

SN	Equipment	Phy Unit	Qty	Unit Exworks	Unit Packing	% ED	% CST	% VAT	% ST	Unit F&I	Plan Dt	Comments
	single HTLS conductor.											
9	A7-SUPPLY -66 kV double Suspension string hardware pilot type suitable for single HTLS conductor.	set	3									
10	A8-SUPPLY -Vibration damper.	Nos	252									
11	A9-SUPPLY -Repair sleeves etc. for conductor.	Nos	1									
12	A10-SUPPLY -Mid span compression joints for conductor.	Nos	1									
13	A11-SUPPLY -Any other item required for completion of work (bidder to submit boq).	Lot	1									
14	B12-SERVICE-Dismantling work of existing conductor & stringing hardware at site and handing over to customer (1 lot = 1ckt).	Lot	2									
15	B13-SERVICE-Reconductoring of transmission line with both circuits of double circuit line shutdown.	ckt-km	8									
16	B14-SERVICE-Additional charges over sl. No. 13 above with only one circuit shutdown for Reconductoring of transmission line.	ckt-km	8									
17	B15-SERVICE-Testing and commissioning.	Lot	2									
18	B16-SERVICE-Route survey of transmission line (Ichapore to ONGC Hazira).	Km	4									

You are requested to submit your most competitive offer so as to reach us positively by the tender opening date & time. THE TENDERS NOT RECEIVED WITHIN SCHEDULED DATE AND TIME ARE LIKELY TO BE IGNORED. BHEL shall not be responsible for any postal delay.

IN YOUR OWN INTEREST YOU ARE ADVISED TO CAREFULLY READ "THE INSTRUCTIONS TO BIDDERS". INCOMPLETE BIDS AND/OR BIDS NOT COMPLYING WITH TENDER CONDITIONS SHALL BE TREATED AS NON RESPONSIVE AND ARE LIKELY TO BE IGNORED.

In case Tender Documents are not received within 7 days of this E-mail message, intimate BHEL accordingly. If no intimation is received, it will be considered that you have received tender enquiry and delay in submission offer due to late receipt of tender documents will not be entertained.

YOU ARE REQUESTED TO SUBMIT YOUR MOST COMPETITIVE OFFER SO AS TO REACH US POSITIVELY BY 2 PM ON THE TENDER OPENING DATE AND TENDER WILL BE OPENED AT 2:30 PM WITH EFFECT FROM 15-SEP-09.

BHEL RESERVES THE RIGHT TO OPT FOR REVERSE AUCTION FOR OBTAINING BEST PRICES.

OFFERS THROUGH E-MAIL / FAX:

WHOEVER DESIRES TO SEND OFFERS ON THEIR OWN RISK (COMPLETE IN ALL RESPECTS) VIA E-MAIL or FAX HAVE TO SEND THE OFFERS TO THE COMMON E-MAIL ADDRESS tenderbox@bhel.in or 0120-6748581 FAX .

THE RECEIVED EMAIL OFFERS WILL BE PRINTED BY PURCHASE COORDINATOR AND PUT THEM INTO COVERS AS PER CONVENTIONAL METHOD FOR TENDER OPENING I.E., TECHNO COMMERCIAL & PRICE OFFER SHALL BE PUT INTO TWO SEPARATE COVERS AND BOTH THE COVERS ARE KEPT IN THIRD COVER DULY SUPER SCRIBING ENQY. NO. AND DUE DATE.

OFFERS SENT TO ANY OTHER E-MAIL ID or FAX NO AND INCOMPLETE OFFERS SHALL NOT BE CONSIDERED FOR EVALUATION PURPOSE.

It is suggested that the bidders are advised to send the files with 'password protection'. procedure for giving a password to a file has been given below:

For saving Excel file with password

Steps to be followed:

1. Click on the FILE option in XP system and Start sign in Vista system then go to SAVE AS option.
2. Select the location to save and Click on the TOOLS box and go to GENERAL OPTION.
3. It will ask for the password, type the password into open or modify box or both as required.
4. Then click on the OK button it will ask for reenter of the password.
5. After reentering the password click on the save box.

For saving Word file with password

Steps to be followed:

1. Click on the FILE option in XP and Start sign in Vista then go to SAVE AS option.
2. Select the location to save and Click on the TOOLS box and go to SECURITY OPTION in XP system and GENERAL OPTION in Vista system.
3. It will ask for the password, type the password into open or modify box or both as required.
4. Then click on the OK button it will ask for reenter of the password.
5. After reentering the password click on the save box.

The vendors who has sent offers with password, the passwords are to be forwarded to another email id: supplierinfo@bhelindustry.com

MSME STATUS

"THOSE INDUSTRIES WHO HAVE FILED A MEMORANDUM WITH THE CONCERNED AUTHORITIES AND REGISTERED AS MICRO & SMALL ENTERPRISE UNDER MICRO, SMALL AND MEDIUM ENTERPRISES DEVELOPMENT ACT 2006, HAVE TO SUBMIT A COPY OF SUCH REGISTRATION CERTIFICATE / MEMORANDUM TO BHEL FOR NECESSARY COMPLIANCES OF THE ABOVE ACT".

Please acknowledge the receipt of tender enquiry and fax back this letter by ticking the appropriate item below.

भारत हेवी इलेक्ट्रिकल्स लिमिटेड के लिए / for BHARAT HEAVY ELECTRICALS LTD

We acknowledge the receipt of tender.

- (a) The offer against subject enquiry shall be submitted by the scheduled date and time.
- (b) We regret to quote. The item in reference is out of our manufacturing range.
- (c) We regret because of our prior commitments.
- (d) Any other reason.

To
S C Shivhare
Sr. Manager
BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP
TOWER-A, 5th Floor,
Advant Navis IT Business Park,
Plot No-7, Sector-142, Expressway Noida
Noida-201305
Distt. Gautam BudhNagar, U.P

Ph: 0120-6748471
Fax: 0120-6748581

हस्ताक्षर और निविदाकार की सील / Signature and Seal of Tenderer

Enquiry No : 275E287 Enquiry Dt : 08-Jan-16



BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

DOCUMENT No.	TB-383-316-003	Rev 00	Prepared	Checked	Appd	
TYPE OF DOC.	TECHNICAL SPECIFICATION	NAME	MM	AS	RS	
High temperature low sag (HTLS) conductor & accessories (420 Amp)		SIGN	<i>Munt</i>	<i>Atul Ramesh</i>	<i>Ramesh</i>	
		DATE	12-10-15	12/10/15	12/10/15	
		GROUP		TBEM		
		W.O. No				

CUSTOMER/CONSULTANT ONGC/
 FITCHNER Consulting Engineers (India) Pvt Ltd.

PROJECT Combined cycle captive power plant at ONGC Hazira (1x51 MW)

Contents:

Section No.	Description	No of Pages
SECTION-1	<ul style="list-style-type: none"> ▪ SCOPE, SPECIFIC TECHNICAL REQUIREMENTS and QUANTITIES ▪ BOQ (Annexure-A) ▪ Annexure-B • Annexure-CL 	7 1 1 4
SECTION-2	EQUIPMENT SPECIFICATION	1+4
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SECTION-4	GUARANTEED TECHNICAL PARTICULAR	14
SECTION 6	CHECKLIST (to be submitted with the bid)	4

Offers without checklist will not be accepted.

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Rev	Date	Altered	Checked	Approved			
Distribution				To			
				Copies			

SECTION – I

SCOPE, SPECIFIC TECHNICAL REQUIREMENT AND QUANTITIES

1. SCOPE

This technical specification covers the requirements of
Supply - design, manufacture, testing at works, packing and dispatch of HTLS Conductor (equivalent to ACSR dog conductor in terms of dimension, weight etc. but current carrying capacity of 420A), stringing hardware, accessories and
Services - reconductoring of 4 km of existing 66 kV double circuit line from 66kV GETCO Ichhapore sub-station (installation, testing & commissioning at site.)
Requirement - The existing dog conductors shall be dismantled and replaced with a new HTLS conductor of 420 A Rating . The transmission line capacity is to be uprated without modification, reinforcement or replacement of existing towers.

The core wire shall be fabricated using steel strands specially made to withstand continuous steady state operating temperature or shall be fabricated using composite materials and shall match the stringent engineering performance requirements of the finished HTLS Conductor suitable for power evacuation of minimum **50MVA at 50 deg.C ambient temperature** (high temperature low sag uprating conductors) for each feeder.

This section covers the specific technical requirement of HTLS conductor, stringing hardware and conductor accessories. This constitutes minimum technical requirement. The offered equipment shall also comply with general technical requirement for the project detailed under section 3 of this specification.

The specification shall comprise of following sections:
Section-1: Scope, Specific Technical requirements & Quantities
Section-2: Equipment Specification
Section-3: General Technical Requirements
Section-4: Guaranteed Technical Particulars

The equipment is required for the following project:

Project name :	Combined cycle captive power plant at ONGC Hazira (1x51 MW)
Customer name :	ONGC
Consultant :	FITCHNER Consulting Engineers (India) Pvt Ltd.
Main Contractor :	BHEL

2. SPECIFIC TECHNICAL REQUIREMENT

System requirement

System voltage	66kV
Max system voltage	72.5kV
1.2/50 micro-sec impulse withstand Voltage	325 kVp
One minute power frequency withstand voltage.	140 kV rms

All equipments shall be suitable for hot line washing.

Span details of transmission line, important crossing alongwith insulator assembly type is enclosed as Annexure-B.

A) HTLS conductor

Sl. No.	Description	Requirement
1.	Code & Standard	Relevant IS/IEC
2.	Overall Diameter	14.15 mm \pm 1%
3.	Weight	394 kg/km
4.	Ultimate Tensile Strength	32.4kN minimum
5.	Coefficient of linear expansion	$< 19.8 \times 10^{-6}$ /deg. C at maximum operating temperature
6.	AC resistance at 75 degC	$<$ for ACSR dog conductor
7.	DC resistance at 20 deg C	< 0.273 ohm/km
8.	Minimum current carrying capacity	420 A
9.	Modulus of elasticity	$>$ for ACSR dog conductor

B) Stringing Hardware and Accessories

String insulator hardware shall be suitable for maximum operating temperature of HTLS conductor. The hardware accessories shall be compatible with existing insulators (120 / 90 kN) and transmission line structure. Each fitting shall be supplied complete in all respects.

The suspension assembly shall include either free centre type suspension clamp alongwith standard preformed armour rods or armour grip suspension clamp.

The fittings shall be suitable for attachment to suspension and tension insulator strings alongwith hardware fittings and shall include 2.5 % extra fasteners and Aluminium filler plugs. The supplier shall be responsible for satisfactory performance of complete conductor system along with fittings offered by them for continuous operation at the maximum temperature specified by them for the HTLS conductor.

C) Conductor accessories

Conductor accessories include items like vibration damper, mid span compression joints and repair sleeves etc. and any other item required for completion of the work {alongwith 2.5% extra fasteners, filler plugs (if applicable) and retaining rods} shall be provided.

3. BILL OF QUANTITY

As per Annexure-A

Note:

- A. The supplier shall be responsible for satisfactory performance of complete conductor system along with accessories offered by them for continuous operation at temperature specified for the offered HTLS Conductor.
- B. Bidder has to offer both supply and services as per the technical specification. Bids with only supplies will be rejected.
- C. Manufacturing lengths and drum length for HTLS conductor shall be determined as per the joint route survey with ONGC /BHEL. Drum length to be proposed by the bidder, minimizing the wastage.
 - a. The Payment of conductor length (for supply) will be as per approved quantities after joint survey.
 - b. The Payment of conductor length (for installation) will be as per actual measurement at site which shall include margins if any.
- D. Unit rate is to be quoted for all items. This shall be applicable for any variation at execution stage.
- E. It may be noted that BOQ is indicative quantity. The bidder shall verify the data during route survey/detailed engineering & shall finalise the BOQ required for satisfactory performance of system. Actual quantities shall be supplied as per approved design and drawings. BHEL reserves the right for quantity variation due to any reason upto +/- 30% value at same unit rate and items during execution of the contract. The quantity of individual items (other than 1) may vary to any extent and may even be deleted.
- F. If any additional item for installation & commissioning is required and same is to be clearly indicated.
- G. Any other item of supply and services listed in the BOQ but is required for the completion of job/work/project to meet specification requirement and for safe and satisfactory operation is deemed to be included in the above quoted prices and will have to be supplied, executed free of cost. No extra price shall be payable in respect to extra items/services.
- H. Factory and site acceptance tests are included in scope of work. Any special installation & testing equipment required at site is to be arranged by bidder and is deemed to be included in scope of supervision work.
- I. As per specification, existing insulator & transmission line structure is to be utilized. In case, the existing insulators cannot be used or additional quantity is required, bidder to clearly indicate this in the offer and provide specification of disc insulators. The insulators shall be provided by BHEL.
- J. Necessary site visit to collect input of existing system is included in scope of work both during bidding stage and during detailed design engineering stage. Apart from data for existing system given in specification, no additional data is available. Bidder is to make site visit for collection of any other information required during bid stage.
- K. Work shall be planned so that the shutdown time is minimized and all safety aspects well taken care of. Work might have to be done during one line shutdown and one line live taking adequate safety measures of humans and power system.
- L. Stringing work is included in present scope of work. Trained personnel with special tools to be deputed at site.
- M. Statutory rules & regulations to be followed.
- N. Dismantled conductor, hardware etc to be handed over to customer.
- O. Any damage to conductor or hardware during the erection work shall be rectified by the bidder to the satisfaction of owners.
- P. Store shall be provided by BHEL. Supervision of loading, unloading & storage shall be in bidder's scope. Office facilities, travel & accommodation for bidder's staff, Transportation of material tools and equipment between storage /warehouse and site shall be in bidder's scope.

Sl.	Particulars	Reply by bidder.	
	HTLS conductor.		
6.4	Store shall be provided by BHEL. Supervision of loading, unloading & storage shall be in bidder's scope. Office facilities, travel & accommodation for bidder's staff, Transportation of material tools and equipment between storage /warehouse and site shall be in bidder's scope.	Confirmed	Yes/No
6.5	Any damage in conductor, civil works and structure during installation will be repaired by the bidder.	Confirmed	Yes/No
7	Site Test		
7.1	Provision of test engineer, supply of all test equipment and arrangement like cranes (for lifting of conductor drums, test equipment etc), all Test Equipment for completion of total installation (re-conductoring) work shall be in bidder's scope.	Confirmed	Yes/No
7.2	All field tests including tests during installation, pre-commissioning, commissioning, field acceptance tests shall be conducted by the Contractor, in presence of representative of the Customer.	Confirmed	Yes/No
7.3	No separate site test will be conducted by BHEL/Customer	Confirmed	Yes/No
8	TYPE TESTS REQUIREMENTS		
8.1	The offered HTLS conductor complete in all respect alongwith stringing hardware and conductor accessories like vibration dampers, repair sleeves, mid-span compression joints) should have been type tested (as per relevant IEC). Stringing Hardware and accessories should be of the same make as used in type test.	Confirmed	Yes/No
8.2	Type test report for HTLS conductor, stringing hardware and conductor accessories shall be submitted with the bid. Differences, if any, in the items offered and those which have been Type tested shall be clearly brought out alongwith explanation for suitability. Type test reports will be vetted by BHEL/ONGC/FCE at contract stage and if the same is not acceptable to BHEL/ONGC/FCE, bidder has to repeat type tests without any cost and delivery extension.	Confirmed and enclosed with bid	Yes/No
8.3	The test - reports submitted shall be of the tests conducted within last 5 (five) years prior to the date of bid opening. Date of Bid opening is 17.12.2012.	Confirmed	Yes/No
8.4	In case the test reports are not found technically valid during contract stage by BHEL/ ONGC or if the tests were conducted earlier than 5 (five) years prior to the date of bid opening, the bidder shall repeat these test(s) <u>at no extra cost to the purchaser and no delivery implication.</u> Technical valid - Any error or (any/all additional type tests not carried out) or discrepancy in the test reports vis-à-vis offered equipment due to any design / manufacturing changes (including substitution of components) or non-compliance with the requirement stipulated in the Technical Specification.	Confirmed	Yes/No
8.5	The type test report shall be complete including list the test objects,	Confirmed	Yes/No

4. DETAILED TECHNICAL REQUIREMENT

As per section 2

5. DOCUMENT TO BE SUBMITTED

5.1 During tender stage

A. Documents for HTLS conductor

- i. Catalogue
- ii. Installation Instructions
- iii. Properties of the conductor strands , core wire strands
- iv. Composition of the conductor, core wire Strands
- v. Guaranteed Technical Parameters
- vi. Guaranteed Technical Parameters - Specification of the Conductor including its weight per meter, AC Resistance at maximum operating Temperature & DC Resistance at 20 Deg C, outer diameter including tolerance, minimum breaking load, coefficient of linear expansion, Modulus of Elasticity, creep characteristics
- vii. Type Test Reports performed on a similar conductor of similar rating
- viii. Current carrying capacity calculations at normal (Continuous) & Emergency Conditions
- ix. Short Circuit Withstand Capacity

B. Documents for String hardware

- i. Catalogue
- ii. Installation Instructions
- iii. Fully dimensioned drawings of the hardwares and their component parts

5.2 During detailed engineering stage

A. Documents for HTLS conductor

- i. Properties of the conductor strands , core wire strands
- ii. Composition of the conductor, core wire Strands
- iii. Specification of the Conductor including its weight per meter, AC Resistance at maximum operating Temperature & DC Resistance at 20 Deg C, outer diameter including tolerance, minimum breaking load, coefficient of linear expansion, Modulus of Elasticity, creep characteristics
- iv. Type Test Reports performed on a similar conductor of similar rating
- v. Routine Test & Acceptance Tests
- vi. Guaranteed Technical Parameters
- vii. Current carrying capacity calculations at normal (Continuous) & Emergency Conditions
- viii. Short Circuit Withstand Capacity
- ix. Sag-Tension calculations of the proposed HTLS conductor in comparison with existing ACSR Conductors are to be submitted along under following conditions.
 - a) At No wind & Full wind conditions of Average ambient Temperature
 - b) At No wind conditions for temperatures such as highest ambient temperature, during highest attainable Temperature of conductor, Transient conditions & at critical conditions.
- x. Any other technical details & data necessary for the successful completion of the work & required by ONGC

B. Documents for String hardware

- i. Fully dimensioned drawings of the hardware and their component parts (Dimensions and dimensional tolerance).
- ii. Material, fabrication details including any weld details & any specified finishes & coatings. Regarding material designation & reference of standards are to be indicated.
- iii. Catalogue No.
- iv. Marking
- v. Weight of assembly
- vi. Installation instructions
- vii. Design installation torque for the bolt or cap screw.
- viii. Withstand torque that may be applied to the bolt or cap screw without failure of component parts.
- ix. The compression die number with recommended compression pressure.
- x. All other relevant terminal details.

6. TYPE TESTS

All the offered equipments shall have valid type test certificates. The type test reports submitted shall be of tests conducted within last 5 years prior to the date of bid opening (date of bid opening is 17/12/2012).

In case reports are not valid or not acceptable to customer, the requisite tests shall be conducted by bidder on the offered equipment without any extra cost and delivery impact to BHEL.

7. INSPECTION, TESTING AND ACCEPTANCE

Bidder has to follow Customer/BHEL approved manufacturing Quality plan.
All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

8. Standards

The conductor, hardware fittings; conductor accessories shall conform to the following Indian/International Standards which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification.

In the event of the supply of conductor, hardware fittings; conductor accessories conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent to those specified. In case of award, salient features of comparison between the Standards proposed by the Contractor and those specified in this document will be provided by the Contractor to establish their equivalence.

8.1 Conductor

Sl. No.	Indian Standard	Title	International Standard
1.	IS: 209-1992	Specification for zinc	BS:3436-1986
2.	IS: 398-1982	Specification for Aluminium Conductors for Overhead Transmission Purposes	IEC:1089-1991 BS:215-1970
3.	IS:398-1990	Aluminum Conductor Galvanised Steel	BS;215-1970

	Part-II	Reinforced	IEC:1089-1991
4.	IS:398-1992	Aluminum Conductor Galvanised Steel- Reinforced	IEC:1089-1991 BS:215-1970
5.	IS : 1778-1980	Reels and Drums for Bare Conductors	BS:1559-1949
6.	IS : 1521-1991	Method of Tensile Testing of Steel Wire	ISO 6892-1984
7.	IS : 2629-1990	Recommended Practice for Hot Dip Galvanising of Iron and Steel	
8.	IS : 2633-1992	Method of Testing Uniformity of Coating on Zinc Coated Articles	
9.	IS : 4826-1992	Galvanised Coating on Round Steel Wires	IEC : 888-1987 BS:443-1969
10.	IS : 6745-1990	Methods of Determination of Weight of Zinc Coating of Zinc Coated Iron and Steel Articles	BS:433-1969 ISO 1460 - 1973
11.	IS : 8263-1990	Method of Radio Interference Tests on High Voltage Insulators	IEC:437-1973 NEMA:107-1964 CISPR
12.	IS : 9997-1988	Aluminium Alloy Redraw Rods	IEC 104 - 1987
13.		Zinc Coated steel wires for stranded Conductors	IEC : 888-1987
14.		Hard drawn Aluminium wire for overhead line conductors	IEC : 889-1987
15.	IS:398 (Part-IV)	Aluminium Alloy stranded conductor	IEC : 208-1966 BS-3242-1970
16.		Aluminium clad steel wires	IEC:1232
17.		Method of measurement of resistivity of metallic materials	IEC:468
18.		Ampacity	IEEE738
19.		Thermal resistant Aluminium Alloy	IEC 62004

8.2 Hardwares

Sl. No.	Indian Standard	Title	International Standard
1.	IS: 209-1992	Specification for zinc	BS:3436-1986
2.	IS:398-1992	Aluminum Conductor Galvanised Steel-Reinforced	IEC:1089-1991 BS:215-1970
3.	IS 1573	Electroplated Coating of Zinc on iron and Steel	

Sl. No.	Indian Standard	Title	International Standard
4.	IS : 2121 (Part-II)	Specification for Conductor and Earthwire Accessories for Overhead Power lines: Mid-span Joints and Repair Sleeves for Conductors	
5.	IS:2486 (Part-I)	Specification for Insulator Fittings for Overhead power Lines with Nominal Voltage greater than 1000 V: General Requirements and Tests	
6.	IS:2629	Recommended Practice for Hot Dip Galvanising of Iron and Steel	
7.	IS:2633	Method of Testing Uniformity of Coating on Zinc Coated Articles	
8.		Ozone test on Elastomer	ASTM-D1 171
9.		Tests on insulators of Ceramic material or glass for overhead lines with a nominal voltage greater than 1000V	IEC:383-1993
10.	IS:4826	Galvanised Coating on Round Steel Wires	ASTM A472-729 BS:443-1969
11.	IS:6745	Methods of Determination of Weight of Zinc Coating of Zinc Coated Iron and Steel Articles	BS:433 ISO : 1460 (E)
12.	IS:8263	Method of Radio Interference Tests on High Voltage Insulators	IEC:437 NEMA:107 CISPR
13.	IS:6639	Hexagonal Bolts for Steel Structures	ISO/R-272
14.	IS:9708	Specification for Stock Bridge Vibration Dampers for Overhead Power Lines	
15.	IS:10162	Specification for Spacers Dampers for Twin Horizontal Bundle Conductors	

Annexure-A

Rev-00

Sl. No.	Description	Unit	Quantity
	SUPPLY		
1	HTLS (high temperature low sag) conductor with current carrying capacity 420A	km	25
2	66 kV Double Tension string hardware , compression type, with tension clamp, with provision of compressing jumper at one end, suitable for single HTLS conductor	set	36
3	66 kV Single Tension string hardware, compression type, with tension clamp, with provision of compressing jumper at one end, suitable for single HTLS conductor	set	96
4	66 kV Single Suspension string hardware, with armour grip suspension clamp , suitable for single HTLS conductor	set	60
5	66 kV Double Suspension, with armour grip suspension clamp , string hardware suitable for single HTLS conductor	set	6
6	66 kV Single Suspension, string hardware pilot type suitable for single HTLS conductor	set	12
7	66 kV double Suspension, string hardware pilot type suitable for single HTLS conductor	set	3
8	Vibration damper	Nos.	252
9	Repair sleeves, etc. for conductor	Nos.	1
10	Mid span compression joints for conductor	Nos.	1
11	Any other item required for completion of work (bidder to submit boq)	Lot	1
	SERVICES		
12	Dismantling work of existing conductor & stringing hardware at site and handing over to customer (1 lot = 1ckt)	Lot	2
13	Reconductoring of transmission line with both circuits of double circuit line shutdown	ckt-km	8
14	Additional charges over sl. No. 13 above with only one circuit shutdown for Reconductoring of transmission line	ckt-km	8
15	Testing and commissioning	Lot	2
16	Route survey of transmission line (Ichapore to ONGC Hazira)	Km	4

ANNEXURE-B

66KV IPORE ONGC line				
LOC NO 1 TO 21				
Lengh- 3905 Km				
Date of comissioning:- 23.11.89				
Conductor used : Dog				
Loc. No.	Type	Type	SPAN In Mtr	Important crossing
Ichhapore Gantry			100	
1	T	R	160	
2	T	R	100	
3	DS	P	190	Sachin Road (6 lane NH 8)
4	DT	S	250	
5	S	P	250	
6	S	P	250	
7	S	P	250	
8	T	R	160	All Tower in ONGC compund
9	S	P	145	
10	T	R	130	
11	T	R	190	
12	S	P	160	
13	S	P	175	
14	S	P	170	
15	T	R	160	
16	S	P	180	
17	S	P	225	
18	DT	S	110	Material Entry gate
19	DT	S	65	
20	S	P	165	Approch road from Mandir(Out of ONGC)
21	T	R	245	ONGC Compound
Ongc Gantry			75	

3905

Total Tension	10
Total Sus.	11
Total	21

Annexure to the report of the JICA
 9925-21334

TOWER SPOTTING DATA FOR 66 KV D/C TOWER SUITABLE FOR ACSR "DOG" CONDUCTOR.

Sr No	Description	Tower type				Remark
		P	Q	R	S	
1	Vertical Load	379(140)	474(150)	474(235)	474(150)	
2	Maximum Deviation	2°	15°	30°	60° or DE	
3	Normal span	260	260	260	260	
4	Maximum individual span	390	390	390	390	
5	Weight span G.W		Max.	Min		
(i)	Effect one span		225	104		In B.W.C.
(ii)	Effect both span		390	172		In N.C
6	Weight span conductor					
(i)	Effect one span		225	104		In B.W.C.
(ii)	Effect both span		390	172		In N.C
7	Permissible sum at adjacent spans for reduce angle of deviation	2°-520 1°-563 0°-608	15°-520 14°-563 13°-608 12°-650 11°-695 10°-736	30°-520 29°-562 28°-605 27°-648 26°-690 25°-734 24°-776	60°-520 59°-558 58°-596 57°-635 56°-674 55°-713 54°-752	1. sum not to exceed twice the max. individual span. 2. consider GW or Cond whichever gives lesser value.
8	Design long tension					

also
 Please send cc to:

Mr. AMIT JOSH (Deputy Engineer
 in-charge (ENGINEERING))

- 2 -

GW Conductor	100% 50%	Long component of full tension do	Three cond or two cond & GW broken	Sag in meter
9 Broken wire condition	One cond or GW broken	Any two cond or one cond and one GW broken	Three cond or two cond & GW broken	
10 Sag tension value consider in design	CONDUCTOR		GROUND WIRE	
	Tension in kg.	Sag in meter	Tension in kg.	Sag in meter
a. 0° - 2/3 rd F.W	1329	-	1210	-
b. 32°C F.W	1223	-	1132	-
c. 67°C No Wind	625	5.330	773	4.670 at 5:
d. 0°C No Wind	1141	2.917	1114	3.238

-3-4

LINE DATAS

- 1) Normal Span – 260 Meters.
- 2) Conductor Tension @ 0 degrees 67% Full Wind – 1329 Kgs.
- 3) Conductor Tension @ 32 degrees 100% full wind – 1223 Kgs.
- 4) Maximum Sag – 5.33 Meters.
- 5) Sag @ 0 Degrees No Wind – 2.917 meters minimum

BASIC DATAS FOR SAG TENSION CALCULATION

- 1) Wind – 45 kgs./sq. meter
- 2) Span – 260 meters

BASIC DATAS FOR AMPERE CAPACITY CALCULATION

- 1) Ambient Temperature – 40 degree
- 2) Solar Absorption co-efficient – 0.8
- 3) Solar radiation – 1045 w/sq. meter
- 4) Emmissivity co-eff. – 0.45
- 5) Wind velocity – 2016 meter/hrs.

3M™ ACCR Conductor Information Request

Please fill in as much of the following information as you can and return to the address or fax below.

Contact Information

Name: PARVINDER SINGH	Company: ONGC Limited HAZIRA
Address: COGEN, HAZIRA PLANT, ONGC	Today's Date: 24-10-12
City: SURAT State: GUJARAT	ZIP code: 394518
Phone: 9427504595 Fax: 02612675577	Email: parvindergrosmph@gmail.com

Existing Conductor Information

Name of line:	Number of circuits:	Expected Project Date:
Number of conductors per phase: Single	Type of structure (wood pole, steel lattice etc): Steel lattice	
Line length: 5 km <input type="checkbox"/> 5 Km.	Voltage: 66 kV	
Conductor name: ACSA D06	Stranding: Type (ACSR, ACSS etc.): ACSA	
Conductor area: 118.5 <input checked="" type="checkbox"/> mm ² <input type="checkbox"/> kcmil	Diameter: 14.15 <input checked="" type="checkbox"/> mm <input type="checkbox"/> in	Strength: 3305 <input type="checkbox"/> lbs <input checked="" type="checkbox"/> kgf <input type="checkbox"/> kN
Max wire temp: Continuous: 67 <input checked="" type="checkbox"/> °C <input type="checkbox"/> °F	Emergency: <input type="checkbox"/> °C <input type="checkbox"/> °F	
Ampacity per conductor Continuous: Emergency:	Emergency temperature ruling span sag: <input type="checkbox"/> m <input type="checkbox"/> ft	

Installed Condition of Existing Conductor

Ruling span: 260 <input checked="" type="checkbox"/> m <input type="checkbox"/> ft	Critical span width: <input type="checkbox"/> m <input type="checkbox"/> ft	Critical span incline: <input type="checkbox"/> m <input type="checkbox"/> ft
Everyday/install temperature: 32 <input checked="" type="checkbox"/> °C <input type="checkbox"/> °F	Installed tension: 26 <input checked="" type="checkbox"/> kgf <input type="checkbox"/> kn <input type="checkbox"/> lbs 32 <input type="checkbox"/> lb	

Ampacity Conditions

Air temp: 40 <input checked="" type="checkbox"/> °C <input type="checkbox"/> °F	Wind velocity: 0.56 <input checked="" type="checkbox"/> m/s <input type="checkbox"/> ft/s	Conductor elevation: 16 <input checked="" type="checkbox"/> m <input type="checkbox"/> ft
Emissivity: 0.45	Absorptivity: 0.80	Conductor latitude:
Conductor direction:	Day of year and time:	Solar flux: 1045 <input checked="" type="checkbox"/> w/m ² <input type="checkbox"/> w/ft ²

Design Limits and Environmental Conditions

Maximum allowed ruling span sag: 600 <input checked="" type="checkbox"/> m <input type="checkbox"/> ft 260 m	Maximum allowed critical span sag: 5.33 <input checked="" type="checkbox"/> m <input type="checkbox"/> ft
Max horizontal tension: <input type="checkbox"/> kgf <input type="checkbox"/> kn <input type="checkbox"/> lbs	Max tension % of RBS:
Condition 1 Name: 32 & E. 10	Allowed tension (% breaking Strength): 1223 Kgs
Air temp: 32 <input type="checkbox"/> °C <input type="checkbox"/> °F	Wind pressure: <input type="checkbox"/> Pa <input type="checkbox"/> lbs/ft ² <input type="checkbox"/> MPH
Ice thickness: <input type="checkbox"/> mm <input type="checkbox"/> in	NESC load factor: <input type="checkbox"/> N/m <input type="checkbox"/> lbs/ft
Condition 2 Name: 30 & 2/3 AD	Allowed tension (% breaking Strength): 1329 Kgs
Air temp: <input type="checkbox"/> °C <input type="checkbox"/> °F	Wind pressure: <input type="checkbox"/> Pa <input type="checkbox"/> lbs/ft ² <input type="checkbox"/> MPH
Ice thickness: <input type="checkbox"/> mm <input type="checkbox"/> in	NESC load factor: <input type="checkbox"/> N/m <input type="checkbox"/> lbs/ft
Condition 3 Name:	Allowed tension (% breaking Strength):
Air temp: <input type="checkbox"/> °C <input type="checkbox"/> °F	Wind pressure: <input type="checkbox"/> Pa <input type="checkbox"/> lbs/ft ² <input type="checkbox"/> MPH
Ice thickness: <input type="checkbox"/> mm <input type="checkbox"/> in	NESC load factor: <input type="checkbox"/> N/m <input type="checkbox"/> lbs/ft

Design Goals

Increase ampacity <input checked="" type="checkbox"/> Goal:	Decrease sag <input type="checkbox"/> Goal:
---	---

Notes:

Please return completed form to:
 R.Pradeep Kumar
 3M Electro & Communication India Pvt Ltd,
 Concorde Block, UB City, 24 Vittal Maliya Road,
 Bangalore 560001
 Phone : +91 80 6659 5415, Fax: +91 80 2223 1450
 prkumar@mnm.com

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Bharat Heavy Electricals Limited

Project : Combined cycle captive power plant at ONGC Hazira
(1x51 MW)


Doc No. TB-383-316-003

Technical Specification for HTLS conductor & accessories
Section 2

Rev 00

SECTION – 2

1. ONGC Technical Specification for HTLS Conductor (Annexure -6, 5 pages)

	Subject	Doc. No.	Rev.	Vol. / Sec.
	BID PACKAGE FOR COMBINED CYCLE CAPTIVE POWER PLANT AT HAZIRA PLANT, GUJARAT	Annexure – 6	RO	Sheet No.
				1

Annexure - 6

Specification for HTLS Conductors

General

This specification covers the design, manufacture, supply, erection, testing and commissioning of HTLS Conductors & auxiliaries.

It is not the intent to specify completely herein all details of the equipment; nevertheless, the equipment shall be complete and operative in all respects and shall conform to the highest standard of engineering, design and workmanship.

Scope of Work

The scope of work shall include but not limited to the following

Dismantling of the existing ACSR Dog Conductors and supply, stringing, sagging & clamping of new HTLS conductors and other accessories & fittings including clamps & vibration dampers on existing 66 KV transmission line structures and disc insulators

Bidder shall also supply necessary hardware to suit the HTLS conductor and to ensure trouble free operation & Power evacuation from the ONGC CCCPP, Hazira.

The hardware accessories supplied by the bidder shall be compatible with existing insulators & other transmission line structures


Codes & Standards

The HTLS conductors & hardware supplied shall conform to relevant IS/IEC/IEEE standards as amended up to date

Technical Requirement

The scope of work necessitates the complete replacement of existing 66kV ACSR conductors by HTLS conductors connected from the Gantry AIS of ONGC , Hazira, Gujarat up to the gantry of GEB Substation, Icchapore ,Gujarat .

The HTLS conductors & all the accessories supplied by the bidder shall be new & proven type. No prototype shall be accepted.

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The minimum continuous current carrying capacity of the HTLS conductor shall be 420 A without exceeding its steady state temperature limits with the maximum ambient temperature.

The hardware and other associated fittings shall retain their electrical, mechanical, thermal & metallurgical properties at the maximum attainable temperature & shall have a satisfactory operation at the worst ambient conditions.

The outer layer of HTLS conductor shall be made of high temperature heat resistant aluminum alloy.

The HTLS conductors shall be smooth, uniformly stranded, rigid & tight & free from all defects. No joints shall be permitted in the individual wires in the outer most layer of the finished conductor. However joints are permitted in the inner layer(s) of the conductor unavoidably broken during stranding provided such breaks are not associated with either inherently defective wire or with the use of short lengths of Aluminium Alloy wires

The core wire shall be fabricated using steel strands specially made to withstand continuous steady state operating temperature or shall be fabricated using composite materials and shall match the stringent engineering performance requirements of the finished HTLS Conductor. It shall be able to suit & withstand the ambient atmospheric conditions of Hazira without any changes in its electrical, mechanical, thermal & metallurgical properties.

In all constructions, the successive layers shall have opposite directions of lay, the outermost layer being right-handed. The wires in each layer shall be evenly and closely stranded.


In conductors having multiple layers of aluminium wires, the lay ratio of any aluminium layer shall not be greater than the lay ratio of the aluminium layer immediately beneath it.

The weight per meter of HTLS conductor shall be equal to or less than that of 394 kg/km

The Modulus of elasticity of HTLS Conductor shall be more than that of ACSR Dog Conductor

The AC resistance at 75 Deg C shall be less than that of ACSR Dog Conductor

The DC resistance at 20 Deg C and shall be less than that of 0.273 ohm/km.

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The Outer diameter shall be 14.15 mm. A tolerance of $\pm 1\%$ is permitted on the nominal diameter of conductor respectively.

The minimum breaking load shall be less than 32.4 kN


The coefficient of linear expansion of the HTLS Conductor at maximum operating temperature shall be less than that of ACSR Dog Conductor ($19.80 \times 10^{-6} / \text{deg. C}$) at its maximum operating temperature.

No Mid span joint shall be allowed in the HTLS conductors & No welds shall be made to achieve the intended span

Tension stringing equipment shall be utilized in order to carry out the entire stringing work of HTLS conductor.

Bidder shall furnish the following for the proposed HTLS conductor for the approval of ONGC during detailed engineering


- 1) Properties of the conductor strands , core wire strands
- 2) Composition of the conductor, core wire Strands
- 3) Specification of the Conductor including its weight per meter, AC Resistance at maximum operating Temperature & DC Resistance at 20 Deg C, outer diameter including tolerance, minimum breaking load, coefficient of linear expansion, Modulus of Elasticity, creep characteristics
- 4) Type Test Reports performed on a similar conductor of similar rating
- 5) Routine Test & Acceptance Tests
- 6) Guaranteed Technical Parameters
- 7) Current carrying capacity calculations at normal (Continuous) & Emergency Conditions
- 8) Short Circuit Withstand Capacity
- 9) Sag-Tension calculations of the proposed HTLS conductor in comparison with existing ACSR Conductors are to be submitted along under following conditions.
 - i) At No wind & Full wind conditions of Average ambient Temperature
 - ii) At No wind conditions for temperatures such as highest ambient temperature, during highest attainable Temperature of conductor, Transient conditions & at critical conditions
- 10) Any other technical details & data necessary for the successful completion of the work & required by ONGC

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ONGC, Hazira Site conditions

1.0	Location	ONGC Limited, Hazira
2.0	Elevation above mean sea level	RL 6.0 above, MSL
3.0	Atmospheric pressure at MSL	1.013 bar
4.0	Ambient Temperature	
a)	Max. average dry bulb temperature	45.6 Deg C
b)	Min. average dry bulb temperature	4.4 Deg C
c)	Design temperature for electrical equipment / device	50 Deg C
5.0	Relative Humidity	
a)	Max.	70%
b)	Min.	18%
c)	Average	64%
6.0	Seismic Zone	III (IS 1893)
7.0	Rainfall	
a)	Max. intensity of rainfall in 24 hrs.	459.2 mm
b)	Period – Monsoon showers	June to September
c)	Average rainfall per annum	1203.5 mm
8.0	Wind data	
	Max. wind speed (as per IS:875) 20-61 kmph for 20 days in a year < 20 kmph for remaining period	62 kmph
	Most predominant wind direction	South - West
9.0	Land	
10.0	Tropicalisation	
	All equipment supplied against specification shall be given tropical and fungicidal treatment in view of the climatic conditions prevailing at site.	
	Tropical protection shall conform to BS: CP-1014-1965 "Protection of Electrical Power Equipment" against climatic conditions.	
11.0	Electrical	
	Refer Volume-III, Section-3, and Detailed Technical Specification – Electrical of this tender document.	

Any other input details necessary for the successful completion of the work shall be provided during detailed engineering

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Bidder to ensure that the HTLS conductors supplied shall confirm to the standards & requirements of GETCO & GEB.

Bidder is requested to visit the ONGC Site in order to assess the tower schedule, insulator strings at suspension & Tension Points, termination details and any other pertinent data including the length of the conductors required.

SECTION – 3
PROJECT DETAILS AND GENERAL SPECIFICATIONS

SL.NO.	DESCRIPTION	
1.	PROJECT INFORMATION	
	a) Customer	ONGC Ltd.
	b) Consultant	FICHTNER Consulting Engineers (India) Pvt. Ltd.
	b) Project	66 KV GIS system for 1 X 51 MW CCCPP for ONGC , Hazira
1.0	Location	ONGC Limited, Hazira
2.0	Elevation above mean sea level	RL 6.0 above, MSL
3.0	Nearest Railway Station	Surat, 20 KM
4.0	Nearest Airport	Surat, 10 KM
5.0	Nearest Harbour	Magdalla, 20 KM
6.0	Access Road	NH-8 (30 KM)
7.0	Atmospheric pressure at MSL	1.013 bar
8.0	Ambient Temperature	
	a) Max. average dry bulb temperature	45.6 oC
	b) Min. average dry bulb temperature	4.4 oC
	c) Design temperature for electrical equipment / device	50 oC
9.0	Relative Humidity	
	a) Max.	70%
	b) Min.	18%
	c) Average	64%
10.0	Seismic Zone	III (IS 1893)
11.0	Rainfall	
	a) Max. Intensity of rainfall in 24 hrs.	459.2 mm
	b) Period – Monsoon showers	June to September
	c) Average rainfall per annum	1203.5 mm
12.0	Wind data	
	Max. wind speed (as per IS:875) 20-61 kmph for 20 days in a year < 20 kmph for remaining period	62 kmph
	Most predominant wind direction	South -West
13.0	Land	
14.0	Tropicalisation	
	All equipment supplied against specification shall be given tropical and fungicidal treatment in view of the climatic conditions prevailing at site.	
	Tropical protection shall conform to BS: CP-1014-1965 "Protection of Electrical Power Equipment" against climatic conditions.	

Auxiliary Supply

Normal Voltage	Variation in Voltage	Frequency in Hz	Phase/Wire	Neutral Connection
415 Volts	± 10%	50 +3% to -5%	3 phase/ 4 wires	Solidly earthed
240 Volts	± 10%	50 +3% to -5%	1 phase/ 2 wires	One point earthed
110 Volts DC	± 10%	DC	1 phase/ 2 wires	Isolated 2 wire system

2. General electrical requirement as per Annexure A (Vol III, Section 3.1 of ONGC specification.(4 pages))

The discharge of pollution in water and air as well as noise levels shall meet with the stipulations of State Pollution Control Board as well as other Acts of the Government under the Ministry of Environment and Forestry. It is a pre-condition that irrespective of what is stated in statutory regulations or any other act or norms, the Specification stipulated environmental qualities standards are the minimum requirements and shall be fulfilled in all aspects.

For control room and offices, noise level shall not exceed 60 dB (A) near to the duct and at other places in the control room/offices noise levels shall not exceed 50 dB (A).

Equipment supplied and all work done including system design and detailed engineering shall also comply with the statutory requirements of the State/Central government and with the Indian Electricity Rules.

Unless otherwise specified, at least 10 % margin shall be considered in equipment sizing over and above the calculated load current/fault current/power requirements.

If not specified otherwise the electrical operational equipment must be designed to meet protection classes stated below.

- HT Switchgear (Indoor) - IP 4X
- LT Switchgear (Indoor) - IP 52
- Control panels (Indoor) - IP 42
- Relay panel - IP 42
- Motors (indoor) - IP 54
- Motors and other equipment located outdoor - IP 55
- Emergency DG (Indoor) - IP 23

Each individual enclosure accommodating electrical equipment which is liable to suffer from internal condensation due to atmospheric or load variations shall be fitted with heating

3. Standards and Codes of Practice

All equipment, systems and works covered under these specifications shall be in accordance with all the applicable statutes, regulations, codes and standard specified as well as all such standards, statutes, regulations and safety codes applicable in the locality where the equipment will be installed. Contractor may familiarize themselves with all such requirements.

Complete design including pressure parts, piping, valves and fittings shall meet or exceed all the latest requirements of the Indian Boiler Regulations (IBR), latest Indian Standards /ASME codes,

latest codes and standards as applicable. Any Indian/International standards shall be followed for any imported equipment. For plant layout aspects and area classification requirements OISD standards shall be followed.

The design, construction and testing of all equipment, facilities, components and systems shall be in accordance with relevant standards and codes issued by Bureau of Indian Standards (BIS) and/or reputed international standards and codes as on the date of Award of Contract. A non-exhaustive list of reputed international standards is given below:

- a) American National Standards Institute (ANSI)
- b) American Petroleum Institute (API)
- c) American Society of Mechanical Engineers (ASME)
- d) American Society of Testing and Materials (ASTM)
- e) American Water Works Association (AWWA)
- f) American Welding Society (AWS)
- g) British Standards (BS)
- h) Cooling Technology Institute (CTI)
- i) Deutsches Institut für Normung (DIN), Germany
- j) Gosstandart of Russia (GOST) standards
- k) Heat Exchange Institute (HEI), USA
- l) Hydraulic Institute Standards (HIS), USA
- m) International Electro-technical Commission (IEC)
- n) Institute of Electrical and Electronics Engineers (IEEE)
- o) International Organisation for Standardisation (ISO)
- p) Japanese Industrial Standards (JIS)
- q) National Electric Code (NEC), USA
- r) National Electrical Manufacturers Association (NEMA), USA
- s) Central Electricity Authority (Construction of Electrical Plants and Electric Lines) Regulations, Notification, 20th August 2010 and to those referred therein
- t) National Fire Protection Association (NFPA), USA
- u) Occupational Safety and Health Administration (OSHA)
- v) Tubular Exchanger Manufacturers Association (TEMA), USA
- w) VDE association for Electrical, Electronic and Information Technologies (VDE), Germany
- x) OISD

Other international Standards, equivalent or superior to the above Standards can also be adopted. However, In the event of any conflict between the requirements of the international standards or codes and the requirements of the BIS standards or codes, the latter shall govern unless specified

elsewhere in the specifications. Any Indian/International standards shall be followed for imported equipment.

The Plants and Electric Lines (within the plant) shall also be designed to comply with the requirements stipulated in.

- a) Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006.
- b) Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007.
- c) Central Electricity Authority (Measures relating to Safety and Electricity Supply), Regulations as and when these are notified by the Authority.
- d) Central Electricity Authority (Safety Requirements for Construction, Operation and Maintenance of Electrical Plants and Electric Lines) Regulations as and when these are notified by the Authority.
- e) Central Electricity Authority (Grid Standards) Regulations as and when these are notified by the Authority.
- f) Central Electricity Authority (Construction of Electrical Plants and Electric Lines) Regulations, Notification, 20th August 2010 and to those referred therein
- g) Indian Electricity Grid Code issued by Central Electricity Regulatory Commission (CERC) and
- h) Applicable State Grid Code issued by appropriate Regulatory Commission.

All material and equipment supplied and all work carried out as well as calculation sheets, drawings, quality and class of equipment, methods of inspection, constructional peculiarities of equipment and parts and acceptances of partial plants, as far as these are beyond the special requirements of the specifications, shall comply in every respect with the technical codes of the above listed codes and Standards.

It shall be the responsibility of the Contractor to take all approvals required and get the HRSG registered under the IBR. In all other cases where IBR does not govern, IS/ASME, Japanese, American, British, German or other international standards established to be equivalent or superior to IS/ASME shall be acceptable with the approval of the Owner/Owner's representative at the time of detailed engineering.

Where there are no standards or regulations, or the standard is not sufficient to meet the need of design and supply, for such items relating to the power plant, the Contractor shall carry out the design, manufacture, supply and installation on the basis of good engineering practice.

During the period of Contract execution, if any standards change, the Contractor shall be responsible to notify the Owner/Owner's representative and provide the basis for the prospect that it would not cause the lowering of quality, performance and service life of the power plant due to alteration of the standard and the latest standards shall be followed by the Contractor.

Further requirements about applicable standards and codes are specified in the detailed technical specifications.

4. SPECIAL TOOLS, TACKLES AND EQUIPMENT

One set of special tools and tackles required unit for the operation, maintenance, inspection and repair of the individual main equipment and auxiliary equipment shall be supplied by the Contractors in sufficient quantity to equip the shift personnel, maintenance personnel and workshop craftsman for commissioning, testing, calibration, modification and maintenance of the unit, List of such special tools, tackles and equipment shall be submitted in the EPC bid.

Special tools and tackles excludes conventional ones and those locally available normally (not those requiring a drawing and considered as those made to order).

The special tools and equipment for maintenance and repair shall be delivered by the Contractor in lockable steel boxes and they shall be marked in an approved manner for identification purposes and a corresponding tool chart shall be supplied with the steel boxes.

The following tools and appliances shall be supplied under this Contract for use by the Owner/Owner's representative:

- two sets of special tools and gauges required for the maintenance of the Plant
- one set of special lifting and handling tackles / appliances required for the maintenance of the Plant.

The tools, tackles and appliances supplied in general, shall not be used for erection purposes by the Contractor and shall be handed over in brand new condition. Damaged tools, tackles, and appliances shall be replaced before handing over.

The exception to this is the special lifting gear which may be used provided that when it is handed over to the Owner/Owner's representative it has not been subjected to more than normal wear and is still fully suitable for its intended use.

Each set of tools, gauges and appliances under category (a) above shall be suitably arranged in fitted boxes of mild steel construction, the number of boxes being determined in relation to the layout of the plant and equipment in question.

If the weight of any box and its contents should be such that it cannot conveniently be carried, it shall be supported on steerable rubber-tyred wheels.

Each cabinet and box shall be painted, fitted with a lock and clearly marked in white letters with the name of the item of equipment for which the tools and appliances contained are intended.

Suitable storage racks shall be provided for all portable lifting tackle supplied under this contract. Suitable lifting lugs, ears or ring bolts, or tapped holes for lifting rings shall be provided on all equipment items where the weight exceeds 15 kg.

All lifting tackle shall be stamped with a unique identification number and safe working load. A test certificate from an approved Authority shall be supplied for each item of lifting tackle.

The Contractor shall provide a schedule of all lifting tackle and tools and appliances being supplied, for the approval of the Owner/Owner's representative.

The Contractor shall provide all runway beams, trolleys, lifting blocks, special slings necessary for the safe and efficient handling and maintenance of the works. Particular attention shall be paid to handling of equipment located at higher elevations safety valves

The tools and appliances with the appropriate storage racks, cabinets and boxes shall be handed over to the Owner/Owner's representative at the time of Taking Over of the complete Plant.

Since the Contract includes site erection, any special tools or appliances required solely for erection shall be provided by the Contractor for his own use and shall remain the property of the Contractor. Control and Instrumentation: Software with associated hardware required to access instruments or control systems to be provided.

5. CLEANING, PROTECTIVE COATING AND PAINTING

Refer Annexure-D (Vol III /Section 2/ Sub Section 2.15 Surface Preparation and Painting.)

6. INSPECTION, TESTING AND INSPECTION CERTIFICATE

Inspection testing shall be done as per customer specification as per Annexure – B.

7. DOCUMENTATION

Format of Documentation

All engineering documents and drawings shall be of international "A" series sizes, that is, A0, A1, A2, A3 and A4.

One set of CD containing all the drawings in Auto CAD (for final as built drawings) shall also be supplied in addition to hard copies.

Soft copy of all other documents shall be supplied in a CD in PDF or editable format. For review purpose pdf or editable version shall be considered.

Grouped documents shall be provided by size A4, with the inclusion of bigger size drawings which, however, have to be folded as Size A4.

Numbering and Identification of Documents

All the drawings shall be identified through a common way of numbering in accordance with the requirement of contracting. The numbering system of drawings and documents proposed by the Contractor shall be in compliance with the plant identification system and to be agreed with the Owner/Owner's representative. Apart from this, some drawings may also be numbered in the way which the contractor or subcontractors are used to do. But, there shall be a common title Block on all published drawings which include the following contents:

- Owner
- Owner's Engineer
- Project
- Contractor
- System
- Drawing No.
- Sheet No
- Revision No.

The measuring units and dimensions marked on the project engineering drawings shall be of SI system conforming to ISO 1000.

English words shall be used as descriptions on drawings.

In case dimensions are not marked in conformity with the scale of drawings and any dimension on the drawing does not conform to those dimensions and sizes measured through certain scale, the actual marked dimensions shall be applicable.

For revision of drawings, the revised part shall be clearly and definitely shown on the drawing.

For revision of documents which have been grouped together, a brief description shall be a perpendicular line with the margin of the revised copy closely following it.

Provision for Documents

Generally, copies of drawings or documents containing trade secret and drawings with patented nature need not be provided.

However, to know whether the Contractor has performed its obligations, the Owner/Owner's representative has the right to examine those drawings within the Contractor's working scope. The Contractor shall meet the Owner/Owner's representative's reasonable demands to files and do the following to satisfy the Owner/Owner's representative:

- Contractor will work according to the requirements specified in the contract.
- Contractor's working has been arranged properly and developed according to the plan.
- The quality control system is reliable.
- After receiving all documents necessary for power plant operation and maintenance, Contractor shall supply equipment and systems.
- Having received all necessary documents for Contractor to perform its legal obligations or other relevant responsibilities.

Distribution of documents

The source, distribution, no. of copies shall be as per the following document distribution schedule. Annexure –C.

Title block for the Project:

a) Customer	ONGC
b) Consultant:	FICHTNER Consulting Engineers (India) Pvt. Ltd.
c) Project:	66 KV GIS system for 1 X 51 MW CCCPP for ONGC , Hazira
d) Main Contractor	BHEL

DOCUMENTS TO BE SUBMITTED ALONGWITH OFFER

- 1) Drawings in 2D and 3D format.
- 2) Guaranteed Technical Particulars
- 3) Type Test Reports
- 4) Manufacturing Quality Plan

DOCUMENTATION SCHEDULE AT CONTRACT STAGE

No. of Copies	A: For Approval
5	Copies of GA drawings (2d and 3D) with projects details, dimension, equipment weight, fixing details, tolerances and terminal details etc.
5	Copies of type test reports
5	Copies of shipping list detailing the description & quantities of all items being dispatched separately, with shipping weights, number of cases and dimensions.
5	Copies of manufacturing and field quality plan.

5	Copies of installation, operation & Maintenance manual.
	B : After Approval and For Information/Distribution.
12	Copies of All drawings
12	Bound sets containing all drawings/manuals, type and routine test reports etc. along with sub-vendor's test reports for all bought out assemblies/components/parts including Internal wiring diagrams and exploded diagrams of assemblies/ parts, shall be furnished.
12	Copies of Installation, Operation & Maintenance manual.
	C: On Completion of Entire works
12	Bound sets of Installation, Operation & Maintenance manual and all as built drawings
12	Set of Computer CD-ROMs (with unbreakable CD Covers) containing all as-built drawings in Auto-Cad version 2008 or later with 2D and 3D drawings, Instruction Manual and GTP.

8. Package, storage

All materials and equipment should be packaged according to the typical environmental conditions during storage. In case of severe conditions, these materials and equipment should be packaged carefully by taking a full and appropriate preventive measure to protect from any damage or wear.

The Contractor and his appointed Subcontractor for installation should guarantee jointly that a good supplementary storage will be carried out within the equipment site controlled by them. Three classes for storehouse are described as follows:

Storehouse class A items: Special measures are taken to protect the stored goods and the temperature, humidity are controlled within a specified range.

Storehouse class B items: Goods are stored with temperature uncontrolled.

Storehouse class C items: It is an outdoor storage with a drainage system on the ground.

For storehouses of class A and B they should be fireproof, heat resisting, waterproof and well ventilated. They should not be wet and should be provided with good drainage system and preferably with a brick laying or concrete ground. For storehouses of class C, they should not be wet and should be well drained, preferably with a brick laying or crushed stone ground, should be protected from rainfall, salt corrosion, ash and other adverse conditions with a temporary cover or tent if possible

Component surfaces should not be contacted directly with the ground or ground laying material. There should be a layer of oilcloth or wax or other similar materials between the machine surface and ground surface.

All components shall be inspected for their painting, storing, sealing and any damage or wear should be repaired during acceptance and storage periodically. The inspection interval is determined by the component function, applied protection measure and storehouse class.

Many components are provided with a drying agent or sealed in a coverage (polyethylene or insulating cover) containing drying agent. The drying condition shall be inspected during storage in an interval of every 4 weeks.

9. SPECIAL TOOLS, TACKLES AND EQUIPMENT

One set of special tools and tackles required unit for the operation, maintenance, inspection and repair of the individual main equipment and auxiliary equipment shall be supplied by the Contractors in sufficient quantity to equip the shift personnel, maintenance personnel and workshop craftsman for commissioning, testing, calibration, modification and maintenance of the unit, List of such special tools, tackles and equipment shall be submitted in the EPC bid.

Special tools and tackles excludes conventional ones and those locally available normally (not those requiring a drawing and considered as those made to order).

The special tools and equipment for maintenance and repair shall be delivered by the Contractor in lockable steel boxes and they shall be marked in an approved manner for identification purposes and a corresponding tool chart shall be supplied with the steel boxes.

The following tools and appliances shall be supplied under this Contract for use by the Owner/Owner's representative:

- Two sets of special tools and gauges required for the maintenance of the Plant
- One set of special lifting and handling tackles / appliances required for the maintenance of the Plant.

The tools, tackles and appliances supplied in general, shall not be used for erection purposes by the Contractor and shall be handed over in brand new condition. Damaged tools, tackles, and appliances shall be replaced before handing over.

The exception to this is the special lifting gear which may be used provided that when it is handed over to the Owner/Owner's representative it has not been subjected to more than normal wear and is still fully suitable for its intended use.

Each set of tools, gauges and appliances under category (a) above shall be suitably arranged in fitted boxes of mild steel construction, the number of boxes being determined in relation to the layout of the plant and equipment in question.

If the weight of any box and its contents should be such that it cannot conveniently be carried, it shall be supported on steerable rubber-tyred wheels.

Each cabinet and box shall be painted, fitted with a lock and clearly marked in white letters with the name of the item of equipment for which the tools and appliances contained are intended.

Suitable storage racks shall be provided for all portable lifting tackle supplied under this contract. Suitable lifting lugs, ears or ring bolts, or tapped holes for lifting rings shall be provided on all equipment items where the weight exceeds 15 kg.

All lifting tackle shall be stamped with a unique identification number and safe working load. A test certificate from an approved Authority shall be supplied for each item of lifting tackle.

The Contractor shall provide a schedule of all lifting tackle and tools and appliances being supplied, for the approval of the Owner/Owner's representative.

The Contractor shall provide all runway beams, trolleys, lifting blocks, special slings necessary for the safe and efficient handling and maintenance of the works. Particular attention shall be paid to handling of equipment located at higher elevations safety valves.

The tools and appliances with the appropriate storage racks, cabinets and boxes shall be handed over to the Owner/Owner's representative at the time of Taking Over of the complete Plant.

Since the Contract includes site erection, any special tools or appliances required solely for erection shall be provided by the Contractor for his own use and shall remain the property of the Contractor.

Control and Instrumentation: Software with associated hardware required to access instruments or control systems to be provided.

10. Painting, Insulation, Anti-dewing

Anti-corrosive coatings and painting shall be carried out as a pre-treatment to all equipment and parts. The paint system used should coordinate with the painted objects and surrounding conditions of project.

In multi-layer painting system, different painting layers should be selected to make the painting coordinate. If multi-layer painting system is used, various painting layers should have distinct colours so that the later layer can be distinguished from the former one.

After the equipment or apparatus finished preliminary or full painting, it can be supplied to field. After the installation is finished, ground coat must be painted.

Entire painting procedure should be supplied in order to repair the injures of painting coat after the equipment is delivered to field.

Colour strip indication system should be used for pipes. These strips should be painted on the joint of pipes, entrance, valves of pipe. This pipe without outside protection layer should be marked by some colour in whole length.

The principal colour of field equipment should be determined by Owner/Owner's representative and Contractor during execution stage. For Electrical equipment, paint shade shall be as mentioned in the equipment Specification.

Further requirements with regard to painting, insulation, and anti-dewing are specified in the relevant sections in the detailed technical specifications. The specified requirements shall be applied to the whole equipment and facilities of the Contract.

Insulation specification for MPP supplied equipment shall be as mentioned in detailed technical specification.

Language to be used

English shall be used as the general Contract language English translations shall be provided for any code and standards not in English language.

Name plates of equipment and instrument scale shall be marked in English.

Documents for training shall be provided in English.

Danger signs / Exit signs shall be in English, Hindi and Gujarati.

11. CONSUMABLES

12.1.0 Lubricants and greases

All lubricants proposed for the Plant operation shall be suitable for all operating and environmental conditions that will be met on site.

All oils and greases shall where possible be readily available in India.

The number of oils and greases shall be kept to a minimum to the extent feasible. For each type and grade of lubricant recommended the contractor shall list at least three equivalent lubricants manufactured by alternative companies. This will be in line with that suggested by OEM and outcome will be informed to the Owner/Owner's representative.

In case of imported oils, lubricants and other consumables, the contractor shall indicate the indigenous equivalents to enable the Owner/Owner's representative to arrange subsequent fills. Preference should be given to indigenous oils and lubricants during first filling itself. Short shelf life items if any may be supplied in a phased manner keeping in view of their actual use.

The Contractor shall supply the first fill lubricants and greases, and also shall provide at the Completion Certificate sufficient lubricants and greases necessary for the efficient operation and maintenance of the Plant at full load 24 hours per day for a period as mentioned in the relevant portion of Commercial Specification.

12.2.0 Chemicals and other consumables

Contract includes the supply (by the Contractor) of all chemicals, reagents, resins, and other consumables required for testing, commissioning and setting to work of each section of the Works. The Contractor shall provide all chemicals and other consumables required for the efficient operation and maintenance of the plant at full load 24 hours per day for a period as mentioned in the relevant portion of Commercial Specification.

The Contractor shall prepare a list of these consumables giving quantities necessary for each section of the works and the recommended suppliers.

The Contractor shall deliver to site sufficient quantities of consumables in his supply to allow for 6 months running of the Works prior to the issue of the Completion Certificate. The delivery of the remainder of the consumables shall be programmed to suit the operational requirements and space availability within the various stores.

12. Plant and Equipment Identification

The contractor shall follow identification system for the whole plant equipment, instruments, facilities and systems as per the Annexure-4 **Guide for Coding Equipment, Documents & Drawings MPP generated drawings, identification system shall be based on MPP standard.**

Labelling

Name plates which are to be firmly fixed on all the equipment, instruments, buildings and structures shall be provided. For equipment of small size, these are to be fixed on the piping or structure adjacent to the equipment. The contents of nameplate are to include the designation and principal parameters of the equipment.

The nameplate within the field shall be made of a high temperature - resistant metallic sheets, with designation permanently engraved on them. Indoor installed equipment (e.g., panels, cabinets, switchgear) shall also be labelled by appropriate name plate.

The form, size, base colour and colour of contents of the name plates and prompting plates will be agreed between the Contractor and the Owner/Owner's representative. It shall be possible for these to be readily seen by the operator. The designation of warning tags shall be different from that of other tags. All buried pipes and cables routes shall be identified with permanent marker.

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VOLUME - III

SUB-SECTION - 3.1

GENERAL ELECTRICAL REQUIREMENT

1.0.0 INTENT OF SPECIFICATION

- 1.1.0 This specification covers the design, manufacture, assembly, testing at manufacturer's works, packing, transportation to site including transit insurance, unloading, erection, testing & commissioning of Electrical Equipment complete with all accessories for efficient and trouble-free operation of combined cycle captive power project.
- 1.2.0 It is not the intent to specify completely herein all details of the equipment; nevertheless, the equipment shall be complete and operative in all respects and shall conform to the highest standard of engineering, design and workmanship.

2.0.0 ELECTRICAL SYSTEM DESCRIPTION

- 2.1.0 The proposed Power plant consisting of one Gas Turbine Generator (GTG) & one Steam Turbine Generator (STG). GTG shall be connected to the new 66kV indoor type Gas Insulated Switchgear (GIS) through a Step-up Generator Transformer using phase segregated bus duct. STG shall be connected to the 66kV Outdoor type Gas insulated switchgear (GIS) through a Step-up Generator Transformer using phase segregated bus duct. Power shall be evacuated from 66kV GIS to the grid through the 66kV outgoing line feeders. For commissioning of plant the start-up power shall be drawn from grid to the 66kV GIS.
- 2.2.0 Auxiliary Power supply is envisaged at 11kV & 415V level. Two numbers of Station Transformers are provided for supplying unit loads.
- 2.3.0 Required numbers of unit and station ~~service transformer~~ (11/0.415 kV) are provided for supplying 415V loads. Electrical Auxiliary power ~~distribution arrangement~~ & Power Evacuation Arrangement is shown in the enclosed "Key Single Line diagram" (Org. No. 00-5111168-E-201, 2 sheets).
- 2.4.0 One number Black start cum Emergency DG set shall be considered for starting of Gas turbine and safe shutdown of units. During ~~blackout condition~~ Diesel Generator (DG) set shall feed essential loads, same Diesel generator set shall feed ~~unit~~ emergency loads for safe shut down of Units.
- 2.5.0 To provide uninterrupted power supply to DCS and other Control Panels, a dedicated 110 V AC UPS system shall be provided. To feed essential loads, such as the emergency oil pumps, Control Supply to Switchgears / Panels, Emergency DC lighting etc, 110 V DC supply backed by DC Batteries shall be provided. DC system shall include 66kV GIS control supply requirements also.
- 2.6.0 If 125V DC system is required by the Gas Turbine supplier as per manufacturer's standard the same shall also be provided.
- 2.7.0 Plant communication system shall be provided with Public address system & telephone system.
- 2.8.0 For all electrical MV/LV/Control panels, Local control panels and Junction boxes, Transformers, etc shall be painted with RAL 7032

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3.0.0 ELECTRICAL SYSTEM DESIGN

- 3.1.0 The plant shall be designed to operate in islanding mode of operation on tripping of all the grid incoming lines and Steam Turbine generator, so that the Gas Turbine generator unit can be made running with the available plant load under such condition.
- 3.2.0 The design, manufacture, assembly, shop testing, erection, testing & commissioning as well as performance of the equipment shall conform to the latest edition of relevant IS / IEC specifications.
- 3.3.0 Before starting manufacture of any equipment the Contractor shall have to take approval of relevant drawings and data from the Owner/Owner's representative.
- 3.4.0 All equipment supplied and all work carried out including design and detailed engineering shall comply with the statutory requirements local Government as well as Central Government and with the Indian Electricity Rules. The accuracy class of meters, CTs, PTs (inside GIS) for energy accountability shall be as per latest GETCO regulations.
- 3.5.0 Unless otherwise specified in the respective section, Electrical design ambient for all equipment sizing shall be considered as 50 Deg C dry bulb temperature and 95% RH. All the equipment are required to operate in a highly corrosive environment and highly humid (at costal area) atmosphere.
- 3.6.0 Unless otherwise specified, at least 20 % margin shall be considered in equipment sizing over and above the calculated load current/fault current/power requirements.
- 3.7.0 Makes of all Electrical equipment are subject to prior approval by the purchaser. Similar equipment and components shall be of same make. Equipment of same type and rating shall be interchangeable.
- 3.8.0 The 415V PCC & MCC panels shall be of minimum FORM 3B type of construction.
- 3.9.0 In respect to the above LV circuit breaker selection, following should be considered as per IEC:-

Utilisation Category	Application
Category A	Circuit-breakers with no assigned short-time rating (e.g Current limiting ACBs and MCCBs) cannot be used if coordination is required with downstream switchboard feeders. Applicable for the outgoing feeders
Category B	Circuit-breakers with assigned short-time rating (e.g ACBs and some Supplier's larger rated MCCBs) that shall be used if coordination is required with downstream switchboard / MCCs. Applicable for the incomer and outgoing feeders.

Outgoing feeders not requiring any coordination for example motor feeders Category "A" MCCB can be considered.

- 3.10.0 In switchgear for Motor feeders rated 15kW & above an ammeter & transducer shall be provided. All transducers will be of dual output type.
- 3.11.0 All LT motors rated 90 kW & above shall be controlled through Air Circuit Breakers. LT motors rated below 90 kW shall be controlled by fused contactor. In addition to the above ELCB shall be provided for all 415V motor feeder. Each feeder shall also provided with O/L relay and SPPR relay.
- 3.12.0 For the motor feeders, the essential auxiliaries shall have contactors with delayed drop out feature adjustable up to 3 sec and necessary auto reset facility and the relay should be of digital type. The

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list of motors shall not be limited to BFP, AOP, JOP, lube oil pump, compressors, barring gear and any other drive recommended by GTG,STG & HRSG vendor.

3.13.0 The power cables upto and including 10 sq.mm should be copper conductor and above 10 sq.mm Aluminium conductor may be used. For CT circuits minimum cable size shall be 4sq.mm copper. Minimum size of control cables shall be 2.5sqmm. ~~20% spare cores shall be provided in all control cables.~~ The maximum no. of cores shall be limited to 27.

3.14.0 The equipment supplied shall meet the requirement of state electricity and Indian grid code.

3.15.0 The Substation Automation System (SAS) shall have provision for interfacing with remote PLDC (Regional Load Dispatch Centre) through suitable gateways with adequate number of ports along with modems at substation level.

3.16.0 Voltage Levels shall be as follows:

- Power Evacuation : 66 kV (+10%), 3 phase, 3 wire 50 Hz, effectively earthed.
- Generation Voltage : Manufacturer's standard Voltage, 3 phase, 50 Hz
- Plant HT Auxiliary Supply : 11000V (+10%), 3-phase, 3W, 50 Hz, earthed through resistance.
- Plant LT Auxiliary Supply : 415V (+10%), 3 phase, 4 wire, solidly earthed.
- Plant LT Emergency Supply : 415V (+10%), 3 phase, 4 wire ungrounded.
- Plant DC Supply : 110V (+10% to -15%), DC 2 wire unearthed.
- Plant UPS Supply : 110V (+10%), 1 phase, 2 wires 50 Hz, A.C.
- Transducers : 110V DC (For LT boards 230V AC)
- Metering : 110V AC PT Voltage
- Control & protection : 110V, DC 2 wire unearthed
- Panel lighting and space heaters : 240V, 1-phase, 2wires 50 Hz, A.C. with one point earthed.
- Control Supply for Breaker feeders : 110V, DC 2 wire unearthed
- Control Supply for LV DOL modules : 110V, 1 phase, 2 wires
- Permissible Frequency variation for generator : +3% to - 5%
- Permissible Frequency variation for auxiliaries : +5% to - 5%
- Voltage level for AC Motors below 0.2 kW : 240 V, Single phase, 50 Hz, with DOL start.
- Voltage level for AC Motors from 0.2kW up to and including 160 kW : 415 V, 3 phase, 50 Hz, with DOL start.
- Voltage level for A.C Motors above 160 kW : 11000V, 3 phase, 50 Hz, with DOL start.

3.17.0 Design short circuit levels shall be at least the following and has to be supported by calculation:

- Three phase symmetrical short circuit ratings of 66kV System : 40 kA for 3 sec
- Three phase symmetrical short circuit ratings of 11kV System : 44 kA for 3 sec
- Earth fault current for 11kV System : 100A.
- Three phase symmetrical short circuit ratings of 415V System : 50 kA for 1sec
- Short circuit ratings of 110V DC System : 20 kA for 1 sec (min)

3.18.0 Insulation level at various voltages shall be as follows:

66kV System

- One minute Power Frequency withstand voltage : 140 kV (rms)
- Switching Impulse withstand Voltage : 325 kV (peak)

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11kV System

One minute Power Frequency withstand voltage : 28 kV (rms)
1.2/50 Micro sec, impulse withstand voltage : 75 kV (peak)

415 V System

One minute Power Frequency withstand voltage : 3 kV (rms)

3.19.0 Sizing criteria for auxiliary transformers

Design Criteria for Auxiliary Transformer and Generator Transformer

i. The Contractor shall size the auxiliary transformer as per sizing criteria furnished below:

Min. Rating of each Auxiliary transformer (in kVA at p.f.0.8) = $1.2 \times (\text{Sum of total connected load} + \text{Max of (sum of 20\% of total standby loads or the largest standby load) + max of (sum of 50\% total intermittent loads or the largest intermittent load)})$

✓ The auxiliary transformers shall be sized for 2x100%

4.0.0 QUALITY ASSURANCE, TESTING & INSPECTION

4.1.0 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, tested, and commissioned at all the stages, as per approved Quality Plan.


4.2.0 All tests shall be conducted as per relevant IS/IEC/IEEE standards and shall be performed in the presence of purchaser's representative, if so desired by the purchaser. The Bidder shall give at least 15 days advance notice of the date when the tests are to be carried out.

4.3.0 Equipment offered shall be of type tested and proven type. Type test certificates for test conducted earlier on similar rating shall be furnished. Type testing shall be conducted without any cost implication to the purchaser if type testing is not already carried out for any equipment supplied. For the various bought out items test certificates from equipment manufacturer shall be furnished. Routine tests shall be carried out for all the equipment as per applicable standards whether specifically mentioned or not. Specific type tests are to be carried out as specified in individual equipment specifications.

4.4.0 Copies of certified reports of all tests carried out at the works shall be furnished. The equipment shall be dispatched from works, only after receipt of Purchaser's written approval of the test reports.

The charges for carrying out all routine tests shall be deemed to be included in the Bid price. The charge of carrying out each type test/ special test if any shall be given separately in "Unit Price Schedule".

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7.17.0 List of Approved Sub-vendors

Refer Volume IV/Annexure-1/ Section 8.

With full information substantiating the technical acceptability of the proposed change. The Owner/Owner's representative's decision shall be final. Concessions granted shall not absolve the Contractor from any of his responsibilities under the Contract.

8.0.0 QUALITY ASSURANCE, SHOP INSPECTION AND TESTING**8.1.0 General**

This section contains general requirements for inspection of material, parts, equipment and workmanship of the plant during manufacture, assembling to demonstrate compliance with specification, codes and standards to ensure overall reliability of plant operation and performance.

The Owner/Owner's representative and/or authorised Representatives shall, at any time, be allowed free and ready access to the Contractor's premises and those of his suppliers as well as to the site installation and the Contractor has to make the plant items available for the purpose of inspecting the specified equipment components and obtaining information as to the progress of the work. Failure on the part of the Owner/Owner's representative, at this or any other time, to discover or reject materials or work which do not meet specified requirements shall not be deemed an acceptance thereof nor a waiver of defects therein.


The approval of the Owner/Owner's representative shall not prejudice the right to reject equipment if it does not give complete satisfaction in service.

8.2.0 Scope

All materials, components and equipments covered under this specification shall be tested at all stages of procurement, manufacturing, erection, commissioning as per a comprehensive quality assurance programme. The requirements of minimum quality plans to be followed by the Bidder in respect of various equipment are specified in detailed technical specification. The Bidder shall draw his own quality plans in line with these requirements and his standard practices and implement such programme after approval by the Owner/Owner's representative. The Owner/Owner's representative shall appoint a Third party inspection (TPI) agency for bought out items/outside inspection. The Owner/Owner's representative will carry out on-site supervision and inspection.

Manufacturing quality plan shall detail out, for all the components and equipments, various tests/inspection to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by contractor's quality control organization, the relevant reference document and standards, acceptance norms and inspection documents raised. during all stages of material procurement, manufacture, assembly and final testing/performance testing.

The Contractor has primary responsibility for ensuring the quality of items of equipment supplied under the contract and remains accountable when manufacture or erection is subcontracted. It is therefore a requirement of the specification that work is only subcontracted to companies with effective quality control organization and that the Contractor monitors the performance of these by the attendance at tests of experienced inspectors employed by the Contractor. The Contractor shall, at the appropriate time, prove that his

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material and / or equipment comply with all the requirements of this Section, such proof being the successful completion of tests and inspections. Routine test and type test certificates shall be submitted for each item of equipment, wherever applicable.

All materials, components and equipment supplied under the contract shall be subject to inspection by the Owner/Owner's representative, his representative, Inspectors of Boilers (India) or his authorized Agency or any other Inspector of the Government, should they so require during manufacture, erection and after completion. The necessary inspection charges of the authorized agency of Inspection of Boilers (India) shall be borne by the contractor. The inspection and tests shall include but shall not be limited to the requirements of this section of the specification. Further requirements to be applied are specified in the detailed specification.

The Bidder along with quality plan, shall also furnish copies of the reference documents/plant standards/acceptance norms/test and inspection procedure referred by him in quality plans. These quality plans and reference documents/standards will be subject to Owner/ Owner's representative's approval and will form a part of the contract. In these approved quality plans, Owner/Owner's representative shall identify customer hold points (CHP), indicating tests/checks which shall be carried out in presence of the Owner/Owner's representative's or authorized representative and beyond which work will not proceed without consent of Owner/Owner's representative's in writing.

No materials/equipment shall be dispatched from the manufacturer's works before the same is either accepted subsequent to pre-dispatch final inspection including verification of records of all previous tests/inspections by Owner/Owner's representative or such pre-dispatch final inspection is waived by the Owner/Owner's representative and dispatch is authorized after review of test reports.

All materials used or supplied shall be accompanied by valid and approved material certificates and test and inspection reports duly approved by the Owner/Owner's representative. These certificates and reports shall indicate the acceptable identification number of the material they proposed to certify. The material certified shall also have the identification details stamped on it.


All material used for equipment construction including castings and forgings shall be of tested quality as per relevant codes/standards. Details of results of the test conducted to determine the mechanical properties, chemical analysis and details of heat treatment procedures 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 as specified in detailed specification.

All welding shall be carried out as per welding procedure drawn and qualified in accordance with requirements of ASME Section IX. Welding procedures shall be submitted to the Owner/Owner's representative for approval prior to carrying out qualification test in the presence of I/Owner/Owner's representative

All welders/welding operators employed on any part of the contract either in the Supplier's works or at site or elsewhere shall be qualified as per ASME Section-IX.

Test results of qualification tests and specimen testing shall be furnished to the Owner /Owner's representative for approval. However, wherever required by the Owner/ Owner's representative, tests shall be conducted in presence of Owner/Owner's representative

All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.

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All the sub-vendors proposed by the Bidder for procurement of major bought out items including castings, forgings, pumps, heat exchangers, semi finished and finished components/equipment-(list of which shall be drawn up by the Bidder along with his offer and finalized with the Owner/Owner's representative) shall be subject to Owner/ Owner's representative's approval.

The type and extent of inspection of items shall be in accordance with the relevant International/Indian Standards/Indian Boiler Regulations and other standards approved by the Owner/Owner's representative, supplemented or amended by the requirements of this section of the specification or as specified elsewhere in the Specification.

8.3.0 Inspection Program and Test Notifications

Before manufacturing commences and not later than 45 days after award of contract, the Contractor shall submit an outline of his proposed inspection program, which shall include all major stages during manufacturing. The inspection and test program shall include for the various items the designation No., name of equipment, part of equipment, the kind of test, test standard, company which carries out the test, place, date and witnesses by the Contractor, third party or Owner/Owner's representative's .

The Owner/Owner's representative will return a copy of the Contractor's proposed inspection program indicating those inspection stages for which notification is required. Notification shall be by Fax or email in a format to be agreed and shall be sent at least 20 days prior to the intended test in accordance with 'Conditions of Contract'. If the Owner/Owner's representative intends to be represented at the test he will provide at least 24 hours' notice and if his representative does not attend on the notified date, the test may proceed unless an alternative date has been requested by the Owner/Owner's representative.

8.4.0 Test Certificate Documentation

The results of all tests shall be certified by the manufacturer, Contractor or independent agency as appropriate.


Document files containing material certificates, welding procedures, test report shall be compiled for each item of plant and shall be suitably identified (including equipment classification reference) and bound.

Three copies of each document file containing inspection reports and certificates of site erection testing activities of a particular item of plant or system shall be supplied to the Owner/Owner's representative prior to commissioning.

Copies of the performance and acceptance test reports shall be prepared and distributed as specified in Clause 'Performance and acceptance test data and reports' of this Section. All documentation as required by IBR shall also be prepared and submitted.

8.5.0 Certification of Equipment by Owner/Owner's representative's

The Personal and travelling costs in connection with the Owner/Owner's representative's inspection and witnessing of tests of equipment, components and material manufactured in India and abroad will be borne by the Owner/Owner's representative.

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8.6.0 Codes and Standards

8.6.1 General

The type and extent of inspection shall generally be in accordance with that specified in the standard used for design and construction of the item of equipment supplemented or amended by the requirements of this section of the specification. The Contractor should provide the relevant codes and standard to the Owner/Owner's representative.

8.6.2 Reference to Codes and Standards

Reference to special codes and standards, where designated either directly or as "relevant", is intended to provide a measure of performance, safety, in-shop and on-site testing, and methods of construction and/or installation which must be equalled or exceeded in order to be considered acceptable for use under this specification. If more than a single degree of quality or accuracy is permitted within the scope of particular code or standard, the highest quality shall be applicable and the degree of accuracy commensurate with the intended function shall be selected, but with the understanding that the final decision will be made by the Owner/Owner's representative.

In all instances, the finally accepted applicable code or standard shall be the version last published.

8.6.3 Alternative Standards

Where no appropriate standard is available, tests shall be conducted in accordance with the manufacturer's standard practice, subject to the approval of the Owner/Owner's representative.

In such cases the Contractor shall submit to the Owner/Owner's representative, complete data and a suggested procedure for the testing to be performed. Commencement of manufacture before receipt of the Owner/Owner's representative's approval shall be at the Contractor's risk.

If the proposed procedures are accepted, the Contractor shall provide the Owner/Owner's representative with four additional copies in English before any test is performed.

8.6.4 Derating Standards

The Contractor's attention is drawn to the climatic conditions in the site area. Derating factors shall apply in accordance with the relevant and approved standards if not specified in the contract documents.


8.7.0 Services prior to and During Inspection and Testing

In accordance with and in addition to specified standards the Contractor shall submit procedures for material testing, manufacture, quality control and performance testing as they apply from the procurement phase of raw materials to the finished product. Manufacture commenced before receipt of the Owner/Owner's representative's approval of material specifications and testing procedures shall be at the Contractor's risk.

No inspection shall be valid unless the Contractor and manufacturer are in possession of relevant approved drawings and procedures for the item to be tested. The Contractor on

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16.4.1 Document Distribution Schedule - After Placement of Order

Sl. No.	Document	Total	Distribution		Owner's representative
			Copies		
			HQ	SITE	
1.	PERT Network, work schedules, Bar charts, Layout drawings	10	-	5	5
2.	Data, drawings, documents, write-ups, calculation - Preliminary - Revised	10 10	- -	5 5	5 5
3.	Approved drawings and documents.	10	-	5	5
4.	Instruction manuals for erection and O&M	10	-	8	2
5.	As built drawings including O & M manual - Hard Copy - Soft Copy	10	-	8	2

	ii).....	%	
4.	OUTER STRANDS AFTER STRANDING		
4.1	Number of outer layers	Nos.	
4.2	Number of strands a) 1 st Layer from core b) 2 nd Layer from core c) 3 rd Layer from core	Nos. Nos. Nos.	
4.2	Diameter of strands a)Nominal b) Maximum c)Minimum	mm mm mm	
4.3	Minimum Breaking load of strand a)Before stranding b) After stranding	kN kN	
4.4	Resistance of 1m length of strand at 20 deg. C	Ohm	
4.5	Final Modulus of elasticity	Kg/sq. mm	
4.6	Final Coefficient of linear expansion	Per ° C	
5	INNER CORE STRANDS/ INNER CORE AFTER STRANDING		
5.1	Number of layers in inner core (excluding central wire)		
5.2	Number of strands a) 1 st Layer from centre (excluding central wire) b) 2 nd Layer from centre c) 3 rd Layer from centre	Nos. Nos. Nos.	
5.3	Diameter a)Nominal b) Maximum c)Minimum	mm mm mm	
5.3	Minimum Breaking load of strand/Core a)Before stranding b) After stranding	kN kN	
5.4	Resistance of 1m length of strand at 20 deg. C	Ohm	
5.5	Final Modulus of elasticity	Kg/sq. mm	
5.6	Final coefficient of linear expansion	Per ° C	
5.7	Aluminum cladding of INVAR core (if applicable)		
	a) Thickness of cladding		
	i) Maximum	mm	
	ii) Minimum	mm	
	b)Minimum no. of twists in a guage length equal to 100 times diameter of wire which		

	the strands can withstand in the torsion test		
	a) Before stranding	Nos.	
	b) After stranding	Nos.	
	c) Minimum elongation of strand for a gauge length of 250 mm	%	
	d) Resistance of 1m length of strand at 20 deg. C	Ohm	
5.8	Galvanising/ Misch Metal coating (if applicable)		
	a) Minimum mass of zinc coating per sqm. of uncoated wire surface.	gm	
	b) Minimum mass of Misch metal coating per sqm. of uncoated wire surface (if applicable).	Nos.	
	c) Min. no. of twists which a single strand shall withstand during torsion test for a length equal to 100times dia of wire after stranding.	Nos.	
	d) Minimum elongation of strand for a gauge length of 250 mm	%	
6	FILLER (if applicable)		
6.1	Type & Designation of Filler		
6.2	Chemical composition of Filler		
6.3	Mass of Filler	Kg/km	
7	COMPLETE HTLS CONDUCTOR		
7.1	Cross section drawing of the offered conductor enclosed	Yes/No	
7.2	Diameter of conductor a) Nominal b) Maximum c) Minimum	mm mm mm	
7.3	UTS (minimum) of Conductor	kN	
7.4	Lay ratio of conductor a) 1 st layer from centre (excluding central wire) b) 2 nd Layer c) 3 rd Layer d) 4 th Layer		Maximum Minimum
7.5	DC resistance of conductor at 20°C	Ohm/km	
7.6	Final Modulus of elasticity		
	a) Upto transition temperature	Kg/sq. mm	
	b) Above transition temperature	Kg/sq. mm	
7.7	Coefficient of linear expansion		
	a) Upto transition temperature	Per deg C	
	b) Above transition temperature	Per deg C	
7.8	Calculation for transition temperature enclosed	Yes/No	
7.9	Transition temperature (corresponding to 400 m ruling span and tension at ruling condition as per 6.19)	Deg C	

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7.10	Minimum Corona Extinction Voltage (line to ground) under Dry condition	kV(rms)	
7.11	RIV at 1MHz and 305 kV (rms) under dry conditions	Micro-volts	
7.12	Maximum permissible conductor temperature for continuous operation	Deg C	
7.13	Maximum permissible conductor temperature for short term operation	Deg C	
7.14	Permissible duration of above short term operation	Minutes	
7.15	Steady state conductor temperature at conductor current of 1228 A and under Ambient conditions detailed in Clause 1.2.1 of Section-II of the Technical Specification (Vol-III)		
7.16	AC resistance at maximum continuous operating temperature corresponding to specified maximum operating current (1228 A under ambient condition enclosed as per Clause 1.2.1 of Section-II of the Technical Specification)	Ohm/km	
7.17	AC resistance at continuous operating temperature corresponding to specified operating current of 420 A (under ambient condition enclosed as per Clause 1.2.1 of Section-II of the Technical Specification)	Ohm/km	
7.18	Details of Creep characteristic for HTLS conductor enclosed (as per Clause 1.4.3 of Section-II of the Technical Specification (Vol-III))	Yes/No	
7.19	Sag Tension Calculation		
7.19.1	Sag Tension Calculation enclosed (clause 1.4.1 of Sec-II of TS)	Yes/No	
7.19.2	Tension at 32 deg. C & no wind	Kg	
7.19.3	Sag & tension at maximum continuous operating temperature (corresponding to current of 1228 A and Ambient conditions detailed in Clause 1.4.1 of Section-II of the Technical Specification (Vol-III))	Meters & Kgs	
i)	Tension at 32 deg. C & full wind for following wind pressure :		
a.	Wind Pressure : 52 kg/m ²	kg	
ii)	Tension at 0 deg. C ,2/3 wind pressure : 35 kg/m ²	kg	
7.19.4	Tension at transition temperature	kg	
7.20	Direction of lay for outside layer		
7.21	Linear mass of the Conductor		
	a) Standard	Kg/km	
	b) Minimum	Kg/km	

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	c)Maximum	Kg/km	
7.22	Standard length of conductor	M	
7.23	Maximum length of conductor that can be offered as single length	M	
7.24	Tolerance on standard length of conductor	%	
7.25	Drum is as per specification	Yes/No	
7.26	No. of cold pressure butt welding equipment available at works	Nos.	

GUARANTEED TECHNICAL PARTICULARS OF SUSPENSION HARDWARE FITTINGS

Sl.	Description	Unit	Value guaranteed by the Bidder
1.	Name & address of Manufacturer		.....
2.	Address of Manufacturer		.....
3.	Drawing enclosed	Yes/No	
4.	Maximum magnetic power loss of suspension clamp at sub-conductor current of 1228 amperes	Watt	.....
5.	Slipping strength of suspension assembly (c!amp torque Vs slip curve shall be enclosed)	kN	.....
6.	Particulars of standard/AGS Standard / AGS preformed armour rod set for suspension assembly		
	a) No. of rods per set	No.	.....
	b) Direction of lay		.....
	c) Overall length after fitting on conductor	mm	.....
	d) Actual length of each rod along its helix	mm	.....
	e) Diameter of each rod	mm	.....
	f) Tolerance in		
	i) Diameter of each rod	±mm	.....
	ii) Length of each rod	±mm	.....
	iii) Difference of length between the longest and shortest rod in a set	±mm	.....
	g) Type of Aluminium alloy used for manufacture of PA rod set		.....
	h) UTS of each rod	Kg/mm ²	.....
7.	Particulars of Elastomer (For AGS Clamp only)		
	a) Supplier of elastomer		.....

- b) Type of elastomer
- c) Shore hardness of elastomer
- d) Temperature range for which elastomer is designed
- e) Moulded on insert Yes/No
- 8. UTS of suspension clamp Yes/No
- 9. Purity of Zinc used for galvanising %
- 11. Minimum corona extinction voltage under dry condition kV (rms)
- 12. Radio interference voltage at 1 Mhz for phase to earth voltage of 305 kV (dry condition)
- 13. Maximum permissible continuous operating temperature of
 - i) Clamp body
 - ii) Standard/AGS preformed rods

GUARANTEED TECHNICAL PARTICULARS OF TENSION HARDWARE FITTINGS

Sl.	Description	Unit	Value guaranteed by the Bidder	
1.	Name of Manufacturer		.....
2.	Address of Manufacturer		.....
3.	Drawing enclosed		Yes/ No	
4.	Purity of aluminum used for aluminum sleeve	%	.....
5.	Material for steel sleeve			
	(i) Type of material with chemical composition		.....
	(ii) Range of Hardness of material (Brinell Hardness)	BHN	From .....to	
	(iii) Weight of zinc coating	gm/m ²	.....
			<u>Aluminium/ Alloy</u>	<u>Steel</u>
6.	Outside diameter of sleeve before compression	mm	.....	.....
7.	Inside diameter of sleeve before compression	mm	.....	.....
8.	Length of sleeve before compression		.....	.....
9.	Dimensions of sleeve after compression			
	(a) Corner to Corner		.....	.....
	(b) Surface to Surface		.....	.....
10.	Length of sleeve after compression	
11.	Weight of sleeve			
	(a) Aluminium/ aluminum Alloy	kg	
	(b) Steel	kg	
	(c) Total	kg	

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GUARANTEED TECHNICAL PARTICULARS OF TENSION HARDWARE FITTINGS

Sl.	Description	Unit	Value guaranteed by the Bidder
12.	Electrical resistance of dead end assembly as a percentage of equivalent length of Conductor	%	.....
13.	Slip strength of dead end assembly	kN	.....
14.	UTS of dead end assembly	kN	.....
10.	Purity of Zinc used for galvanising	%	.....
12.	Design calculation of yoke plates and sag adjustment plate enclosed.		Yes/ No
13.	Minimum corona extinction voltage under dry condition	kV (rms)	
14.	Radio interference voltage at 1 Mhz for phase to earth voltage of 305 kV (dry condition)		
15.	Maximum permissible continuous operating temperature of dead end assembly		

GUARANTEED TECHNICAL PARTICULARS OF MID SPAN COMPRESSION JOINT FOR HTLS CONDUCTOR

Sl.	Description	Unit	Value guaranteed by the Bidder	
1.	Name of Manufacturer		.....
2.	Address of Manufacturer		.....
3.	Drawing enclosed		Yes/No	
4.	Suitable for conductor size	mm	.....
5.	Purity of aluminium used for aluminium sleeve	%	.....
6.	Material for steel sleeve			
	(i) Type of material with chemical composition		.....
	(ii) Range of Hardness of material (Brinell Hardness)	BHN	From .....to	
	(iii) Weight of zinc coating	gm/m ²	.....
			<u>Aluminium/ alloy</u>	<u>Steel</u>
7.	Outside diameter of sleeve before compression	mm	.....	.....
8.	Inside diameter of sleeve before compression	mm	.....	.....
9.	Length of sleeve before compression		.....	.....
10.	Dimensions of sleeve after compression			
	(a) <u>Corner to Corner</u>		.....	.....
	(b) <u>Surface to Surface</u>		.....	.....
11.	Length of sleeve after compression		.....	.....
12.	Weight of sleeve			
	(a) Aluminium	kg	
	(b) Steel	kg	
	(c) Total	kg	
13.	Slip strength	kN	

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|-----|---|-----------|-------|
| 14. | Resistance of the compressed unit expressed, as percentage of the resistivity of equivalent length of bare conductor. | % | |
| 15. | Minimum Corona extinction voltage under dry condition | kV (rms) | ..... |
| 16. | Radio interference voltage at 1 MHz for phase to earth voltage of 305 kV under dry condition | Microvolt | ..... |
| 17. | Maximum permissible continuous operating temperature of mid span compression joint | Deg. C | |

**GUARANTEED TECHNICAL PARTICULARS OF REPAIR SLEEVE FOR HTLS
CONDUCTOR**

Sl.	Description	Unit	Value guaranteed by the Bidder
1.	Name of Manufacturer		.....
2.	Address of Manufacturer		
3.	Drawing enclosed		Yes/No
4.	Suitable for conductor size	mm	.....
5.	Purity of Aluminium / Al Alloy type	%	.....
6.	Dimension of sleeve before compression		
	i) Inside diameter of sleeve	mm	.....
	ii) Outside dimensions of sleeve	mm	.....
	iii) Length of sleeve	mm	.....
7.	Dimension of sleeve after compression		
	i) Corner to Corner	mm	.....
	ii) Surface to Surface	mm	.....
	iii) Length of sleeve	mm	.....
8.	Weight of sleeve	Kg	.....
9.	Minimum Corona extinction voltage under dry condition	kV (rms)	.....
10.	Radio interference voltage at 1 MHz for phase to earth voltage of 305 kV dry condition)	μ V	.....
11.	Maximum permissible continuous operating temperature of Repair Sleeve	Deg. C	

NOTE: Tolerances, wherever applicable, shall also be specified.

GUARANTEED TECHNICAL PARTICULARS OF VIBRATION DAMPER FOR HTLS CONDUCTOR (IF APPLICABLE)

Sl.	Description	Unit	Value guaranteed by the Bidder	
1.	Name of Manufacturer		.....
2.	Address of Manufacturer			
3.	Drawing enclosed			
	(a) Design Drawing		YES / NO	
	(b) Placement Chart		YES / NO	
4.	Suitable for conductor size	mm	.....
5.	Total weight of one damper	kg		
			<u>Right</u>	<u>Left</u>
6.	Diameter of each damper mass	mm	.....	.....
7.	Length of each damper mass	mm	.....	.....
8.	Weight of each damper mass	kg	.....	.....
9.	Material of damper masses		.....
10.	Material of clamp		.....
11.	Material of the stranded messenger cable		.....
12.	Number of strands in stranded messenger cable		.....
13.	Lay ratio of stranded messenger cable		.....
14.	Minimum ultimate tensile strength of stranded messenger cable	Kg/mm ²	.....
15.	Slip strength of stranded messenger cable (mass pull off)	kN	.....

GUARANTEED TECHNICAL PARTICULARS OF VIBRATION DAMPER FOR HTLS CONDUCTOR (IF APPLICABLE)

Sl.	Description	Unit	Value guaranteed by the Bidder	
			<u>Right</u>	<u>Left</u>
16.	Resonance frequencies			
	(a) First frequency	Hz	.....	.....
	(b) Second frequency	Hz	.....	.....
17	Designed clamping torque	Kg-m	.....	.....
18.	Slipping strength of damper clamp			
	(a) Before fatigue test	kN	.....	.....
	(b) After fatigue test	kN	.....	.....
19.	Magnetic power loss per vibration damper watts for 1228 amps, 50 Hz Alternating Current	watts	.....	.....
20.	Minimum corona Extinction voltage kV (rms) under dry condition	kV	.....	.....
21.	Radio Interference Voltage at 1 MHz for phase to earth voltage of 305 kV (rms) Microvolts under dry condition	μV	.....	.....
22.	Maximum permissible continuous operating temperature of Vibration Damper	Deg. C	.....	.....
23.	Percentage variation in reactance after fatigue test in comparison with that before fatigue test	%	.....	.....
24.	Percentage variation in power dissipation after fatigue test in comparison with that before fatigue test	%	.....	.....

NOTE: Tolerances, wherever applicable, shall also be specified.

SECTION – 5
CHECK LIST

**TECHNICAL REQUIREMENTS FOR HTLS CONDUCTOR, STRINGING HARDWARE
 AND CONDUCTOR ACCESSORIES**

Sl.	Particulars	Reply by bidder.	
1	TECHNICAL QUALIFYING REQUIREMENT		
1.1	Documents for meeting qualifying criteria submitted with the offer.	Confirmed	Yes/No
1.2	The bid shall be submitted by the Manufacturer of the conductor. The bidder's scope includes supply and services like installation, testing and commissioning. Bids submitted by agents will not be considered.	Confirmed	Yes/No
1.3	All the documents shall be submitted in English. Translated pages should be attested by the bidder.	Confirmed	Yes/No
2	Un-priced Offer		
2.1	Confirm that all items have been quoted. (If any item has not been quoted, the same shall be specifically brought out in Schedule of Technical Deviation)	Confirmed	Yes/No
2.2	The Specification envisages turnkey execution of re-conductoring of transmission line and the scope includes dismantling of existing conductor, hardware etc and installation (re-conductoring) services i.e. including stringing, supervision and testing, necessary to execute the job to satisfaction of ONGC and BHEL.	Confirmed	Yes/No
2.3	Any other item /service required for the execution for the complete job is deemed to be included in the offer, whether specifically mentioned in the specification or not. The Bill of quantities included in the offer shall clearly reflect such additional items along with their respective quantities and prices. List of items required for completeness (Attach list, if required)	Additional items required	Yes/No
2.4	The entire supply , erection, testing & commissioning is in scope of bidder	Confirmed	Yes/No
3	Conductor Lengths		
3.1	Manufacturing lengths and drum length for HTLS conductor shall be determined as per the joint route survey with ONGC /BHEL.	Confirmed	Yes/No
3.2	The Payment of conductor length (for supply) will be as per approved quantities after joint survey.	Confirmed	Yes/No
3.3	The Payment of conductor length (for installation) will be as per actual measurement at site which shall include margins if any.	Confirmed	Yes/No
4	Technical		
4.1	Calculations		
4.1.1	Calculations – All calculations as per section1, clause 5 have been submitted alongwith bid document	Enclosed with bid	Yes/No

Sl.	Particulars	Reply by bidder.	
4.2	Technical Particluars		
4.2.1	Material of conductor strands		Bidder to furnish
4.2.2.	Material of core wire strands		
4.2.3	Outer diameter	14.15 mm \pm 1%	Yes/No
4.2.4	Minimum continuous current carrying capacity at ambient temperature	420A	
4.2.5	Minimum breaking load	32.4 kN	Yes/No
4.2.6	Co-efficient of linear expansion	Less than that of ACSR dog conductor	Yes/No
4.2.7	DC resistance at 20 deg.C	< 0.273 ohm/km	Yes/No
4.2.8	AC resistance at 75 deg C	< ACSR dog conductor	Yes/No
4.2.8	Linear Temperature Co- efficient of Expansion	< 19.86 X 10 ⁻⁶ /deg C	Yes/No
4.3	Documents with offer – All documents as per section1, clause 5 have been submitted alongwith bid document		
4.4	Technical Deviations		
4.4.1	Confirm that the Complete systems have been offered as per the requirements of Technical Specification and Technical Deviation sheet has been submitted. Deviations mentioned elsewhere in the bid will not be considered.	Confirmed	Yes/No
4.4.2	Technical Deviation sheet has been submitted.	Confirmed	Yes/No
5	Barchart		
5.1	Bidder will submit detailed bar chart indicating all the milestones from Engineering till manufacturing/ testing, dispatch to site and commissioning.	Confirmed	Yes/No
6	Conditions		
6.1	The necessary power supply at site shall be provided by BHEL at one point only.	Noted	Yes/No
6.2	Provision of manpower in the grade of foreman and skilled technician, provision of laying supervisor, provision for stringing tools and equipment etc. to complete.	Confirmed	Yes/No
6.3	Any tools and tackles and accessories required to complete the reconductoring including dismantling of existing conductor, stringing of HTLS conductor including stringing hardware and conductor accessories and ETC shall be included in the offer. Please note BHEL shall not provide any equipment, tool and tackles for carrying out any test /or stringing of	Noted	Yes/No

Sl.	Particulars	Reply by bidder.	
	HTLS conductor.		
6.4	Store shall be provided by BHEL. Supervision of loading, unloading & storage shall be in bidder's scope. Office facilities, travel & accommodation for bidder's staff, transportation of material tools and equipment between storage /warehouse and site shall be in bidder's scope.	Confirmed	Yes/No
6.5	Any damage in conductor, civil works and structure during installation will be repaired by the bidder.	Confirmed	Yes/No
7	Site Test		
7.1	Provision of test engineer, supply of all test equipment and arrangement like cranes (for lifting of conductor drums, test equipment etc), all Test Equipment for completion of total installation (re-conductoring) work shall be in bidder's scope.	Confirmed	Yes/No
7.2	All field tests including tests during installation, pre-commissioning, commissioning, field acceptance tests shall be conducted by the Contractor, in presence of representative of the Customer.	Confirmed	Yes/No
7.3	No separate site test will be conducted by BHEL/Customer	Confirmed	Yes/No
8	TYPE TESTS REQUIREMENTS		
8.1	The offered HTLS conductor complete in all respect alongwith stringing hardware and conductor accessories like vibration dampers, repair sleeves, mid-span compression joints) should have been type tested (as per relevant IEC). Stringing Hardware and accessories should be of the same make as used in type test.	Confirmed	Yes/No
8.2	Type test report for HTLS conductor, stringing hardware and conductor accessories shall be submitted with the bid. Differences, if any, in the items offered and those which have been Type tested shall be clearly brought out alongwith explanation for suitability. Type test reports will be vetted by BHEL/ONGC/FCE at contract stage and if the same is not acceptable to BHEL/ONGC/FCE, bidder has to repeat type tests without any cost and delivery extension.	Confirmed and enclosed with bid	Yes/No
8.3	The test - reports submitted shall be of the tests conducted within last 5 (five) years prior to the date of bid opening. Date of Bid opening is 17.12.2012.	Confirmed	Yes/No
8.4	In case the test reports are not found technically valid during contract stage by BHEL/ ONGC or if the tests were conducted earlier than 5 (five) years prior to the date of bid opening, the bidder shall repeat these test(s) at <u>no extra cost to the purchaser and no delivery implication</u> . Technical valid - Any error or (any/all additional type tests not carried out) or discrepancy in the test reports vis-à-vis offered equipment due to any design / manufacturing changes (including substitution of components) or non-compliance with the requirement stipulated in the Technical Specification.	Confirmed	Yes/No

Sl.	Particulars	Reply by bidder.	
8.5	The type test report shall be complete including list the test objects, photographs, oscillographs, test arrangement, drawing of tested objects, test connections. The type test report shall be in English. If it is in any other language, it should include an English version (Translation shall be attested by the Bidder). The English version should be complete with measured values and conclusion.	Confirmed	Yes/No
9	INSPECTION & TESTING		
9.1	Inspection and Testing shall be as per approved Quality Plan.	Confirmed	Yes/No