Documentation in two hard copies and two CD ROMs, as identified in respective quality plan.

Each QA Documentation shall have a project specific Cover Sheet bearing name and identification number of equipment including index of its contents with page control on each document. The QA Documentation file shall be progressively completed by the Contractor/sub-vendor to allow regular reviews by all parties during the manufacturing.

The final quality document will be compiled and issued at the final assembly place of equipment before despatch. However, CD-ROM may be issued not later than three weeks.

Before dispatch / commissioning of any equipment, the Contractor shall make sure that the corresponding quality document or in the case of protracted phased deliveries, the applicable section of the quality document file is completed. The Contractor will then notify the Inspector regarding the readiness of the quality document (or applicable section) for review.

The contractor shall be required to submit copies of the following quality assurance documents in original duly reviewed and accepted by contractor along with the request letter for issuance of MDCC (Material Dispatch Clearance Certificate):

- QUALITY PLAN CHECK LIST.
- MATERIAL MILL TEST REPORTS ON COMPONENTS AS SPECIFIED IN QUALITY PLAN.
- SKETCHES AND DRAWINGS USED FOR INDICATING THE METHOD OF TRACEABILITY OF THE
- RADIOGRAPHS TO THE LOCATION ON THE EQUIPMENT.
- NON-DESTRUCTIVE EXAMINATION RESULTS REPORTS INCLUDING INTERPRETATION REPORTS.
- CALIBRATION CERTIFICATE OF ALL METERS & MEASURING INSTRUMENTS PROPOSED TO
- BE SUPPLIED AS PART OF RELEVANT BILLING BREAKUP ITEM.
- ROUTINE TEST REPORTS FOR TESTING REQUIRED AS PER APPLICABLE CODES AND
- STANDARDS REFERRED IN THE SPECIFICATIONS.
- INSPECTION REPORTS DULY SIGNED BY AUTHORIZED REPRESENTATIVE OF LTHP Ltd./NHPC AND CONTRACTOR FOR THE AGREED CUSTOMER HOLD POINTS.
- ALL THE ACCEPTED DEVIATIONS SHALL BE INCLUDED WITH COMPLETE TECHNICAL DETAILS.
- LIST OF BALANCE POINTS IF ANY.
- CERTIFICATES IN RESPECT OF CALIBRATION, WELDERS & BRAZERS QUALIFICATION ETC.
- COPY OF ALL REFERENCE DRAWINGS AND REFERENCE TECHNICAL DOCUMENTS
- ACCEPTANCE OF TYPE TEST REPORTS BY LTHP Ltd./CONSULTANT.

Similarly, the Contractor shall be required to submit two sets (two hard copies and two CD ROMs), containing QA Documentation pertaining to field activities as per Approved Field Quality Plans and other agreed manuals/procedures, within 2 weeks after commissioning of individual system.

On release of QA Documentation by Inspector, one set of quality document shall be forwarded to Consultant and other set to LTHP Ltd. For the particular case of phased deliveries, the complete quality document to the LTHP Ltd./Consultant shall be issued not later than 3 weeks after the date of the last delivery of equipment.

3.12.1.3 Safety

Safety of personnel

All equipment and services provided under this contract shall abide by international standards commonly accepted in the hydroelectric utility industry for safety of personnel whether involved with operation or maintenance.

Safety of operation

All equipment and services provided under this contract shall abide by commonly accepted standards for safety of operation.
The various system and sub-systems supplied under this contract shall be designed to follow and operate under a clear hierarchical structure:
• Plant control level,
• Unit control level,
• Functional control level, functional drive group level,
• Local drive level.

Each hierarchical control level shall perform its specific tasks and always depend on the subordinate lower control levels. In general, should a higher control level failure occur, the lower control level shall not be affected and shall be able to control the power plant with full safety.

The Contractor shall accordingly build into the "Electrical & Mechanical System" adequate levels of autonomy, independence, redundancy and functional distribution to insure that safety is maintained at all times.

3.12.1.4 Earthing

Earthing terminals for equipment of these specifications shall form part of equipment supplies. The contractor shall connect the earthing conductors to these terminals as required.

Risers from earthing bus shall be in the scope of purchaser. However, extension from these risers to the equipment shall be in the scope of supplier in the Power House, Transformer Hall, Switchyard.

However, overall earthing arrangement required for HT panel, LT panel, DG set, motor & motor control panels etc. at isolated location such as Dam Site, TRT Outfall area and Surge Shaft either by pit earthing or counter poise etc. shall be in the scope of supplier including civil works, design, material supply (for main earthing risers, interconnection, charcoal, salt, Bentonite etc.), erection, testing & commissioning etc.

A copper ground bus, sized to carry maximum short circuit current, shall run along the entire length of panel structure and shall have terminal connector at each end for connection to station ground grid (50 X 6 mm G.I. flat).

Tests
Each panel shall be completely assembled, wired, adjusted and tested at the factory prior to shipment. The test shall include wiring continuity tests, insulation tests and functional tests to ensure satisfactory operation and control of individual equipment.

Special Cables
Special cables for specific purpose, as required, shall be supplied and installed by the Bidder.

3.12.1.5 Completeness of the specification

Any fittings, accessories, equipment or any other things required for successful commissioning of Project, though may not have been specifically mentioned in the specification but are usually necessary for the completeness of the equipment shall be deemed to be included in the specification and shall be supplied by the contractor without any extra cost to the Employer.

3.12.1.6 Packaging and Shipment

The Contractor shall provide such packing of the Goods as it is required to prevent their damage or deterioration during transit to their final destination as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the final destination of Goods and the absence of heavy handling facilities at all points in transit.

The packing, marking and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract and, subject to any subsequent instruction ordered by the Employer consistent with the requirements of the Contract.
After unpacking of Goods the packing material shall become the property of Employer

The contractor shall wrap, pack and crate all plant included in the work or part thereof, suitable for shipment to a tropical location, facilitating proper handling and protection from damage in rail, truck, ocean or air shipment as applicable. An approved drying agent, such as Silica Gel, shall be packed in containers or packages holding plant which may be adversely affected by moisture or excessive humidity.

All packing crates shall be clearly marked before shipping to indicate the contract number, shipping address, volume, weight, name, number and unit number of the contents, slinging and weight bearing points.

All plant parts shall be marked to facilitate erection. Each packing crate shall contain a packing list in a waterproof envelope. Parts shall be described and also identified by their numbered marking in the packing list.

Three copies of the packing list shall be forwarded to the purchaser prior to dispatch. The ownership of packaging materials shall be of Employer. All wooden packaging crates and steel support structures shall be dumped to the designated area within 5kms of the power house as per the direction of Engineer in charge.

The supplier shall be entirely responsible for the insurance, shipment, handling and transportation.

The equipment shall not be dispatched by the Bidder from the place of manufacture to the site until the dispatch instructions are issued by the Owner.

3.12.1.7 PACKAGING, HANDLING AND SITE STORAGE

The Contractor shall follow the general requirement of packaging, Handling and Storage elaborated in "section 8 - Transport and installation" of "General Technical Specification (GTS). The Contractor shall pack all the consignment in sea worthy packaging, wherever required, strong enough to withstand rough handling during transit. Machine surface shall be suitably protected against scratches, corrosion, shocks, impact etc. Packages shall be suitably and distinctly identified for type of handling and kind of storage.
The packaging and storage of electronic equipment shall be strictly in accordance with internationally accepted standards. Electronic equipment shall be packaged, shipped and stored in anti-static packing. All packages shall be stored indoor. Packages containing electronic equipment shall be stored in humidity controlled environment.
If required, dehumidifiers shall be deployed by Contractor to control the condition of storage space. Storage of the equipment till commissioning is responsibility of the Contractor.

3.13 SPECIAL INSTRUCTIONS TO BIDDERS

General

The Bidder shall base the equipment design on the information given in this specification. The equipment shall be complete in all respects. Any item which is not specifically mentioned herein but found essential for safe and efficient operation and maintenance and satisfactory performance of the system shall be deemed to have been included in the scope of the Bidder. It shall be presumed that the Bidder has studied the site, all the drawings, tender documents and is fully aware of the scope of work involved and the site conditions prevailing.

3.14 Codes and Standards

a) All equipment, systems and works covered under this specification shall comply, in all respect, with requirements of applicable latest statutes and that of latest editions of codes and standards. Latest regulations and safety & environmental requirements as applicable in India / state of installation shall also be complied with.
b) All codes and standards mentioned shall mean as relevant and applicable to a particular equipment / system.
c) All other codes/standards not covered in Section 1 / Section 2 but required for the plant and system offered shall also be referred / followed by the Bidder. The Bidder, along with the bid, shall submit a comprehensive list of codes and standards to be followed for various equipment / system.
d) In all cases where IBR does not govern, German, American, British, ISO or other international standards established to be equivalent or superior to the codes specified are also acceptable. In the event of any conflict between the requirements of equivalent codes and standards and the requirements of Indian standards / regulations, the latter will govern unless specified otherwise in the specifications.

e) The Bidder shall be responsible to be in possession of all the specified Codes / Standards and ensure reference to the same before submitting the offer/ bid.

f) Mandatory codes / local regulations to be followed for safety, design, fabrication and operation of the switchyard shall be, followed:

g) If the equipment supplied does not conform to the codes and standards mentioned in this specification, but is manufactured to the Bidder's own standard, developed as a result of his experience, is also acceptable provided the same is found to be superior to the above mentioned codes and standards. The Bidder shall identify such equipment and shall also present sufficient data to the Owner / Consultant to support his design and to establish the superiority. The design may be accepted by Owner/ his Consultants only if the Purchase / his consultant is satisfied that sufficient experience exists with the design proposed.

h) Design not meeting the stipulations of the codes and standards will not be acceptable.

i) Apart from various codes and standards mentioned in Section 1/2, the Manufacturer shall comply with other requirements of codes and standards mentioned in this Specification for detailed design, manufacture, testing, erection, construction etc.

Control System	IEEE – 122 , 1992
Metering / Dosing pumps	API 675 – 1987 (Positive displacement pumps – controlled volume) API 676 – 1987 (Positive displacement pumps – Rotary).
Centrifugal pumps	API 610 – 1990, ASME PTC 8.2 – 1965
Gear Box	API 613 – 1993 & AGMA 420 & 421
Coupling	API 671 – 1993
Structural	IS 1893 – 1991, IS 875-1992 & IS 800 – 1991
Pressure Vessel	ASME Sec. VIII, Div. 1 – 1995
Piping	ANSI B 31.1-1995 / 31.3 – 1993, IBR
Valve	API
Instrument	ISA, API
Electrical	As per specification attached & relevant
	IS/IEC
Tanks	API 650- 1993
Electrodes	AWS, IS
Painting	IS Standards
Performances Tests	
Overload test of crane and hoists	IS 3177

3.15 Deviations and Assumptions

Bidders requested to carefully examine and understand the specifications and seek clarifications, if required, to ensure that they have understood the specifications. The Bidder's offer should not carry any sections like clarifications, interpretations and/or assumptions. In the event of conflict between the Technical Specifications and the condition of contract, the requirements as indicated in the technical specification shall govern, unless confirmed otherwise by the Owner in writing before the award of contract, based on written request from the bidder for such a clarification.

In the event of conflict between requirements of any two clauses of the specification documents, the more stringent requirements shall apply, unless otherwise confirmed by the Owner in writing before the award of this contract, based on a written request from the Bidder for such clarification.

The Bidders are advised that while making their Bid Proposals and quoting prices, all terms and conditions of bidding documents may appropriately be taken into consideration. Bidders are required to furnish a certificate indicating their full compliance to the terms and conditions of the bidding documents.

3.16 Limit of Contract

Equipment furnished shall be complete in all respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/ or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions. All similar standard components/ parts of similar standard equipment provided shall be interchangeable with one another.

This review by the Owner's Engineer / Consultant may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicative of the accuracy of the information submitted. This review and/ or approval by the Engineer shall not be construed by the Bidder, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements specified under these specifications and documents.

3.17 Latent Defects

Notwithstanding the issue of the Take Over Certificate, the Contractor shall be responsible for making good with all possible speed any Latent Defect in any Works /equipment of the plant which appears at any time before the expiry of defect liability period. And shall remedy such defect at its own cost and expense. The latent defect liability period shall be a minimum of 5 years from the end of defect liability period. The defects to which this applies are defects in design, materials or workmanship or defects arising from any act or omission of the Contractor done or omitted prior to Take-over of the portion of the Plant affected by the defects or during the Warranty Period which a reasonable examination at the end of the Warranty Period would not have disclosed.

3.18 Defect Liability

The Contractor warrants that all the facilities or any part thereof are new, unused, and of the most recent or current models, and that they incorporate all recent improvements in design and materials, unless provided otherwise in the Contract.

The Contractor further warrants that the Plant and equipment shall be free from defects arising from any act or omission of the Contractor or arising from design, materials, and workmanship, under normal use in the conditions prevailing in the, If during the Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant and equipment supplied or part thereof, the Contractor shall promptly, in consultation and agreement with the Employer regarding appropriate remedying of the defects, and at its cost, repair, replace or otherwise make good (as the Contractor shall, at its discretion, determine) such defect as well as any damage to the Facilities caused by such defect. The Contractor shall not be responsible for the repair, replacement or making good of any defect or of any damage to the Facilities arising out of or resulting from any of the following causes:

(a) Improper operation or maintenance of the Plant and equipment by the Employer
(b) Operation of the Facilities outside specifications provided in the Contract
(c) Normal wear and tear.

3.19 Completion Schedule

The Bidder shall submit Time Bar chart indicating completion date of major activities such as submission of design data / calculations and drawings for approval, manufacturing of components / units, supply, inspection etc. without which the Tender shall not be considered. Time Bar Chart furnished shall afterwards form part of the contract and cannot be altered arbitrarily except Force Majeure conditions as may be agreed with the Owner.

3.20 Drawings & Documents for Owner's use and Archives

The Bidder shall submit all final drawings, documents, manuals for Owner's use and for reference / record required during course of operation and maintenance of the plant. Numbers of copies and their form (hard copy, electronic form, reproducible) to be submitted and the details of the documents, drawings, manual etc. to be furnished by the Bidder are described elsewhere in the specification.

Drawings, documents, calculation, data & Information to be submitted by the Bidder along with the offer:

Technical Data to be submitted with the Tender

1) List of performance tests proposed by the Bidder to demonstrate the guaranteed parameters for generator and other electrical equipment.
2) Specific energy consumption.
3) Type test certificates for major categories of equipment, issued by independent testing authority.
4) Guaranteed Technical Parameters.
5) Technical catalogues.

6) Manufacturing Quality Plan

Operation & Maintenance Manuals

Instruction manuals, presenting the basic categories of information for the operating and/or maintenance personnel, as detailed herein below shall be furnished by Bidder.
The instruction manuals shall present the following basic categories of information in particular complete and comprehensive manner and prepared for the use by operating and/or maintenance personnel.

i. Instructions for initial commissioning, short duration and long duration shut down.
ii. Instruction for operation, routine inspection and maintenance including preventive maintenance.
iii. Recommendation for inspection points, method of inspection and period of inspection.
iv. Information on detection, cause and rectification of troubles and faults.
v. Instructions on normal repairs and overhaul.
vi. Complete parts list with proper and complete identification (Tag nos./Serial nos. as shown in the respective approved drawings) and ordering information for all replaceable parts. The identification details of equivalent and alternative makes for these spare parts which are not manufacturer's own product shall also be listed.
vii. List of all special tools and tackle & spares and instructions for use of such tools and tackle & spares.
viii. One complete set of as built drawings of the entire systems.
ix. The information shall be organized in a logical and orderly sequence. A general description of equipment including significant technical characteristics shall be included to familiarize operating and maintenance personnel with the equipment. Such description and technical characteristics shall not differ from the approved data.
x. Necessary drawings, curves and other illustrations shall be included or copies of appropriate approved drawings shall be bound in the manuals. Tests, adjustment and calibration information, as appropriate, shall be included. Safety and other warning notices and installation, maintenance and operating cautions shall be emphasized.
xi. Write-up, figures, part list etc., shall be clearly legible. The manuals shall be prepared on good quality paper securely bound in durable folders.
xii. The instruction manuals shall be subject to Consultant's approval in the same fashion as that for drawings.
xiii. Instruction manual shall give step by step procedure for Erection, testing and commissioning
xiv. Operation, Maintenance and Repair Instruction manual shall also contain:
xv. List of spare parts with ordering specifications and manufacturer's catalogues
xvi. List of consumables, lubricants, chemicals with specifications, brand names and annual consumption figures.
xvii. Drawings relevant for erection, operation, maintenance and repair of the equipment.
xviii. Procedure for ordering spares.
xix. Maintenance Manual shall also include:
xx. Diagnostic trouble shooting / fault location charts
xxi. Tests for checking of proper functioning.

Drawings / documents for approval

- Quality Control & Quality Assurance plan.
- G.A. and Cross Sectional drawings of all equipment indicating weights, material of construction, bill of material, dimension, specification etc.
- Final design calculations and assumptions.
- Actual performance data and characteristic curves based on the testing at site.
- Technical specification of all equipment, motors, for all system and all other accessories.
- Final list of drawings.
- As built drawings.

Miscellaneous

i. General arrangement and cross sectional drawings of all major components with bill of material.

ii. Foundation drawings, load data & design calculation for all equipment.

iii. Erection drawings for all equipment and structures showing complete erection details.

iv. Engineering and design calculations of installations and units.

v. QAPs

vi. Detailed procedures of shop testing of all the items applicable shall be submitted to the Owner/ Consultant for approval before conducting tests.

vii. Following shop test certificates/test curves/data, shall be furnished.

- Materials and components test certificates.
- Performance test results and characteristic curves of all fans, pumps, and electric drive motors etc.
- Non-destructive test results as applicable.
- Reports and test certificates of shop tests.
- Type test & routine test certificates.

viii. Detailed quality assurance program along with quality plan shall be submitted.

Following data shall be furnished: -

a) Technical data of all the plant, equipment, drive motors, instruments, panels, etc. shall be furnished.
b) Following lists/tables / write ups shall be furnished, complete with tag nos. and brief specification. Proper numbering system as approved by Consultant/Owner shall be adopted.

i) Instrument schedule (with service, range, make of instrument).
ii) Flow element schedule.

iii) Valve schedule.
iv) Pipe schedule.
v) Cable schedule (Power & Control).
vi) Schedule of actuators (electric/pneumatic)

The scheduled dates for the submission of these as well as for, any data/information to be furnished by the Employer would be discussed and finalized at the time of award. The supplier shall also submit required no. of copies as mentioned in this specification of all drawings/design documents/test reports for approval by the Employer.

Note: The contractor may please note that all resubmissions must incorporate, all comments given in the submission by the Employer failing which the submission of documents is likely to be returned. Every revision shall be a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

3.21 Workmanship and Quality Control

All moving parts of equipment, which can conceivably cause injury to the operator and otherwise authorized personnel within the vicinity of working area shall be suitably guarded and warning displays shall be put at prominent places.

The Bidder shall clearly indicate and identify the plans and procedures, which shall be followed in the design, manufacture and installation of plant and equipment to control and assure to the Owner of the desired quality.

FUNGI STATIC VARNISH

Besides the space heaters, special moisture and fungus resistance varnish shall be applied on parts which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interfere with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application of the varnish.

3.22 Title Block:

Project	Teesta-VI H.E. Project (4x125 MW)			
Customer	Lanco Teesta Hydro Power Limited (A wholly owned Subsidiary of NHPC LTD.) LTHP LTD. (A wholly owned subsidiary of NHPC Ltd.)			
Consultant	NHPC Ltd.			
BHEL	BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA		Name	Sign
		Drawn		
		Checked		
		Approved		
Title		Drawing Number :		**Rev**

----------XXXX----------

SECTION-4
GUARANTEED TECHNICAL PARTICULARS

	LINE TRAPS	:
1	Name of manufacturer and country	:
2	Type Model and Catalogue No	:
3	System Voltage Rating	:
4	Continuous current rating at 50° C ambient	:
5	Continuous current rating at 65° C ambient	:
6	Maximum Symmetrical short circuit current rating for 1 sec Duration	:
7	Asymmetric peak value of first half wave of rated short time current	:
8	Rated Inductance	:
9	Blocking Range	:
10	Minimum Guaranteed Resistive Component in Blocking frequency range	:
11	Type of Tuning	:
12	Variation in 50Hz Impedance per Degree Centigrade variation in ambient temperture	:
13	Variation in Resonant frequency band per degree centigrade variation in ambient temperature	:
14	Details of protection of capacitors and coils against voltage surges indicate type of protective device.	:
15	Basic Insulation level	:
16	Standard Nominal Discharge Current of Protective Device for 8/20 Micro second wave impulse	:
17	Rated voltage of the Arrestor (Protective device)	:
18	Min. value of power frequency sparkover voltage (Dry and wet) of protective devices	:
19	Maximum 1.2/50 usec Impulse Sparkover voltage of protective device	:
20	Virtual steepness and max front of wave impulse sparkover voltage of protective device	:
21	Max. residual discharge voltage of protective device for 8/20 usec impulse discharge current of	
	(a) 5000 Amps	:
	(b) 10000 Amps	:

GUARANTEED TECHNICAL PARTICULARS

22	Class of Insulation of line traps as per table - 1 of IEC 353	:
23	Temperture Rise in line trap under rated continuous current	:
24	Visual corona Extinction voltage	:
25	Radio Interference voltage	:
26	Type of incoming and outgoing terminals	:
27	Visual corona Extinction voltage for terminal concurrence	:
28	Radio interference voltage in terminal connectors	:
29	Continuous current rating of terminal connector at 50° C ambient	:
30	Short time current rating of terminals connectors	:
31	Temperature rise in terminal connector under rated continuous current over 50° C ambient	:
32	Type of Mounting	:
33	Maximum working stress	:
34	Ultimate tensile strength	:
35	Material of main coil	:
36	Material of terminal connector	:
37	Material of pedestal	:
38	Material of mounting hardware	:
39	Net weight (Approx)	:
40	Whether corona rings are provided	:
41	Whether Bird Barries are provided	:
42	Overall Dimensions provided (a) Diameter (b) Height	: :
43	Any other feature	:
44	No of turns in theline trap main coil	:
45	Type of conductor whether solid or standard	:
46	Overall conductor size	:
47	Cross sectional area of conductor of one layer	:
48	Type of construction (no of coils and whether open type or covered with insulating material	:

CHECK LIST FOR INFORMATION TO BE FURNISHED WITH OFFER RETURN THIS CHECKLIST AS PART OF THE OFFER DULY SIGNED

PLEASE NOTE:

a) The offer may not be considered if the following information and this Checklist are not enclosed with the Offer.

BHEL ENQUIRY. NO:

BIDDER OFFER REFERENCE:

EQUIPMENT: 220kV WAVE TRAP

S. No.	Parameters	Data	Yes /No	Remarks
1.	Applicable Standards	IEC: 60353(latest), IS:8792,IS 8793, IEC: 60099 (Part I&IV), IS : 3072 (Part - I) and IS : 5561	Yes/No	
2.	Type	Outdoor Type , Air cored , pedestal/suspension Mounted	Yes/No	
3	System Voltage (Indenter to tick)	220kV √	Yes/No	
4	Max. operating voltage of system	245kV √	Yes/No	
5	Rated Inductance for 220kV Line Trap	1mH	Yes/No	
6	Rated Frequency	50 Hz	Yes/No	
7	Rated current	2000A	Yes/No	
S. No.	**Parameters**	**Data**	**Yes /No**	**Remarks**
8	Rated Short Circuit Current	220kV LT-40kA/sec	Yes/No	
9	Tuning device type	Field adjustable	Yes/No	
10	Type of tuning	Broad Band tuned	Yes/No	
11	Blocking Bandwidth	50 to 500 kHz.	Yes/No	
12	Minimum blocking Impedance or resistance	220kV/132kV system: Not less than 570 ohm	Yes/No	
13	Visual Corona discharge: The line trap shall show no visual corona discharge at following Power frequency falling voltage	Not less than 156kV (rms)	Yes/No	
14	Corona Rings for 220kV Line Trap	Corona rings provided	Yes/No	
15	Radio Interference voltage	Not exceed 500μV at 163 kV (rms)	Yes/No	
16	Lightning Arrestor :	Shall be station class current limiting active gap type	Yes /No	
		In case of gapless type metal	Yes/No	

		oxide arrestor. The full justification for the same has been attached along with the offer.		
17	Rated discharge current of lighting arrestor	10kA		
18	Coordination shall be done by taking 20kA at 8/20 micro-sec discharge current into account		Yes/No	
19	Material of main coil	Non magnetic	Yes/No	
20	Mounting arrangement	Pedestal/suspension mounting	Yes/No	
21	Max. wind pressure the pedestal mounted Line trap can withstand	260kg/m^2	Yes/No	
22	Material of fixing bolts, hardware and all accessories.	Non magnetic material	Yes/No	
23	Bird barriers .	Provided	Yes/No	
S. No.	**Parameters**	**Data**	**Yes /No**	**Remarks**
24	a) 220kV WT -Terminal connectors for line side	Provided	Yes/No	
	b) 220kV WT -Terminal connectors for station side	Provided	Yes/No	
25	Visual Corona Extinction voltage for clamps and connectors (Indenter to tick)	Not less than 156 kV (rms) (for 220 kV) √	Yes/No	
26	Radio Interference voltage for clamps and connectors (Indenter to tick)	Not exceed 500 µV at 163 kV (rms) (for 220 kV)	Yes/No	
27	Material of clamp and connector	Non magnetic	Yes/No	
28	Valid Type test reports as per Section-III, is attached along with this offer.	Line Trap –as per Section-II	Yes/No	
		Terminal connectors –as per clause 13 (Section-II)	Yes/No	
29	Confirmation to Section –III pertaining to TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE		Yes/No	
30	List of Deviations if any , is attached along with offer		Yes/No	

31	List of all special tools and tackles if any which are specifically required for the equipment offered and are proprietary in nature . The list shall be on Equipment manufacturers letter head and duly signed . (to be attached with offer)		Yes/No	
32	Following Documents are attached along with the offer :			
	a. Filled Checklist.		Yes/No	
	~~**b. Filled GTP**~~		~~Yes/No~~	
	~~**c. Drawings**~~		~~Yes/No~~	
	d. List of special Tools and tackles on company letter Head, duly signed and stamped.		Yes/No	
33	Bidder to confirm if UJVNL standard approved drgs/ previously approved UJVNL drgs are available for approval extension .		Yes /No	

B) TYPE TESTS

i) Whether valid type test reports of the type test as per relevant IS/IEC conducted earlier on identical or similar material are available (test reports are of the test conducted not earlier than 10 (ten) years prior to the originally scheduled date of bid opening).

(YES)

ii) If type test reports are not acceptable to BHEL/Customer then above tests shall be conducted by the bidder free of cost.

(YES)

Date:

Signature of the authorized representative of Bidder

Company Seal

SCHEDULE OF TECHNICAL DEVIATIONS

Bidder shall list out all technical potential deviation/ change request (s) along with clause with respect to technical specifications.

Sl. No.	Page No.	Clause No.	Deviation	Reason / Justification

Any deviation not specifically brought out in this section shall not be admissible for any commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications irrespective of any such deviation indicated / taken elsewhere in the submitted offer.

Date: Bidder's Stamp & Signature

ANNEXURE-B:
COMPLIANCE CERTIFICATE OF TECHNICAL SPECIFICATION

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.

2. There are no deviation(s) with respect to specification other than those furnished in the 'schedule of deviations'.

3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.

4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

Date: Bidder's Stamp & Signature