



भारत हेवी इलेक्ट्रिकल्स लिमिटेड

(भारत सरकार का उपक्रम)

BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)

TCN - 04

Ref: PSER:SCT:NKP-C1772:TCN-04

Date: 21-10-2016

Sub	Tender Change Notice (TCN) – 04.	
Job	Package A - Civil works of AIR COOLED CONDENSER OF 50% of UNIT 1 & 3 for 3x660 MW North Karanpura STPP, Jharkhand. Package B - Civil works of AIR COOLED CONDENSER OF 50% of UNIT 1 & 2 for 3x660 MW North Karanpura STPP, Jharkhand. Package C - Civil works of AIR COOLED CONDENSER OF 50% of UNIT 2 & 3 for 3x660 MW North Karanpura STPP, Jharkhand.	
Ref	1.0	Tender no. PSER:SCT:NKP-C1772:16.
	2.0	BHEL's NIT, vide reference no PSER:SCT:NKP-C1772:5231, Dated 19-09-2016.
	3.0	BHEL's TCN-01, vide reference no PSER:SCT:NKP-C1772:TCN-01, Dated 28-09-2016.
	4.0	BHEL's TCN-02, vide reference no PSER:SCT:NKP-C1772:TCN-02, Dated 07-10-2016.
	5.0	BHEL's TCN-03, vide reference no PSER:SCT:NKP-C1772:TCN-03, Dated 19-10-2016.
	6.0	All other pertinent issues till date.

With reference to above, following points/documents, relevant to tender, may please be noted and complied with while submitting the offer.

1. Bidder's Clarification is attached vide **Annexure-A to TCN-04.**
2. Bank Guarantee format for EMD is introduced under Volume-IE of tender documents and attached herewith.
3. Revised 'No deviation certificate' as per enclosed Annexure-2. Bidder shall submit no deviation certificate as per enclosed format only.
4. All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,
for BHARAT HEAVY ELECTRICALS LTD

ENGR (SCT)

Encl: As above.

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)

POWER SECTOR EASTERN REGION, DJ-9/1, SECTOR-II, SALT LAKE CITY, KOLKATA - 700 091

फैक्स/Fax : (033) 23211960

फोन/Phone : बोर्ड/EPABX : (033) 2339-8000/ 2339 8231

ANNEXURE-A TO TCN-04

**JOB: Package A - Civil works of AIR COOLED CONDENSER OF 50% of UNIT 1 & 3 for 3x660 MW North Karanpura STPP, Jharkhand.
Package B - Civil works of AIR COOLED CONDENSER OF 50% of UNIT 1 & 2 for 3x660 MW North Karanpura STPP, Jharkhand.
Package C - Civil works of AIR COOLED CONDENSER OF 50% of UNIT 2 & 3 for 3x660 MW North Karanpura STPP, Jharkhand.**

TENDER NO. PSER:SCT:NKP-C1772:16Clarification Of Bidder's Query

SL NO	REFERENCE CLAUSE OF TENDER DOCUMENT	EXISTING PROVISION	BIDDER'S QUERY	BHEL'S CLARIFICATION
1	FORMATS	-	EMD Bank Guarantee format is missing or "PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)" to be used for EMD.	Bank Guarantee format for EMD is introduced under Volume-IE of tender documents and is attached.
2	VOLUME-IF-TCC-TS	-	Please note that the file "FILE-2.2.1-SCT-NKP-C1772-VOLUME-IF-TCC-00 ACC - SPEC" is password protective. So we are not able to take printout of file. So please provide the "not protective" file.	Technical Specification of file name "FILE-2.2.1-SCT-NKP-C1772-VOLUME-IF-TCC-00 ACC - SPEC" attached again.

Bharat Heavy Electricals Limited		
Power Sector - Eastern Region, Kolkata		
TENDER NO. PSER:SCT:NKP-C1772:16 (TCN-04)		
FORMATS	BANK GUARANTEE FORMAT FOR EMD	PAGE 1 OF 4

PROFORMA OF BANK GUARANTEE FOR EARNEST MONEY
(On non-Judicial paper of appropriate value)

Bank Guarantee No.....

Date.....

To

(Employer's Name and Address)

.....

Dear Sirs,

In accordance with the terms and conditions of your Invitation for Bids/Notice Inviting Tender No.....¹(Tender Conditions) M/s. having its registered office at² (hereinafter referred to as the '**Tenderer**'), is submitting its bid for the work of..... for.....³. at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091.⁴(name of the Employer)

The Tender Conditions provide that the **Tenderer** shall pay a sum of Rs as Earnest Money Deposit in the form therein mentioned. The form of payment of Earnest Money Deposit includes Bank Guarantee executed by a Scheduled Bank.

In lieu of the stipulations contained in the aforesaid Tender Conditions that an irrevocable and unconditional Bank Guarantee against Earnest Money Deposit for an amount of⁵ is required to be submitted by the Tenderer as a condition precedent for participation in the said Tender and the Tenderer having approached us for giving the said Guarantee,,

we, the[Name & address of the Bank] having our Head Office at(hereinafter referred to as the Bank) being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer without any demur, merely on your first demand any sum or sums of Rs. 5

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.....(*).....without any reservation, protest, and recourse and without the beneficiary needing to prove or demonstrate reasons for its such demand. Any such demand made by the 'Employer' shall be conclusive and binding on us irrespective of any dispute or difference raised by the Tenderer.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Tenderer shall have no claim against us for making such payment.

We Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Tender or to extend the time of submission of bids from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Tenderer and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Tendered or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Tenderer or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Tenderer and notwithstanding any security or other guarantee that the Employer may have in relation to the Tenderer's liabilities.

This Guarantee shall be irrevocable and shall remain in force upto and including.....⁶ and shall be extended from time to time for such period as may be desired by the Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Tenderer but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms hereof. However, unless a demand or claim under this Guarantee is made on us in writing on or before the⁷ we shall be discharged from all liabilities under this Guarantee.

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We, Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁵.....
- b) This Guarantee shall be valid up to⁶
- c) Unless the Bank is served a written claim or demand on or before _____⁷ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of

(Name of the Bank)

Date.....

Place of Issue.....

¹ *Details of the Invitation to Bid/Notice Inviting Tender*

² *Name and Address of the Tenderer*

³ *Details of the Work*

⁴ *Name and Address of BHEL Unit/Division/Region (Already filled up)*

⁵ *BG Amount in words and Figures*


⁶ *Validity Date*

Bharat Heavy Electricals Limited		
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⁷ *Date of Expiry of Claim Period*

Note:


1. Units are advised that expiry of claim period may be kept 2/3 months after validity date. As per Works Policy, the Bank Guarantee shall be valid for at least six months.
2. In Case of Bank Guarantees submitted by Foreign Vendors-
 - a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
 - b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**
 - b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter-Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
 - b.2 **In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank** (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
 - b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.
 - b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

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सामग्री सूची संख्या को अधिकृतिक करता है SUPERSEDES INVENTORY NO.	PRODUCT PURCHASE SPECIFICATION				पृष्ठ का Page 1 of 129
<p>AIR COOLED CONDENSER PACKAGE</p>					
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स्वाधिकार एवं गोपनीय


इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।

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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	PRODUCT PURCHASE SPECIFICATION			पृष्ठ का Page 2 of 129
स्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कम्पनी के हित में हो सकेगा नहीं न किया जाए। COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	CONTENT			
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COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं अनावश्यक रूप से किसी भी प्रकार प्रयोग, जो कि सम्पत्ती के हित में हानिकारक हो न किया जाए। स्वत्वाधिकार एवं गोपनीय	<p>I. Intent of Specification</p> <p>Bidder shall be responsible for providing the complete engineering, design, drawings, supply of all material equipment, fabrication, assembly, pre-shipment testing at manufacturer's works, proper packing for transportation, delivery at plant site, unloading, storage, erection, interconnection with related plant and equipment, calibration, performance testing, commissioning and putting the ACC together with all accessories, auxiliaries and associated equipment and services specified / or otherwise which are required to complete the job under these specifications.</p> <p>Should the BHEL find during the discussions that the package offered is not absolutely complete and in line with their requirement as specified by them, the bidder shall agree to comply with the requirement of BHEL without any extra commercial implication and completion schedule. Nothing in this specification shall be construed to relieve the Bidder of his responsibility.</p> <p>I.1 Scope of The Proposal</p> <p>The scope of the proposal for Air Cooled Condenser package for North Karanpura 3X660MW Project shall completely cover the following activities and services in respect of all the equipment(s) specified and covered under the specifications including handing over to the owner a complete Air Cooled Condenser.</p> <ol style="list-style-type: none"> i. Detailed design and engineering of all the equipment and systems; ii. Complete manufacture including shop testing iii. All equipment modules shall be complete with all necessary interconnecting pipe work, valves, instruments and electrical wiring for control. The components of the package shall be arranged in a compact and orderly manner to ensure good access for operation, maintenance and repair. Piping interfaces shall terminate at with a pipe flange. iv. Erection and commissioning, protection and temporary storage at site. v. Project activities scheduling, monthly progress report. vi. Quality assurance planning, control and documentation. vii. Providing engineering data, drawings, equipment sizing, thermal, mechanical, hydraulic calculations and performance data, instruction manual, as-built drawings, erection and commissioning drawings - documents, civil assignment drawings, layout drawings - documents, O & M manuals etc. for Purchaser's / Owner's approval. Bidder shall provide complete civil design and documents for BHEL / NTPC review and approval. viii. Seaworthy Packing and transportation ix. Bidder to note that supporting structure of ACC shall be RCC only. x. Reliability tests and performance and guarantee tests including the tests for performance demonstration after successful completion of trial operation; xi. Furnishing of spares 		
सामग्री सूची संख्या INVENTORY NO.	Rev. no. 00	निर्माणकर्ता WORKED BY जांचकर्ता CHECKED BY	ASHISH GUPTA ROHIT BANSAL 28.04.2014 28.04.2014

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COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company		<p>xii. Satisfactory conclusion of the Contract</p> <p>xiii. Other services:</p> <ol style="list-style-type: none"> 3-D model of complete package together with all necessary piping, valves, fittings, supports, pumps and drives etc. First fill of all lubricants, servo-fluids and chemicals. The consumption during the trial operation and final filling/topping up after the trial operation shall also be included in the bidder's scope. One set of all special tools and tackles for maintenance of all the equipment/system. Necessary paints, primers and painting of all equipment for the protection and colour codes for identification as specified elsewhere in the specification. The scope shall also include necessary touch up paints in sealed containers. Training of Owner's personnel / Customer as per requirement specified. Erection consumables like welding electrodes touch up paints, earthing and lighting protection material etc. <p>Notes:</p> <ol style="list-style-type: none"> In the specification Owner/ Engineer/ Customer referred is M/s NTPC, Purchaser / Employer referred is M/s BHEL, and Contractor/Supplier/Vendor referred is Bidder. The Bidder shall be responsible for providing all material, equipment and services, specified or otherwise which are required to complete the project and fulfill the intent of ensuring operability, maintainability and the reliability of the complete work covered under this specification. It is not the intent to specify completely herein, all aspects of design and construction equipment. Nevertheless, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to Purchaser/Owner. Below ground earthing network is not in the scope of bidder. All concrete work and Firefighting system are excluded from scope of work. The scope of erection of RCC columns and concrete work shall be in BHEL scope. The requirement mentioned in this specification is minimum, for completeness, bidder shall be responsible to meet the requirements specified in referred specifications/ standards. <p>Additional Requirements</p> <ol style="list-style-type: none"> Before submitting his bid, the Bidder should inspect and examine the site and its surroundings and should satisfy himself as to the nature of the ground and subsoil, the quantities and nature of work, materials necessary for completion of the work and their availability, means of access to site and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his offer. No consequent extra claims on any misunderstanding or otherwise shall be allowed by the Employer. Bidder shall take all necessary precautions to protect all the existing equipment, structures, facilities and buildings etc. from damage. In case any damage occurs due to the activities of the contractor on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be immediately made good by the contractor 											
	स्वत्वाधिकार एवं गोपनीय इस प्रस्ताव में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अनावरण के बिना किसी भी प्रकार प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।												
सामग्री सूची संख्या INVENTORY NO.	दिनांक एवं हस्ताक्षर SIGN & DATE	<table border="1"> <tr> <td>Rev. no.</td> <td></td> <td>निर्माणकर्ता WORKED BY</td> <td>ASHISH GUPTA</td> <td>28.04.2014</td> </tr> <tr> <td>00</td> <td></td> <td>जांचकर्ता CHECKED BY</td> <td>ROHIT BANSAL</td> <td>28.04.2014</td> </tr> </table>	Rev. no.		निर्माणकर्ता WORKED BY	ASHISH GUPTA	28.04.2014	00		जांचकर्ता CHECKED BY	ROHIT BANSAL	28.04.2014	
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			जांचकर्ता CHECKED BY	ROHIT BANSAL		28.04.2014

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स्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कम्पनी के हित में होना आवश्यक हो न किया जाए।	स्वाधिकार एवं गोपनीय The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	<p>i. Location and Approach, Meteorological Data etc as per Annexure-II-1</p> <p>ii. Plant Configuration</p> <ol style="list-style-type: none"> (a) The steam Turbine is Multi cylinder, Reheat, Condensing, Extraction type Steam Turbine of HP, IP and LP Turbine operating at supercritical Steam parameters. The LP Turbine exhaust is radial single Bottom exhaust. (b) For normal make up to the power cycle, DM water shall be added in the condensate storage tank through the cycle makeup control station. The makeup station shall have suitable control valves for normal and emergency makeup with required isolation and motorized bypass valves. The Cycle makeup pumps shall supply the makeup water. (c) The condensate to regenerative cycle shall be through Condensate Extraction Pump (CEP) discharge at specified flow and pressure value. Recirculation line for CEP and its control shall be done through DCS and provision of connection in condensate tank shall be provided. (d) Cooling water for heat exchanger of Air Evacuation system shall be provided. Cooling water temperature is specified in the specification. Bidder to indicate the cooling water flow required. (e) Instrument Air line for instruments shall be provided. The air flow value required by Bidder has to be as specified. 	


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- a. The Contractor shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in these specifications.
- b. The guaranteed performance parameters furnished by the bidder in his offer, shall be without any tolerance values whatsoever and all margins required for instrument inaccuracies and other uncertainties shall be deemed to have been included in the guaranteed figures.
- c. The Contractor shall conduct performance test and demonstrate all the guarantees covered herein, during performance guarantee/acceptance test. The various tests which are to be carried out during performance guarantee/acceptance test are listed in this Sub-section. The guarantee tests shall be conducted by the Contractor at site in presence of Employer/Owner on each unit individually.
- d. All costs associated with the tests including cost associated with the supply, calibration, installation and removal of the test instrumentation shall be included in the bid price.
- e. It is the responsibility of the contractor to perform the Performance Guarantee/Acceptance test as specified in this subsection. The performance test will be performed using only the normal number of owner supplied operating staff. Contractor, vendor or other subcontractor personnel shall only be used for instructional purposes or data collection. At all times during the Performance Tests the emissions and effluents from the Plant shall not exceed the Guaranteed Emission and Effluent Limits.
- f. The Contractor shall make ACC plant ready for the performance guarantee tests.
- g. All instruments required for performance testing shall be of the type and accuracy required by the code and prior to the test, the contractor shall get these instruments calibrated in an independent test Institute approved by the Employer/owner. All test instrumentation required for performance tests shall be supplied by the contractor and shall be retained by him upon satisfactory completion of all such tests at site. All calibration procedures and standards shall be subjected to the approval of the Employer/ Owner. The protecting tubes, pressure connections and other test connections required for conducting guarantee test shall conform to the relevant codes.
- h. Tools and tackles, thermowells (both screwed and welded) instruments/devices including flow devices, matching flanges, impulse piping & valves etc. and any

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SUPERSEDES INVENTORY NO. सामग्री सूची संख्या को अधिकृतिक करना है	<p>by the Employer, after the tests have been completed, the Employer will have the right to either of the following:</p> <p>i. For Category-I Guarantees Reject the equipment/system/plant and recover from the Contractor the payments already made</p> <p style="text-align: center;">OR</p> <p>Accept the equipment/system/plant after levying Liquidated Damages as specified hereunder. The liquidated damages, for shortfall in performance indicated in clause III.2 for this sub-section are on per unit basis and shall be levied separately for each unit. The liquidated damages shall be prorated for the fractional parts of the deficiencies. The performance guarantees coming under this category shall be called 'Category - I' Guarantees.</p> <p>ii. For Category-II Guarantees Reject the equipment/plant/system and recover from the Contractor the payments already made. The performance guarantees under this category shall be called 'Category - II ' Guarantees. Conformance to the performance requirements under Category -II is mandatory.</p> <p>iii. For Category-III Guarantees Reject the equipment / system/plant & recover from the Contractor the payments already made.</p> <p>Accept the equipment/system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by the EMPLOYER. Such damages shall, however be limited to the cost of replacement of the equipment(s) / system(s) replacement of which shall remove the deficiency so as to achieve the guarantee performance. These parameters/capacities shall be termed as category - III, guarantees.</p>										
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III.1.2 Performance Guarantee Tests :

a. Cat-1

- i) ACC should be designed for guaranteed back pressure of 106.6 mmHg (abs) measured at 300 mm below LP Exhaust connection at valve wide open (VWO) 3 % make-up (MU) Condition.
- ii) Unit auxiliaries power consumption of all unit Auxiliaries required for continuous unit operation at 660MW (i.e. 100% rated load) under rated steam conditions and at condenser pressure of 196 mm Hg abs with 0% make up shall be guaranteed in line with the requirements stipulated in clause III.2.
Note:- Power consumption of each of the pump/ compressors etc. whether mentioned shall be measured at switchgear end.

b. Cat-2

Not Applicable.

c. Cat-3:


- i) Noise level shall not exceed 85 dBA at distance of 1.0 m horizontally from the nearest surface of any equipment / machine and at a height of 1.5 M above the floor level elevation. Combined Noise level of ACC fans at rated speed and pitch angle shall not exceed 85dBA at 1.5 m from ACC perimeter. The composite noise level from ACC should comply with the applicable environmental norms.

Noise measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 651 or BS5969 or IS 9779.

Minimum 6 points around each equipment shall be covered for measurement. Additional measurement points shall be considered based on the applicable standards and the size of the equipment. The measurement shall be done with slow response on the A - weighting scale. The average of A-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 micro bar shall not exceed the guaranteed value. Corrections for background noise shall be considered in line with the applicable standards. All the necessary data for determining these corrections, in line with the applicable standards, shall be collected during the tests.

- ii) Air Leakage to ACC shall not exceed 50% of design value taken for sizing of Vacuum Pumps

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PARAMETER	Rate of Liquidity Damage	Acceptable Short Fall with LD
For Deficiency in Condenser Back Pressure 106.6 mmHg abs, (in case actual pressure drop inside hot box is different from the value provided by BHEL, suitable correction shall be applicable.) measured at 300mm below LP Turbine exhaust flange connection.	\$ 851,430 per 1 mm Hg increase in Condenser Pressure	(+) 2.5% of the guaranteed condenser pressure
Auxiliary power consumption for unit auxiliaries: For increase in the auxiliary power consumption in KW guaranteed at 196 mm Hg abs condenser pressure measured at 300mm below LP Turbine exhaust flange connection.	US \$ 3,275 /- (US Dollar Three Thousand Two Hundred Seventy Five only) per 1 KW increase	Auxiliary Power Consumption. (+) 1.0% of the Guaranteed KW Power Consumption.

AUXILIARY POWER CONSUMPTION

The respective auxiliary power consumption for ACC package is to be calculated in isolation to calculate the respective guaranteed power consumption

$$P_{au} = \sum (P_u)$$

P_{au} = Guaranteed ACC Auxiliary Power Consumption.

P_u = Power consumed by the each auxiliary of the ACC under test.

The power consumed by each auxiliary shall be measured at the switchgear end.


Bidder shall provide the suitable power meter at the time of the test.

While guaranteeing the auxiliary power consumption the bidder shall necessarily include all continuously operating unit auxiliaries. The auxiliaries to be considered shall include but not limited to the following:

- Motor for ACC fans
- Drain Pumps
- Vacuum Pump motors (holding)
- other equipment which are deemed to be seen as consuming electricity.

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 इस प्रवेश में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं
 अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया
 जाए।

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SUPERSEDES INVENTORY NO.	<p>IV.2 Main components of the System</p> <p>TYPE: Direct air cooled, forced cooling type, single row.</p> <p>Air cooled condenser and associated system shall be built to standard proven design and shall comply to requirements of the HEI for Air Cooled Condenser, ISO-13706 and ASME VIII, Div-1 as applicable, requirements as per HEI shall prevail in case of similar requirement specified in other applicable standards. The exhaust steam from the turbine shall be cooled using an Air Cooled Condenser with forced convection air as a cooling medium. Expanded steam from the Steam Turbine is condensed through the condenser tubes. Cooling air is drawn over the condenser tubes by motor fans to produce condensate. The condensate is collected in a common condensate tank and returned to the feed water tank / deaerator via the condensate pumps.</p> <p>Bidder's scope for Air Cooled Condenser package comprises the following essential components and services.</p> <p>IV.2.1 Main Steam Duct with Transition piece / Hot Box, Bellows, and Rupture Disc</p> <p>Steam distributing system from steam turbine outlet to the ACC unit including Turbine Exhaust Device / Hot Box / Exhaust Transition Device (not in Bidder's scope), main horizontal steam duct, steam distribution manifold, steam header, condensate collection header as defined elsewhere in the specification. Connection between turbine and exhaust system shall be welded and main horizontal duct shall also be welded to exhaust device.</p> <p>Steam duct connecting turbine exhaust flange to steam distribution manifold shall include expansion joints, rupture discs, inspection ports, drain pots and necessary vent and drain connections, manholes etc.</p> <p>IV.2.2 Drain pot, Drain Pump and Condensate Storage tank</p> <p>One number drain pot complete with, suction isolation, stand pipes, discharge control & isolation valves, instrumentation, interconnecting pipelines and one number Condensate storage tank including connections for makeup water with condensate strainer, standpipe, manholes, nozzles connection, hand railing etc., shall be provided of capacity as per design criteria defined elsewhere in the specification. 2X100% drain pumps shall be provided with all accessories to pump drain collected in drain pot to Condensate storage tank with associated piping from drain pot to drain pumps and to condensate storage tanks with all support structures, accessories, instrumentation, control and fittings etc.</p> <p>IV.2.3 Tube Bundles</p> <p>i. Bundles: A bundle shall consist of multiple finned tubes (Single row type only) welded into the tube sheets at either end. The finned tubes shall be arranged in a sloping A-</p>	सामग्री सूची संख्या को अधिकारित करना है	COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं अत्यन्त रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ती के हित में हानिकारक हो न किया जाए।
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SUPERSEDES INVENTORY NO. सामग्री सूची संख्या को अधिकारित करना है	<p>frame type installation, from the main steam header to the condensate collection system.</p> <p>There are two types of bundles: first and second stage condensing bundles as per HEI.</p> <p>ii. First Stage Bundle - These bundles are to be connected to the steam header at the top and condensate header at the bottom. Condensate is also collected within the condensate header and drained. The first stage bundles typically condense 60-90% of the total steam through the ACC.</p> <p>iii. Second Stage Bundle - The second stage bundles condense the remaining steam and collect non-condensable gases. Non-condensable gases are to be extracted by the air removal system. 10-40% of total area provided shall be provided for second stage bundle.</p> <p>IV.2.4 Fan, Motor and Gear Box</p> <p>This equipment includes the complete fan assemblies, comprised of blades, hub, and seal disks to provide optimum efficiencies over the expected range of ambient temperatures and fan speed modulation.</p> <p>Fan systems shall be equipped with inlet bell rings to improve the entering airflow characteristics upstream of the fan. Wind wall to avoid air –recirculation shall be provided all round at fan deck.</p> <p>Gearboxes shall be designed for continuous service.</p> <p>Axial flow fans, installed at ACC deck level shall be driven by electric motors along with coupling, coupling guard and complete lubricating oil system. Suitable arrangement shall be provided to improve the entering airflow characteristics upstream of the fan. Each fan or gearbox shall be fitted with vibration detection devices arranged to trip the fan due to high vibration. Each fan and gearbox assembly shall be fitted with devices to prevent reverse rotation. Selection of fans and speed reducer shall be as per HEI.</p> <p>IV.2.5 Semi-Automatic Tube cleaning system</p> <p>Fin tube cleaning system of semi-automatic type as per HEI is to be provided. The fin tube bundles shall be cleaned using high pressure water.</p> <p>IV.2.6 Condensate Extraction pumps, Recirculation valve and Piping (Not included in the scope of supply of Bidder)</p> <p>3 x 50% capacity motor driven condensate extraction pumps for each unit along with all accessories, drives, suction strainers, associated piping, and valves, flow elements with flow transmitter and indicators, instrumentation and control etc. Including one number canister drainage pump per station shall be provided. It will be located under the condensate storage tank of ACC.</p> <p>IV.2.7 DM Make-up lines with control valve and piping. (Not in Bidder's scope)</p>
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DM water Make-up lines along with control valve and piping shall be in BHEL scope.

IV.2.8 Air Evacuation system

Each unit shall consist of 2x100% vacuum pumps(minimum 30SCFM capacity) for holding operation with all accessories and instrumentation for condenser air evacuation. One (01) start up hogging vacuum pump per unit with capacity not be less than 800scfm (1360 cu.m per hour) under standard conditions i.e. 760 mm of Hg (abs) and 21.1 deg C at 10 inch (254 mm) of Hg (abs) shall be provided.

All three pumps running together should be able to bring condenser pressure from atmospheric pressure to 10 inch of Hg (abs) within 30 minutes.

The handling arrangement for pumps shall also to be provided by Bidder.

IV.2.9 Access

Walkways, ladders / stairs and platforms including interconnecting platforms required for access for all equipment, piping, valves etc. for area marked shall be supplied by successful bidder

IV.2.10 Handling systems

All systems required to remove, convey across the ACC, lower to grade, and replace/maintain mechanical equipment fall into the general category of hoists, davits, and monorails. Such equipment will be permanently mounted, with removable panels at intermediate and end walls to convey equipment through and out of the ACC.

IV.2.11 Mandatory spares for 2 years of operation


IV.2.12 Start up and commissioning spares as per requirements

Bidder shall supply all start up and commissioning spares required for initial operation till the equipment is declared by the Owner as having satisfactorily completed the trial operation. The scope shall minimum include the following commissioning spares as below

- Sufficient quantity of gasket, O rings, seals and other soft parts
- One set of calibrated pressure gauge, temperature gauge
- One set of coupling for pump motor (each type)
- One set of filter elements
- Test rig for resetting of relief valve, pressure gauge, temperature gauge etc. at site
- Sufficient quantity of electrical spares like fuses etc.
- Commissioning consumables like lubricants, greases etc.

IV.2.13 Pipe trestles, pipe racks and supporting structures as per requirements

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सामग्री सूची संख्या को अधिकृतिक करना है SUPERSEDES INVENTORY NO.	<p>IV.3 Design Criteria for Air Cooled Condenser</p> <p>IV.3.1 The Air Cooled Condenser shall be designed to achieve Condenser Pressure of 106.6 mm Hg (abs) measured at 300mm downstream of LP turbine exhaust flange under Valve wide open (VWO) 3% make up (MU) condition at ambient air temperature of 38°C. The Air cooled condenser (ACC) shall be built to a standard and proven design and complying with the requirements of the Heat Exchange Institute (HEI), ISO-13706 and ASME VIII / TEMA as applicable, requirements as per HEI shall prevail in case of similar requirement specified in other applicable standards</p> <p>IV.3.2 The equipments and auxiliaries shall be suitable for continuous operation in the frequency range of 47.5 Hz to 51.5 Hz.</p> <p>IV.3.3 Input Data/ Design data shall be as per ANNEXURE-IV.3-1& Annexure-IV.3-4 for Guaranteed back pressure and guaranteed Auxiliary power consumption conditions respectively.</p> <p>IV.3.4 Pressure drop value from Turbine Exhaust Flange to inlet of ACC duct inside HotBox at VWO 3%MU shall be maximum 1mbar; however the final value shall be provided at the time of detailed engineering, in case actual pressure drop inside hot box is different from the value provided by BHEL, suitable correction shall be applicable. Bidder shall design ACC suitably to achieve guaranteed condenser pressure as per clause IV.3.1. Bidder to also furnish the value of worst vacuum corresponding to Maximum ambient air temperature 42 degC.</p> <p>IV.3.5 The ACC is to be designed to sustain and operate in all climatic conditions as per project data specified in section-II of specification, max./min. ambient temperature and effects of wind excess as per allowable limit mentioned in ASME PTC 30.1, without damage. Air Cooled Condenser fans shall supply winds homogeneously whatever are the main wind orientations. The design of the ACC shall be based on proven design practices and the supplier shall indicate the provision made for wind effects on the performance of the ACC.</p> <p>IV.3.6 The Air Cooled Condenser shall be designed for entire plant life of 30 years with high efficiency and reliability. The ACC shall be designed taking into account the environmental conditions & the seismic condition.</p> <p>IV.3.7 Under all the operating conditions, while passing the required steam flows as per the relevant heat balances, the condenser should be able to accept the entire steam without increasing the exhaust hood temperature and condenser pressure beyond the maximum permissible value. The ACC shall be capable of condensing the steam flows under the following, but not limited to conditions:</p>
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सामग्री सूची संख्या को अधिष्ठापित करना है SUPERSEDES INVENTORY NO.	<p>IV.3.14 Components shall be designed for outdoor location or placed in open shed except drain tank/pot and drain pump.</p> <p>IV.3.15 Plant shall comply with an agreed internationally accepted standard specification.</p> <p>IV.3.16 The components of the system shall be complete with all necessary interconnecting pipe work, valves, gauges and electrical wiring for control. The components of the package shall be arranged in a compact and orderly manner to ensure good access for operation, maintenance and repair. Piping interfaces shall terminate at the edge of the module with pipe flange.</p> <p>IV.3.17 All high points in the piping system shall be provided with vents. All low points shall be provided with drains.</p> <p>IV.3.18 No damaging due to vibration during normal, abnormal and transient conditions and during turbine trip from full load to HP-LP bypass operation, feed heaters out of operation, VWO condition, 100% load and start-up condition etc. Bidder to ensure satisfactory operation under above operating conditions.</p> <p>IV.3.19 The acceptable sound pressure level shall be as per clause III.1.2 c. If the noise fails to reach the requirements when or after the ACC system is put into operation, the Bidder shall adjust or replace the equipment free of charge in time until the noise reaches the requirements.</p> <p>IV.3.20 The Bidder shall consider that there shall be no resonance occurring with fan group, which is caused by the rotating fan, ACC platform and support system and endangers the safety of the system and structure under various operating conditions. The Bidder shall consider taking control means or other measures to avoid occurrence of above situation in the design. Bidder to furnish the calculations during detail engineering.</p> <p>IV.3.21 Suitable supports, anchors, hangers, saddles, clamps etc. shall be provided for the piping system covered in the scope of the specification. The supports shall be so interspaced as to minimize sagging of the pipes and to keep it within permissible limits at operating conditions.</p> <p>IV.3.22 ACC shall be connected to each other at fan deck level for movement from one unit to another unit.</p> <p>IV.3.23 Wherever required expansion loops shall be provided in order to restrict end forces and movements.</p> <p>IV.3.24 Manufactures standard and proven practice shall be followed where HEI for Air Cooled Condenser or any standard as specified does not specify design criteria.</p> <p>IV.3.25 All pipes shall be supplied with relevant test certificates.</p>			पृष्ठ का Page 21 of 129
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सामग्री सूची संख्या को अधिचिह्नित करना है	SUPERSEDES INVENTORY NO.	<p>IV.3.26 All statutory requirements including safe distances between various facilities as per applicable rules/ acts/ laws are to be met. Provision of rupture devices shall be as per HEI.</p> <p>IV.3.27 The inspection port should be designed for ease of accessibility with leakage proof features while in operation Tools for inspection ports to be provided.</p> <p>IV.3.28 Outdoor support shall be provided for sliding movement of pipe over the support. All steel sliding support faces shall be covered with Teflon plates fitted with counter sunk screws on both top and bottom sliding faces of support.</p> <p>IV.3.29 Bidder shall provide performance curve to indicate losses and gains in ACC performance as the ambient air temperature rises and falls from the contract guarantee value. Bidder to furnish the thermal, mechanical and hydraulic calculation as per relevant standards during detail engineering for approval.</p> <p>IV.3.30 The type tests shall be carried out in presence of the Employer's representative, for which minimum 45 days notice shall be given by the Contractor. The Contractor shall obtain the Employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out. Irrespective of the requirement of conducting the type tests under this contract, the Contractor shall submit the reports of the type tests carried out within last five years from the 28.11.2013. These reports should be for the tests conducted on the equipment same (model / type / size / rating) to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Employer reserves the right to waive conducting of any or all of the specified type tests under this contract, in which case the type test charges shall not be payable for the type tests waived by the Employer.</p> <p>IV.3.31 For the purpose of sizing and establishing the rated capacity of the condensate storage tank, it shall be sized for five (5) minutes' storage capacity (between normal and low-low level) of total design flow with the turbine operating at VWO + 3% make-up, design condenser pressure as per HEI for ACC, but not limited to, the following conditions:</p> <ul style="list-style-type: none"> • The low-low level of condensate tank shall be at least 200 mm above the bottom of the tank. • Operation of the steam from the Steam Turbine under Turbine VWO + 3% makeup and all normal operating conditions plus; • All drains plus; • A suitable margin as per ACC Supplier's design philosophy. • Or the highest condensate flow resulting from the parallel operation of the turbine bypass system and the steam turbine. 	
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सामग्री सूची संख्या को अधिकृतित करना है	SUPERSEDES INVENTORY NO.	<p>IV.3.32 To account for losses due to corrosion, erosion etc. during the plant service life, a minimum allowance of as per HEI shall be added to the minimum wall thickness calculated as per ASME/ ANSI B 31.1.</p> <p>IV.3.33 Expected steam/ water quality during normal operation shall be as per Annexure-IV.3-5.</p> <p>IV.3.34 Space available at site for arranging three units of ACCs (including big exhaust steam pipe outside A-row and walkway of ACC platform) shall be as per sketch "layout constraints" attached ANNEXURE-IV.3-2. Suggestive P&ID for system is as per Annexure-IV.3-3.</p> <p style="text-align: center;">IV.4 Detailed Technical Specification Mechanical Components</p> <p>IV.4.1 Turbine Exhaust Device / Exhaust transition Device (ETD) / Hot Box (Not in Bidder's Scope of supplies)</p> <p>IV.4.1.1 Purpose of exhaust transition device is to carry the LP turbine load, guide to exhaust flow into horizontal steam duct, transfer of force and moments and compensation of thermal movement and transmission device from rectangular turbine flange to circular Air Cooler Condenser duct flange. The exhaust transition Device for Air Cooled Condenser shall consist of following:</p> <ul style="list-style-type: none"> (a) Welded connection to LP turbine. (b) Fabricated carbon steel structure with inner parts. (c) Welded Connection to Horizontal Steam Duct. (d) Connection provision for TDBFT exhaust (2 no.), LP Heater 1, Steam by Pass and vents. (e) Foundation and Bearing Supports for the exhaust Box. <p>IV.4.1.2 The ETD shall be designed for full vacuum and internal pressure of 0.5 bar.</p> <p>IV.4.1.3 The ETD shall be connected via welded joint with LP Outer casing, No bellow is allowed in the ETD. No drain / condensate are allowed inside ETD.</p> <p>IV.4.1.4 The ETD shall rests on a bearing system on the foundation.</p> <p>IV.4.1.5 Terminal points for ETD shall be as per Annexure- IV.4-1.</p> <p>IV.4.2 Exhaust steam pipeline system</p> <p>IV.4.2.1 The exhaust steam pipeline system refers to the pipelines (Towards A-row) between outlet of ETD / HotBox as described under clause IV.4.1 under LP cylinder of steam turbine (Terminal point as per Annexure IV.4-1) and steam distributing pipes connected to each row of ACCs as well as sliding/fixed supports, spring supports/hangers, expansion compensator, associated isolating valves and overhaul</p>		
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		IV.4.2.3 The layout, elevation and requirement of the exhaust duct system shall be made suitable as per the drawing no ANNEXURE-IV.4-1. The outer diameter of the exhaust duct should not exceed 9200mm.		
IV.4.2.4 The Bidder shall indicate the number of pressure relief valves equipped for ACC system and exhaust steam volume, diameter, set pressure and installation position of each pressure relief valve in case pressure relief valve are provided.				
IV.4.2.5 Main Steam Ducting IV.4.2.5.1 The ducting carrying steam between the connection at ETD / Hot Box and the ACC shall be of welded steel construction as per HEI, arranged in conjunction with the ACC tube arrangement to ensure proper distribution of steam over the whole of the parallel flow tube banks, so as to prevent the stagnation of steam at any point. The ducting from the steam turbine shall be designed with suitable turning vanes to prevent internal erosion.				
IV.4.2.5.2 The ducting shall be of adequate size to reduce the pressure drop along the length of the steam path to a practical minimum. Guide vanes shall be used within large diameter bends in the ducting. The ducting shall be stiffened and supported to ensure that it remains tight and free from distortion at all pressures and stresses to which it may be subjected during transport, handling and operation. Special precautions shall be taken to ensure that the completed ducting is free from distortion due to welding or any other cause. Suitable provision in the form of flexible joints, bellows and sliding feet shall be made to allow thermal expansion of the ducting over the full range between minimum ambient air temperature and the maximum steam temperature condition.				
IV.4.2.5.3 Internal silencers or baffle plates shall be provided in the steam duct to reduce the noise levels within the steam duct. If required to meet the requirements of allowed noise levels additional noise attenuation/heat insulation cladding is required then this shall be taken into consideration in the design of the ACC cooling capacity.				
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सामग्री सूची संख्या को अधिकृतिक करना है SUPERSEDES INVENTORY NO.	<p>IV.4.2.5.4 The main duct is also designed to provide connection points. Location of the connections shall be finalised at the stage of Detailed Engineering.</p> <p>IV.4.2.5.5 Any exhaust duct drainage shall be by means of gravity rather than a pumped system to the drains collecting vessel.</p> <p>IV.4.2.5.6 Access by means of hinged and bolted manhole doors shall be provided for the internal inspection of the steam ducting. Each external manhole shall have a permanent external access ladder and work platform, internal access shall also be provided where necessary. The number and positions of manholes shall take into account the blockage of baffle plates at the turn inside the duct and convenience in replacing the seal rings at both sides of the isolating valve (if any). All staircases shall have resting and landing platform preferably for every 5m height.</p>				
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	<p>IV.4.2.7 Steam Header The steam header shall be provided to convey steam between the manifolds and the bundles of an ACC row. Arrangement may also be required in the steam header to accommodate thermal expansion.</p> <p>IV.4.2.8 Design Data to be considered for Exhaust steam pipeline system:</p> <table border="1"> <tr> <td>i.</td> <td>Material of construction</td> <td> MS as per IS:2062 or equivalent (plates should be normalised for thickness 12 mm or above Flanges : ASTM A 105 Fittings : ASTM A 105 / A234 WPB Stud / Nuts : A 193 B7 / A 194 2H </td> </tr> </table>			i.	Material of construction
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स्थायिकार एवं गोपनीय


इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में होना आवश्यक हो न किया जाए।


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COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अत्यन्त रूप से गोपनीय की श्रेणी में संश्लेषण नहीं होना चाहिए।		<p>IV.4.3.13 The pumps shall be designed for maximum continuous operation conditions at grid frequencies between 47.5 – 51.5 Hz.</p> <p>IV.4.3.14 Suitable Lifting arrangement for drain pumps shall be provided by Bidder.</p> <p>IV.4.3.15 The pumps shall operate satisfactorily when delivering varying quantities from minimum to maximum flow at all possible operating conditions.</p> <p>IV.4.4 Tube Bundles</p> <p>IV.4.4.1 Heat Exchanger of Air Cooled Condenser shall be comprised of finned tube bundles arranged on A-frame structure. A bundle shall consist of finned tubes, only Single Row Tube design shall be acceptable, the details of tube to tube sheet joint shall be furnished by Bidder at the time of detailed engineering. Connections are of welded type.</p> <p>IV.4.4.2 The total finned-tube system needs to accommodate expansion and contraction with changes in thermal loads. Cooling fins shall be designed to withstand the cleaning water jet pressure.</p> <p>IV.4.4.3 Materials of construction for tubes shall be Aluminum clad (from outside) carbon steel plates. The thickness of the aluminum layer of the base tube plate shall not be less than 70µm; the total thickness of this clad plate shall not be less than 1.5mm. Aluminum-clad tubes shall be finned with aluminum or Aluminum alloy fins brazed to the tubes, the fin thickness after brazing shall be more than or equal to 0.25mm.</p> <p>IV.4.4.4 The process of cladding shall be high pressure rolling of the aluminium and carbon steel strips which are compressed to form a bond. Pre-treatment of strips and heat treatment of bond shall be ensured. Bidder to indicate the list of sub-vendors and manufacturing process for the aluminum clad steel strips alongwith the Bid.</p> <p>IV.4.4.5 Base tube formed shall be cleaned prior to fin brazing.</p> <p>IV.4.4.6 The weld location on the base tube of the single-row flat tube shall be provided with anticorrosion treatment and the base tube weld shall ensure 30 years service life.</p>							
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सामग्री सूची संख्या को अधिकृतित करना है	SUPERSEDES INVENTORY NO.	<p>IV.4.4.7 The finned tubes shall be designed for the full vacuum and internal pressure of 0.5 bar and 5% area margin shall be provided over the required area.</p> <p>IV.4.4.8 Each tube bundle shall be leak test at a pressure of at least 1.3 times the design internal pressure or vacuum drop test on the tube bundle shall be conducted.</p> <p>IV.4.4.9 Type test for performance (Heat transfer coefficient) of tube bundles of type and size offered for this project shall be conduct which shall be witnessed by BHEL. Procedure shall be submitted by Bidder for BHEL approval.</p> <p>IV.4.4.10 The design shall prevent the formation of overcooled or dead zones in the ACC. The Bidder shall state tube dimensions and material in its proposal.</p> <p>IV.4.4.11 The Bidder shall provide details of the method of attaching tubing to the steam supply headers and condensate collectors and of attaching fins to the tubing, together with details of materials employed, differences in fin spacing, etc at the time of offer.</p> <p>IV.4.4.12 A movable access ladder/work platform shall be provided for accessing the steam supply header manholes and instrumentation without the requirement to erect scaffolding.</p> <p>IV.4.5 Cooling air system The complete cooling air system (fan assembly , motor and gearbox) will operate outdoors and shall be able to adapt to the natural environment of the region where the plant site is located. The fan shall adopt axial-flow fan and shall be equipped with supporting bridge, air-guide duct, grid guard, etc. Fan motor shall be supplied as per the details specified elsewhere in the specification. The complete cooling air system consists of the following main elements:</p> <ul style="list-style-type: none"> • Multi-bladed fan mounted on fan hubs • Speed reduction gear box • Electric motor • Fan bell / Fan ring • Fan protection screen • Instrumentation and All necessary accessories. <p>Each cooling air condenser cell shall be separated by a wall and arrangement shall be made such that all main components of separate cell shall be lifted via hoist and beam for maintainance.</p>													
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सामग्री सूची संख्या को अधिष्ठापित करना है SUPERSEDES INVENTORY NO.	<p>arrangement shall be provided to improve the entering airflow characteristics upstream of the fan.</p> <p>IV.4.5.1.3 The Bidder shall verify that the fans and the ACC will perform in minimum and maximum density inlet air environments, including those associated with warm weather conditions, plus a recirculation allowance.</p> <p>IV.4.5.1.4 Fan blades shall be FRP / Glass fiber-reinforced plastic or equivalent and fan hubs & fan shaft shall be hot dip galvanized steel. The bolts for fixing of the fan blades on the hub shall be 1401 SAE grade. This shall be confirmed in material test certificate. The angle of fan blade shall be adjustable at standstill. Fan blade and hub assemblies shall be designed to facilitate adjustment of blade pitch following installation and operation in the ACC. Each fan blade shall be equipped with a leading edge protection. Fan blade fastening equipment to be provided.</p> <p>IV.4.5.1.5 The construction of fan blades shall have a proven performance record. Evidence shall be provided in support of the same.</p> <p>IV.4.5.1.6 The principle of bonding between fan shell and fan shaft shall be of proven technology with a proven record. Evidence shall be provided in support of the same.</p> <p>IV.4.5.1.7 Record of fan blade and hub assemblies must be maintained and communicated with the shipment of separate fan blades and hubs. Replacement fan blades shall be manufactured in such a fashion as to be interchangeable, without adverse impacts to static balancing.</p> <p>IV.4.5.1.8 Fan blade systems and operations will be designed so that there are no natural frequencies set up between the intended operations of the fans and the ACC structure itself. The first critical speed of the fan assembly units shall lie at least 25% above maximum operating speed.</p> <p>IV.4.5.1.9 Fans shall be capable of operating at 110% of their design operating speeds.</p> <p>IV.4.5.1.10 The inlet fan rings/ fan bells shall be fabricated from multi-segmented FRP. The inlets to each fan shall be protected with a screen capable of preventing objects such as local birds, entrained paper, plastic bags, and the like from being carried into the rotating fan assemblies and also protect the space & all installations below the ACC platform in case of fan or equipment failure. The fan system installation, including inlet bell, shall result in fan tip clearances not to exceed the performance and installation guidelines set forth by the fan manufacturer. The fan bell discharge mouth shall be flushed with fan deck top metal sheeting.</p> <p>IV.4.5.1.11 The fan shall be able to adapt to continuous and intermittent operation, fan operation shall not cause any excessive vibration of its surrounding structure or ACC, the use of anti-vibration pads is not foreseen. The fan shall be provided with vibration protection switch, this switch shall adopt mechanical</p>			पृष्ठ का Page 31 of 129	
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>instrument with reset button and this button shall be provided in a place accessible to the operating personnel so as to make operation convenient. The fan unit shall be convenient in servicing and maintenance.</p> <p>IV.4.5.1.12 The noise levels of the fan, the gearbox and the motors shall be guaranteed in accordance with the requirements defined in the specification.</p> <p>IV.4.5.1.13 The characteristic fan performance curve shall relate static pressure, rate of flow, blade pitch and fan input break horsepower. The operating point and brake horsepower for the designed ambient temperature and maximum ambient temperature shall be shown separately. Torque speed curve alongwith the fan characteristic performance curve as per above shall be furnished. The fan total static pressure shall include pressure losses as per HEI.</p> <p>IV.4.5.1.14 Blade pitch angle shall be indicated by the vendor.</p> <p>IV.4.5.1.15 Bidder to conform that the rating of motor is adequate for driving the fan with rated capacity under continuous service.</p> <p>IV.4.5.1.16 Fan tip speed shall not excited 60 m/s (12000 fpm).</p> <p>IV.4.5.1.17 The fan blade shall be statically balanced.</p> <p>IV.4.5.1.18 The fan hub and fan assembly shall be dynamically balanced at speeds at least equal to operating speed in accordance with DIN ISO 1940 to meet balancing grade G 6.3.</p> <p>IV.4.5.1.19 The blade, blade shanks, hub, and entire fan assembly shall be coated suitably for the protection against air brone dust particles and environment conditions.</p> <p>IV.4.5.1.20 Bidder to furnish the data sheet of fan as per Annexure-IV.4-3 and IV.4-4 during detailed engineering</p> <p>IV.4.5.1.21 Fan test for performance, noise and vibration at full speed, 110%, 75%, 50% and 25% speed shall be conducted as per procedure. The test of first Fan assembly shall be witnessed by BHEL. Procedure of performance testing to be submitted to BHEL</p> <p>IV.4.5.1.22 On site testing of entire cooling air system incl. fan, gearbox, motor and frequency converter (if provided) will be conducted and include the following:</p> <ul style="list-style-type: none"> • Cooling air system adjustment, safety and monitor system test • Cooling air system overall characteristic measurement • Cooling air system vibration & noise measurement test. 		
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	<p>IV.4.5.2 GEAR BOX:</p> <p>IV.4.5.2.1 The gearbox matched with the fan shall be of parallel vertical shaft helical gear type, the design service factor or application factor shall not be less than 2.0</p>		
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सामग्री सूची संख्या को अधिकारित करना है SUPERSEDES INVENTORY NO.	<p>lube oil sump temperature measurement device, lube oil pressure switch, Fan & motor to gear box coupling.</p> <p>IV.4.5.2.17 The transmission efficiency of the gearbox shall not be lower than 97%. The design life of gearbox under the condition of full load and total speed shall not be less than 100,000 hours and the gearbox shall use anti-friction bearing with metal shield.</p> <p>IV.4.5.2.18 Performance test at no load for smooth running, gear ratio, noise level etc. as per procedure of first Gear box shall be witnessed by BHEL. Procedure of performance testing is to be submitted for BHEL.</p> <p>IV.4.5.2.19 Datasheet of Gearbox to be furnished as per Annexure IV.4-5</p>		
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company स्वाधिकार एवं गोपनीय इस प्रस्ताव में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अनावरण के बिना की जाये, जो कि सम्पत्ति के हित में होना आवश्यक है।	<p>IV.4.6 Condensate Storage tank (CST) and associated pipeline</p> <p>IV.4.6.1 The condensate tank shall be a horizontal cylindrical tank sized using the design steam turbine flow rate, drains coming from drain pot, normal and emergency make-up and other connections. The condensate is to be drained out of the condensate collector and flows by gravity towards the condensate tank. List of connections shall be finalized at the time of detailed engineering. Sealing between condenser streets is to be assured by separate drain lines and drain points at the condensate receiving tank well below water level. The drain lines shall be designed and routed to prevent drain condensate from flashing.</p> <p>IV.4.6.2 The condensate tank shall be mounted on a steel structure on higher elevation</p> <p>IV.4.6.3 Condensate collection tank material shall be as per ASTM A285 Gr. C or equivalent with proper drainage provision.</p> <p>IV.4.6.4 Condensate tank shall be designed as per ASME Sec VIII, Div1.</p> <p>IV.4.6.5 Corrosion allowance shall be as per HEI for ACC.</p> <p>IV.4.6.6 Bidder to provide all galleries, crawl beams, all around platforms, handrails, staircase necessary for safe and efficient access to condensate storage tank for erection, operation and maintenance.</p> <p>IV.4.6.7 Stand pipes with necessary instruments with water level gauges and isolation valves shall be provided for condensate storage tank.</p> <p>IV.4.6.8 Maximum oxygen content of condensate at the outlet of condensate storage tank shall be 0.015 cc/litre over entire load range. To achieve the same proper deaeration system for make-up water and condensate shall be provided. Bidder to provide the detailed write-up for the same in its proposal.</p>		
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सामग्री सूची संख्या INVENTORY NO.	<p>IV.4.6.9 Provision of large box type screening structure with anti-vortex baffling at each CST connection to suction of condensate pumps to be provided by Bidder.</p> <p>IV.4.7 Piping, valves, Fittings and accessories</p> <p>IV.4.7.1 The design, fabrication, assembly and testing of pipes, fittings, flanges, piping components etc. shall generally conform to the requirements of ASME/ ANSI B 31.1.</p> <p>IV.4.7.2 This includes complete piping system along with valves, fittings and accessories for the entire system.</p> <p>IV.4.7.3 The specification of piping, valves and fittings shall be as per Annexure-IV.4-7.</p> <p>IV.4.7.4 All structural steel work pipe, rack pipe, support shall be designed as per IS 2062 or equivalent standard.</p> <p>IV.4.7.5 Valves shall be installed in accessible position otherwise suitable operating platform/valve operating mechanisms shall be provided for access to the valves.</p> <p>IV.4.7.6 Wherever required for safety purpose, locking devices shall be furnished with the valves.</p> <p>IV.4.7.7 Wherever ASTM 106 Gr. B/Gr. C or A - 105 material are used the maximum carbon content shall be limited to 0.30% (Max.).</p> <p>IV.4.7.8 All pipings shall be provided with vents at the highest point and drains at the lowest points. The drain valves shall be provided with threaded plugs.</p> <p>IV.4.7.9 Suitable support, hanger, anchor, saddles, clamps etc. shall be provided for the piping system. The entire piping system shall be effectively earthed.</p> <p>IV.4.7.10 Adequate provision for allowing smooth movement due to thermal expansion shall be provided. Suitable slope shall be given in all pipelines towards drain point.</p> <p>IV.4.7.11 All drains and vents shall be provided with isolating valves.</p> <p>IV.4.7.12 The pipeline shall be designed and installed as per ANSI/ ASME B 31.1 and all pipes shall be supplied with test certificates. However, bidder shall follow the following pipe schedule as minimum requirement for system design.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Nominal Pipe size in inches</th> <th>Schedule as per ANSI</th> </tr> </thead> <tbody> <tr> <td>1" , 2" & 4"</td> <td>Sch 80</td> </tr> <tr> <td>6"</td> <td>Sch 40</td> </tr> <tr> <td>8", 10", 12" and 14"</td> <td>Sch 30</td> </tr> </tbody> </table>	Nominal Pipe size in inches	Schedule as per ANSI	1" , 2" & 4"	Sch 80	6"	Sch 40	8", 10", 12" and 14"	Sch 30
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16" and higher

Sch 20

The above requirements shall be applicable for carbon as well as stainless steel piping.

IV.4.7.13 Standard pipes, fittings and connecting pieces shall be acid pickled, neutralized, passivated or blasted on the inside, cleaned (the abrasive material removed), primed on the outside and fitted with end caps prior to supply by bidder. The inside surface of the pipe material must be minimum comply with the requirements of Rust Level C as per ISO 8501. This means a steel surface from which scale has rusted away or can be scraped off but which has only the initial signs of pitting visible to the naked eye. If the pipes, fittings and connecting pieces are blasted, the quality of the inside surfaces must be at least Sa 2½ or "very thorough blasting" i.e scales, rust and coatings must be removed to the extent that residual material on the surface of the steel remains visible only as a slight shadow as a result of the discoloration produced by the pores.

IV.4.8 Valves

The specification of valves shall be as per Annexure-IV.4-7.

IV.4.9 Name plates / identification tags

Name plates / identification tags shall be stainless steel. Labels and Name plates of all equipment shall be in English. Annexure-IV.4-8 shall be followed.

IV.4.10 Air Evacuation package

IV.4.10.1 Provision of 2X100% air evacuation pumps for holding operation per unit along with all accessories and instrumentation. One (01) start up hogging vacuum pump per unit with suitable capacity under standard conditions i.e. 760 mm of Hg. (abs) and 21.1 deg. C) at 10 inch (254 mm) of Hg (abs) shall be provided. All other requirements shall be as per specification HE 57016 at Annexure IV.4-6.

IV.4.10.2 Single/ two stage liquid ring type with both stages(if two stages pumps provided) mounted on a common shaft

IV.4.10.3 Each pump and its accessories shall be mounted on common steel base plate. Pump shall be connected to motor by flexible coupling

IV.4.10.4 Heat Exchangers shall be shell and tube type, alternatively-plate type heat exchangers with SS 316 plates and 20% area margin on plates also acceptable.

IV.4.10.5 Material of tube-stainless steel type 316 and material of shell and tube plates as M.S. type ASTM-A285 Gr. C properly coated.

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इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अत्यन्त रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ती के हित में हानिकारक हो न किया जाए।

दिनांक एवं हस्ताक्षर
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सामग्री सूची संख्या
INVENTORY NO.

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00		जांचकर्ता CHECKED BY	ROHIT BANSAL	28.04.2014

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सामग्री सूची संख्या को अधिनिर्दिष्ट करना है SUPERSEDES INVENTORY NO.	<p>IV.4.10.6 For U-tube type : Removable tube bundle provision.</p> <p>IV.4.10.7 Provision of air ejector (if required) for abnormal operation and selection of suitable compression ratio for air ejector</p> <p>IV.4.10.8 Suitable Handling arrangement for pumps (holding & Hogging) shall be provided by Bidder.</p> <p>IV.4.10.9 The stand-by pump (holding) shall cut in automatically in case running pump fails or when condenser pressure falls back to a preset value</p> <p>IV.4.10.10 No cavitation under all operating conditions without air ejector.</p> <p>IV.4.10.11 Noise levels should not exceed limitations as specified in Section of General Technical Requirements and vibration levels shall be Zone A of ISO 10816.</p> <p>IV.4.10.12 Pumps (holding) shall be sized as per latest HEI requirements. Capacity of each pump(holding) in free dry air at standard condition with condenser operating at design pressure of 1 inch (25.4 mm) of Hg (abs) and sub cooled to 4.17 degC below temperature corresponding to absolute suction pressure shall not be less than 30 scfm (51 cu.m per hour under standard condition i.e 760 mm of Hg (abs) and 21.1 deg. C) .</p> <p>IV.4.10.13 The capacity of each pump (holding& hogging) during hogging shall not be less than 800 scfm (1360 cu.m/per hour) under standard conditions i.e. 760 mm of Hg. (abs) and 21.1 deg. C) at 10 inch (254 mm) of Hg (abs).</p> <p>IV.4.10.14 All three pumps (2X100% Holding+ 01 Hogging pump) running together should be able to bring condenser pressure from atmospheric pressure to 10 inch of Hg (abs) within 30 minutes.</p> <p>IV.4.10.15 Type test for Cavitation and Wet air test for each type of vacuum pump (Holding & hogging) as detailed in specification HE 57016 at Annexure IV.4-6.</p> <p>IV.4.10.16 Motor requirements as per Sec-V- Electrical shall supersedes the requirements specified in HE57016 (Annexure-IV.4-6).</p> <p>IV.4.11 Condensate extraction pumps (Not in Bidder's scope of supplies)</p> <p>IV.4.12 Pipe racks, pipe trestles</p> <p>The pipes in ACC area shall be routed on trestle at a height of about 8.0 m bottom of steel(B.O.S.). The pipes routed above ground on trestles shall have minimum clearance of 8.0m bottom of steel(B.O.S.). at road crossings.</p> <p>Structures shall be designed for the most critical combinations of dead loads, imposed loads, equipment loads, crane loads, piping loads (static and dynamic), wind loads, seismic loads and</p>		पृष्ठ का Page 37 of 129
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स्वामित्विकार एवं गोपनीय इस प्रबंध में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।			
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SUPERSEDES INVENTORY NO.	<p>temperature loads. In addition, loads and forces developed due to differential settlement shall also be considered.</p> <p>IV.4.13 Access</p> <p>IV.4.13.1 General – Access refers to all stairways, platforms, ladders, manways, etc. to safely access, inspect, maintain, and operate the ACC.</p> <p>IV.4.13.2 Recommended Access Type and Locations:</p> <p>a. Minimum 4 no.s staircase shall be provided for Air Cooled Condensers of all three units. These stair cases shall be equally distributed on the front (adjacent to TG Hall) and back side (towards switchyard) of the ACC and landing level of staircase shall match with the landing level of the elevator provided for ACCs. Further the all ACC units shall be interconnected with each other by providing suitable platform & structure.</p> <p>b. Grating platforms connecting the ACC cells and accessing the mechanical equipment.</p> <p>c. Walkway around the ACC perimeter at the tube-bundle condensate collection level</p> <p>d. Access to steam duct rupture disc and any valve that may require manual operation</p> <p>e. Access to instrumentation and sensor locations, including all permanent and temporary test wells or ports</p> <p>f. Hinged doorways with automatic closure and full seals for access to each end of a street.</p> <p>g. Rolling staircase for access to upper surfaces of tube bundles and cleaning spray nozzles.</p> <p>IV.4.13.3 All stairways, catwalks, and platforms will be equipped with kick plates and handrails as well as intermediate piping and base plates.</p> <p>IV.4.14 Handling systems (EOT crane, Monorail and Hoist)</p> <p>IV.4.14.1 Suitable EOT Crane/HOT crane/monorail beams with hoists/chain pulley blocks of adequate capacity to meet the erection and maintenance requirements are to be provided by the Bidders for handling equipments in ACC package.</p> <p>IV.4.14.2 Monorail Beams – This includes a full run of monorail along the length of any entire “street,” i.e., along each condensing run. It shall be designed to suspend and convey the weight of a fan blade bundle, fan hub, fan motor, or gearbox. The beams will have</p>
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सामग्री सूची संख्या को अधिचिह्नित करना है SUPERSEDES INVENTORY NO.	<p>sufficient overhang on one end of the ACC to raise or lower removed or replacement assemblies to and from grade to the fan elevation level.</p> <p>IV.4.14.3 EOT crane, Monorail Trolley and Hoist – The monorail trolley and hoist, include a movable roller-type assembly and electric hoist with movable operating panel and cable to run the length of a condensate run or street. This scope shall include all items / devices needed to comply with the requirements indicated Annexure IV.4-2.</p>		
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. स्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं अनावरण रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।	<p>IV.4.15 Semi-Automatic Tube Cleaning system</p> <p>IV.4.15.1 The scope of supply shall include all design, supply, installation and commissioning of the semi-automatic tube cleaning system as required to clean the exterior finned tubes from all the foreign matter.</p> <p>The complete system shall consist of high pressure pumps including electric motor, motor control center, local panel, safety valves, filters, pipes, valves and instrumentation etc. necessary for reliable and safe operation of the system.</p> <p>Bidder to indicate the requirement of cleaning water as per Annexure IV.8-3.</p> <p>IV.4.15.2 Design Requirements and Data</p> <p>For each condenser street cleaning rig shall be provided on both side of the A-frame. The cleaning rig shall consist of vertical tube running along the length of the tube bundle. Horizontal pipes with spray nozzles shall be connected to the vertical tube and movement of vertical tube shall be controlled using motor to achieve full area of tube bundles to be cleaned.</p> <p>The rig shall be fitted with monorail and caster wheel in order to move the rig along the complete length of Condenser Street.</p> <p>Cleaning can either be done during shutdown or during operation of the ACC.</p> <p>IV.4.16 METALLIC EXPANSION JOINTS</p> <p>IV.4.16.1 The design, material, construction, manufacture, inspection, testing and performance of the expansion joints shall comply with the currently applicable requirement of EJMA, Boiler and Pressure Vessel Code Section III, ANSI B-31.1 and all statutes, regulations and safety codes.</p> <p>IV.4.16.2 The bellow shall be hydraulically or roll formed from perfect cylinders of single ply, 304 grade stainless steel. It shall have internal sleeves of the same material as the bellows and installed with sufficient clearance to allow full rated deflection</p> <p>IV.4.16.3 Type test of Metallic Expansion joints</p> <p>IV.4.16.3.1 Following tests (Type tests) shall be carried out for metallic expansion joints as per the procedures given in EJMA. Each type shall be witnessed by BHEL.</p> <ol style="list-style-type: none"> Life Cycle Test : the number of test cycles shall be minimum 10,000 cycles Meridional yield-rupture testing 		
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SUPERSEDES INVENTORY NO.	<p>g. Check the interference of hangers and supports with structures, piping, cable trays, other hangers etc.</p> <p>IV.4.18 Supports and Attachments</p> <p>a. All hangers and supports shall be provided with suitable linkage to permit swing, adjustment during installation and subsequent readjustment. Adjustment facilities shall be such as to minimise the use of temporary supports during installation and during cold pull procedure, if any.</p> <p>b. Supports of field run piping shall be done in accordance with applicable codes mentioned above such that the stresses, forces and moments on connected equipment and supporting steel are kept to a minimum and within allowable values. The field work shall be simple and shall present a neat appearance.</p> <p>c. All sliding surfaces of supports and restraint shall have teflon lining on one surface coming in contact with stainless steel lining on the other surface. Teflon and stainless material shall be supplied by bidder.</p> <p>d. All pipe hangers and supports shall be designed to carry the weight of the piping, fittings, thermal insulation, self weight of the hanger assembly and medium transported or test medium whichever is heavier.</p> <p>e. NTPC specification as per Annexure- IV.4-7 shall be read in conjunction with above requirement.</p> <p>IV.4.19 Spring hangers</p> <p>a. Constant load hangers shall generally be used when vertical displacement exceeds 40mm or where the supporting effort variation available exceeds 25%.</p> <p>b. Constant load hangers shall be of moment-coil spring counter balanced design. Variable spring hanger shall be of helical spring design. Spring hangers shall be constructed such that complete release of piping load is impossible in case of spring misalignment or failure.</p> <p>c. Constant load hangers shall have a minimum field adjustment range of +15% of the load. The total travel for constant load hangers shall be design travel plus 20% but in no case shall the difference between total travel and design travel be less than 50mm. The supporting effort variation shall not exceed 3.5% throughout the travel range of constant load hangers.</p> <p>d. Variable spring hangers shall have supporting efforts variation of not more than 25% throughout the total travel range.</p> <p>e. All springs shall remain under compression throughout their operating regime and never under tension.</p> <p>f. Spring hangers shall have provision for locking the hangers in any position of the travel.</p>	सामग्री सूची संख्या को अधिकारित करना है	COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	इस प्रवेश में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ती के हित में हानिकारक हो न किया जाए।
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सामग्री सूची संख्या को अधिष्ठापित करना है SUPERSEDES INVENTORY NO.		<p>g. Spring hangers shall be adjusted to the cold position before shipment and blocked in that position. The cold and hot position shall be clearly marked on the travel indicator scales.</p> <p>h. All spring hangers shall be locked before performing the pneumatic test. The locking shall be removed before the line is placed under operation.</p> <p>i. NTPC specification as per Annexure- IV.4-7 shall be read in conjunction with above requirement.</p>	पृष्ठ का Page 42 of 129										
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company		<p>IV.4.20 Restraints and Anchors</p> <p>a. All anchors shall be designed for direct rigid fastening to the structural steel member.</p> <p>b. Anchors, guides and restraints shall be capable of withstanding the forces & moments due to thermal expansion and dynamic effect.</p> <p>IV.4.21 Elevators</p> <p>IV.4.21.1 Two (2) no. conventional type elevator having capacity of 10 persons for three units of ACC shall be provided by Bidder. One elevator shall be located between ACC of unit 1 and 2 and another between ACC of unit 2 and 3.</p> <p>IV.4.21.2 The scope shall include all items / accessories, service along with all electrical equipment etc. required to meet all design, installation, operation, safety, protection and other requirements of IS: 14665 (latest edition) (all parts), 'Lift' and service lifts'. This scope shall include all items / devices needed to comply with the requirements indicated Annexure IV.4-2. The scope shall include but not limited to the following:</p> <p>(a) 1 No. fireman's switch for each elevator.</p> <p>(b) Machinery supporting Beam.</p> <p>IV.4.21.3 Complete erection, testing and commissioning including all testing and commissioning materials, consumables and other tools and tackles required for erection.</p> <p>IV.4.21.4 To obtain necessary local administration permits / approvals and make arrangements for inspection and tests required thereby.</p> <p>IV.4.22 Thermal Insulation</p> <p>Specification for thermal insulation shall conform to the requirements as per Annexure IV.4-</p>											
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सामग्री सूची संख्या को अधिकृतित करना है	IV.4.23 Spares
SUPERSEDES INVENTORY NO.	IV.4.23.1 Mandatory Spare Parts

- a) The contract shall include in this scope the supply of mandatory spares for one ACC unit as per below:

SI no.	Description	QTY
1	Condenser air evacuation pump motor	1 no. of each type
2	Condenser air evacuation pump motor bearing	1 set of each type
3	Condenser air evacuation pump (Complete set of spare internals required to form one pump except for pump body)	1 Set
4	fans	5 % of total no.
5	Gear Box	5 % of total no.
6	Condenser manhole cover gaskets (Set comprising of complete replacement for one condenser)	1 set

In addition to above, bidder to furnish the list of mandatory spares as essential based on his experience along with the price of each item.

b. Mandatory Spares for Elevator

SI no.	Description	QTY
1	Friction block	2 Nos. of each type
2	Guide roller of each type	20% of total population or 3 Nos. whichever is high
3	Contactors	2 Nos. of each type
4	Bushing (for door front)	2 sets of each type
5	Pinion	2 nos. of each type
6	Worm gear spares	
6a	'O' rings	4 Sets*

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			00		जांचकर्ता CHECKED BY	ROHIT BANSAL		28.04.2014

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सामग्री सूची संख्या को अधिकारित करना है	SUPERSEDES INVENTORY NO.	<table border="1"> <tr> <td style="width: 10%;">6b</td> <td style="width: 60%;">Sealing ring of each type</td> <td style="width: 30%;">4 Sets*</td> </tr> <tr> <td>7</td> <td>Time device/Timer card(as applicable)</td> <td>2 nos. of each type and rating</td> </tr> <tr> <td>8</td> <td>Rectifiers</td> <td>2 nos. of each type and rating</td> </tr> <tr> <td>9</td> <td>Overcurrent relay (if applicable)</td> <td>3 nos. of each type and rating</td> </tr> <tr> <td>10</td> <td>Resistor (if applicable)</td> <td>3 nos. of each type and rating</td> </tr> <tr> <td>11</td> <td>Fuses/MCB/Switches (as applicable)</td> <td>2 nos. of each type & rating</td> </tr> <tr> <td>12</td> <td>Limit switches Push button</td> <td>3 nos. of each type and rating complete replacement of one elevator</td> </tr> <tr> <td>13</td> <td>Contact device (if applicable)</td> <td>3 nos. of each type and rating</td> </tr> <tr> <td>14</td> <td>Brake motor/ magnet(as applicable)</td> <td>1 nos. of each type and rating</td> </tr> <tr> <td>15</td> <td>Transmitters and Receiver</td> <td>2 nos. of each type</td> </tr> <tr> <td>16</td> <td>Bearings</td> <td>2 nos. of each type & size</td> </tr> <tr> <td>17</td> <td>Roller</td> <td>3 nos.of each type</td> </tr> <tr> <td>18</td> <td>Spares for brakes for each type</td> <td></td> </tr> <tr> <td>18a</td> <td>Magnetic coil</td> <td>3 nos.</td> </tr> <tr> <td>19</td> <td>Brake disc & pad</td> <td>2 nos of each type *</td> </tr> <tr> <td>20</td> <td>Floor indicator Display unit</td> <td>1 nos of each type</td> </tr> <tr> <td>21</td> <td>Electrical Actuator</td> <td>1 Nos of each type and rating</td> </tr> <tr> <td></td> <td colspan="2"> Note :- * One set means one complete replacement for an equipment. </td> </tr> </table>		6b	Sealing ring of each type	4 Sets*	7	Time device/Timer card(as applicable)	2 nos. of each type and rating	8	Rectifiers	2 nos. of each type and rating	9	Overcurrent relay (if applicable)	3 nos. of each type and rating	10	Resistor (if applicable)	3 nos. of each type and rating	11	Fuses/MCB/Switches (as applicable)	2 nos. of each type & rating	12	Limit switches Push button	3 nos. of each type and rating complete replacement of one elevator	13	Contact device (if applicable)	3 nos. of each type and rating	14	Brake motor/ magnet(as applicable)	1 nos. of each type and rating	15	Transmitters and Receiver	2 nos. of each type	16	Bearings	2 nos. of each type & size	17	Roller	3 nos.of each type	18	Spares for brakes for each type		18a	Magnetic coil	3 nos.	19	Brake disc & pad	2 nos of each type *	20	Floor indicator Display unit	1 nos of each type	21	Electrical Actuator	1 Nos of each type and rating		Note :- * One set means one complete replacement for an equipment.	
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 इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं
 अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया
 जाए।


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सामग्री सूची संख्या को अतिरिक्तिकर करना है SUPERSEDES INVENTORY NO.	<p>IV.4.23.2 Recommended Spare Parts</p> <p>In addition to the mandatory spare parts, the bidder is required to submit, as part of the contract, a complete list of recommended spare parts for the equipment supplied, based on his experience and according to the selected design and operation, which are essential for a plant operation of ten (10) years. The BHEL/ employer is free to order these recommended spare parts at any time.</p>						
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company स्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अत्यन्त रूप से गोपनीय की तरह प्रयोग, जो कि कंपनी के हित में होना आवश्यक हो न किया जाए।	<p>IV.4.23.3 General Requirement for Spare Parts</p> <p>All spare parts shall be handed over to the employer piece by piece corrosion-protected and sealed air tight in transparent heavy duty plastic. The individual spare parts must be labeled with an identification number, easily legible from the outside. The contractor shall follow a system of designing and tagging each and every spare part for ease of store keeping.</p> <p>Any spare parts furnished by the bidder in connection with the works under the contract shall be guaranteed to be free of manufacturing defects and shall upon any failure occurring within the Guarantee period (24 months) from their incorporation into the works, be replaced without cost to the employer.</p> <p>All spare parts must be prepared and protected for long term storage to preclude damage during this period. The storage requirements shall be submitted to the employer.</p> <p>IV.4.23.4 Long term Availability of Spares</p> <p>The bidder shall generate the long term availability of spares to the employer for the full life of the equipment covered under the contract. The bidder shall generate that before going out of production of spare parts of the equipment covered under the contract, he shall give the employer at least twelve (12) month advance notice so that the employer may order his bulk requirement of spares, if he so desires. The same provision shall also be applicable to the subcontractors. Further, in case of discontinuance of manufacturer of any spares by the bidder or his subcontractor, the bidder shall provide the employer, two years in advance, with full manufacturing drawing, material specification and technical information required by the employer for the purpose of manufacturer of such items.</p> <p>Further, in case of discontinuance of supply of the spares by the bidder or his subcontractor, the bidder shall provide the employer with full information for replacement of such spares with other equivalent makes, if so required by the employer.</p> <p>The bidder shall provide the employer with a "directory" of his subcontractors giving the addresses and other particulars of his subcontractors. The employer, if he so desires, shall has the right to procure the spares directly from subcontractor.</p> <p>IV.4.23.5 Start Up and Commissioning Spares</p> <p>Bidder shall supply all commissioning and start-up spares required for initial operation till the system is declared by Owner as having satisfactorily completed the Trial Operation. The supplier shall furnish a list of all such spares within 60 days from the date of letter of award and such list shall be reviewed by the purchaser / Owner and mutually agreed to. However, such review and</p>						
	सामग्री सूची संख्या INVENTORY NO.	Rev. no. 00	निर्माणकर्ता WORKED BY जांचकर्ता CHECKED BY	<table border="1"> <tr> <td>ASHISH GUPTA</td> <td>28.04.2014</td> </tr> <tr> <td>ROHIT BANSAL</td> <td>28.04.2014</td> </tr> </table>	ASHISH GUPTA	28.04.2014	ROHIT BANSAL
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स्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ती के हित में हानिकारक हो न किया जाए। COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	agreement will not absolve Supplier of his responsibility to supply all commissioning spares so that initial operations do not suffer for want of such spares.			
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सामग्री सूची संख्या को अधिकृतित करना है	SUPERSEDES INVENTORY NO.	<p>IV.6 Fabrication of structural steel work, walkways, stairways, intermediate landings, gratings and handrails and Ducts</p> <p>IV.6.1 Bidder shall supply pre-fabricated (shop fabricated) bolted structural steel materials for all structures including fan deck supporting structure, stair, exhaust duct supporting structures, elevator structures, pipe sleepers, pipe trestles, pipe racks in ready to erect condition. Only site erection and painting shall be performed at site. All the workmanship and finish shall be of the best quality and shall conform to the best approved method of fabrication. All materials shall be finished straight and shall be machined true and square as per applicable standard. All holes and edges shall be free of burrs. Shearing and chipping shall be neatly and accurately done and all portions of work exposed to view shall be neatly finished. Bidder shall inform the list of applicable standards for design, engineering and fabrication of structural steel in their technical offer.</p> <p>IV.6.2 Bolts, nuts, washers and other fastening material shall be shipped separately and applied suitable protective coating. All bolts, nuts and washers shall conform to the relevant national or international standards.</p>


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स्वत्वाधिकार एवं गोपनीय


इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अनावश्यक रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ती के हित में हानिकारक हो न किया जाए।


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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.		<p>work will not proceed without consent of Purchaser/ Owner/Authorized representative in writing.</p> <p>IV.7.1.3 The bidder shall submit to the BHEL/ Owner field welding schedule for field welding activities. The field welding schedule shall be submitted to the Purchaser/Owner alongwith all supporting procedures, like welding procedures, heat treatment procedures, NDT procedures etc., at-least thirty days before schedule start of erection work at site.</p> <p>IV.7.1.4 No material shall be despatched from the manufacturer's works without Material Despatch Clearance Certificate (MDCC) to be issued by Purchaser/owner.</p> <p>IV.7.1.5 All materials used or supplied shall be accompanied by valid and approved materials certificate tests and inspection report. These documents should be correlated with the supply having suitable identifications as per applicable standards/ codes.</p> <p>IV.7.1.6 All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME B & PV code Section-IX or other International equivalent standard acceptable to the Purchaser/Owner.</p> <p>IV.7.1.7 All welding/brazing procedures shall be submitted to the Purchaser/Owner or its authorized representative for approval prior to carrying out the welding/ brazing.</p> <p>IV.7.1.8 All brazers, welders and welding operators employed on any part of the contract either in Contractor's/his Sub-Contractors works or at site or elsewhere shall be qualified as per ASME B & PV Code Section IX or other equivalent International Standards acceptable to the Purchaser/Owner.</p> <p>IV.7.1.9 Test results of qualification tests and specimen testing shall be furnished to the Purchaser/Owner for approval. However where required by the Purchaser/Owner, tests shall be conducted in presence of Purchaser/Owner/Authorised representative.</p> <p>IV.7.1.10 Latest statutory/regulatory requirements wherever applicable shall be followed.</p> <p>IV.7.1.11 All gas cut weld edge preparations on alloy steels/stainless steels shall be examined by MPI/DPT.</p> <p>IV.7.1.12 All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.</p> <p>IV.7.1.13 All non-destructive examination shall be performed in accordance with written procedures (as per International standard). The NDT operator shall be qualified as per SNT-TC-IA (of the American Society of non-destructive examination). NDT shall be recorded in a report which includes details of procedure, equipment used, result evaluation, job data, identification of personnel employed and details of co-relations the test report with the job.</p>	पृष्ठ का Page 50 of 129				
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स्वत्वाधिकार एवं गोपनीय इस प्रबंध में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अनावरण के बिना स्वत्वाधिकारक हो न किया जाए।							
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>IV.7.1.14 All the sub-vendors proposed by the bidder for procurement of major bought out items, list of which shall be as per Document no. HXE/SK/10829/3, if required by purchaser/ owner, the bidder has to submit vendor details like their manufacturing and testing facilities, past experience, technical leaflets/ catalogue to demonstrate proven capabilities to supply the required item. Such vendor approval shall not relieve the Contractor from any obligation, duty or responsibility under the contract.</p>		
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	<p>IV.7.1.15 Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Purchaser/Owner/authorized representative.</p> <p>IV.7.1.16 Deviations, if any, to this specification or subsequent to agreed Quality Plan, must be documented and referred to purchaser/owner for written approval.</p> <p>IV.7.1.17 Bidder shall carry out test at site to prove to the Owner that each equipment of the system complies with requirements stipulated and is erected in accordance with requirement as specified in the specification. Field quality plan to be submitted by bidder. Before the plant is put to conduct trial to demonstrate to the employer that each item of the plant is capable of correctly performing the functions for which it was specified. These trials may be conducted concurrently with those required under commissioning sequence.</p> <p>IV.7.2 Major items to be covered in detail in Quality Plan are listed below along with minimum checks to be covered.</p> <p>IV.7.2.1 DRAIN PUMPS</p> <ol style="list-style-type: none"> Material tests as per specification requirements. Dimensional check of all the component parts including surface finish, axial and radial runout of shaft etc. during manufacture and assembly. Non-destructive examination as follows: <ol style="list-style-type: none"> Impeller/wear ring/ shaft sleeve/Casing/ diffuser: MPI/DPT. Shaft, Couplings and other active components: UT and DPT. Fabricated Pump components: Dye penetration test on weld. Hydro-test of pump casing shall be done as per approved drawing/standard. Dynamic balancing as per ISO-1940, Gr 6.3 of assembled rotor. Performance test as per Hydraulic Institute Standards and approved data sheet over entire operating range at rated speed, including vibration and noise measurement. Type test of NPSH (R) of drain pump to be carried out and same shall be witnessed by BHEL. 		
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सामग्री सूची संख्या को अधिकारित करना है SUPERSEDES INVENTORY NO.	<p>h. SITE TEST: Tests shall be carried out to ensure satisfactory parallel operation, vibration and noise level tests shall also be performed.</p> <p>IV.7.2.2 FABRICATION OF PRESSURE PARTS (DUCT, ELBOW, CONDENSATE TANK & DRAIN POT)</p> <p>a. DPT/MPI on all welds shall be carried out as per ASME/equivalent agreed standard.</p> <p>b. Edge preparation for welds to be carried out at site shall be checked by DPT/ magnetic particle inspection method before dispatch.</p> <p>c. All welds shall be visually examined. Radiographic examination of 10% of butt welds shall be carried out as per ASME/equivalent agreed standard. Same shall be applied for site welds.</p> <p>d. In case of fabricated flanges, welds shall be checked by 100% radiographic/ ultrasonic and 100% magnetic particle inspection methods to ensure freedom from internal and surface defects.</p> <p>e. Plates greater than 40 mm thick shall be ultrasonically tested as per ASTM A 435 or equivalent.</p> <p>f. Drain pot and condensate tank shall be hydraulically tested at 1.3 times the design pressure.</p> <p>g. Leak tightness test to be carried out as per HEI.</p> <p>IV.7.2.3 STRAINERS/FILTERS</p> <p>a. Check for mesh size shall be carried out.</p> <p>b. Suitable NDT shall be carried on body and cover to ensure freedom from defects as per agreed norms.</p> <p>c. Strainer body shall be subjected to hydraulic test at 1.3 times the design pressure.</p> <p>d. Pressure drop tests shall be carried out at rated flow to demonstrate, pressure drop in clean conditions, clogged conditions and filter characteristics.</p> <p>IV.7.2.4 RUPTURE DISC</p> <p>a. Test certificates of raw material for disc and safety head shall be tested as per applicable material standards and shall be tested for internal defects as per relevant code.</p> <p>b. Burst testing of Disc shall be done as per approved drawing/ standard. (1 no. per lot)</p>		
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इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।


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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>g. Type test of tube bundle to be carried out as per section IV.4.</p> <p>IV.7.2.8 FAN</p> <p>a. Test certificates of raw material for hub, disc and blades shall be tested as per applicable material standards and shall be tested for internal defects as per relevant code.</p> <p>b. Blades static balancing and fan hub & fan assembly shall be dynamically balanced at speeds at least equal to operating speed in accordance with DIN ISO 1940 to meet balancing grade G 6.3.</p> <p>c. Ultrasonic test shall be carried out on shaft material diameter ≥ 40 mm as per ASTM 435 or equivalent.</p> <p>d. Moment weight test on blades, blade track variation, tip clearance shall be checked as per approved drawing.</p> <p>e. In case of fabrication of hub and blades by welding, the weld joint shall be 100% RT tested as per agreed norms.</p> <p>f. Fan performance, noise & vibration test to be carried out at works as per agreed procedure. The performance test of first Fan shall be witnessed by BHEL.</p> <p>g. On site testing of air cooling system shall be performed as per clause IV.4.5.1.22 of specification.</p> <p>IV.7.2.9 GEAR BOX</p> <p>a. Test certificates of raw material for casing, pinion, input shaft, output shaft and gear wheel shall be furnished as per applicable material standards.</p> <p>b. Kerosene Leak test of Gear Box casing shall be done as per approved drg.</p> <p>c. Heat Treatment of Gears, pinions and shaft shall be done as per manufacturer's standard for checking the HT cycle verification, hardness, case hardening depth etc. to be furnished.</p> <p>d. Performance test at no load for smooth running, gear ratio, noise level etc. as per procedure of first Gear box shall be witnessed by BHEL. Procedure of performance testing is to be submitted to BHEL.</p> <p>IV.7.2.10 SPRING ASSEMBLY (IF REQUIRED)</p> <p>a. Static load testing of the springs shall be carried out and spring characteristics shall be drawn and verified.</p>
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 अत्यन्त रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया
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सामग्री सूची संख्या को अधिनिर्दिष्ट करना है SUPERSEDES INVENTORY NO.	<p>b. Surface defect test shall be carried out on all the springs after coiling and heat treatment.</p> <p>c. Surface cleaning shall be checked prior to painting and check for thickness of painting shall be carried out.</p> <p>IV.7.2.11 Hangers and Supports</p> <p>Hanger and support shall be tested as per the requirement specified in Annexure-IV.7-3.</p> <p>IV.7.2.12 VALVES AND FLANGES</p> <p>a. The testing of conventional valves shall be as per Annexure-IV.7-3.</p> <p>b. Testing requirement for control valves shall be as per ANSI B 16.31.</p> <p>c. Functional test on control valves shall include check for hysteresis, opening & closing time and correct action on loss of supply. Functional test on stop valve shall include check for stroking time, limit switch setting etc. These tests shall be carried out alongwith respective actuators and accessories.</p> <p>d. Type test for discharge coefficient, relieving capacity and pressure drop co-efficient as applicable shall be carried out. Report of same shall be furnished.</p> <p>e. Flanges shall be forged or made from single plates as far as possible. For flanges 50 mm and above in thickness ultrasonic testing shall be carried out on plates as per ASTM A-435/ A 435 M-90. In case of forged flanges, ultrasonic testing shall be carried out as per ASTM E-388.</p> <p>f. Flanges shall be completely stress relieved after welding in accordance with specified codes.</p> <p>g. In case of fabricated flanges, all welds shall be subjected to 100% radiographic examination after rough machining. Sealing welds after back gouging and final run of welded joints shall be subjected to magnetic particle dye penetrant examination.</p> <p>IV.7.2.13 Structural steel like columns, girder, beams and truss etc.</p> <p>a. Standard Quality plan for structural steel fabrication and erection for applicable areas shall be as per Annexure-IV.7-2. Vendor to prepare the quality plan inline with same and shall be furnished for review to purchaser.</p> <p>b. Steel plates / sections to be used shall be tested for chemical and mechanical properties as per relevant specification and shall be supplied with mill test certificates.</p> <p>c. Plates of 40 mm thickness and above shall be subjected to ultrasonic test as per ASTM 435 or equivalent to check the presence of laminations if any.</p>			पृष्ठ का Page 55 of 129
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<ul style="list-style-type: none"> Erection manuals Commissioning procedure Storage instructions at site 		
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JUNCTION BOX													
No. of ways	12/24/36/48/64 with 20 % spares terminals												
Material and thickness	4mm thick Fiberglass Reinforced Polyester/2 mm CRCA steel sheet.												
Type	Screwed at all four corners for door												
Colour	RAL7035												
Degree of Protection	IP55												

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The brackets, bolts, nuts, screws, glands required for erection shall be of Stainless Steel and included in Bidders scope of supply.

VI.1.4.4 CONDUITS

All rigid conduits, couplings and elbows shall be hot dipped galvanised rigid mild steel in accordance with IS: 9537 Part-I and Part-II. The conduit internal and external surface shall have continuous zinc coating with an overcoat of transparent enamel lacker or zinc chromate. Flexible conduit shall be heat resistant lead coated galvanised steel with water leak, fire and rust proof protected.

Conduits from each Junction Box to local ACC control Room shall also be in Bidders scope.

VI.1.4.5 CABLE TRAYS/ROUTING

All cables/tubes shall run on cable trays. These cable trays shall be made out of galvanised MS and shall be of sheet steel of 2.5 mm thick.

Suitable cable clamps shall be supplied for binding the cables / tubes at every 500 mm.

A minimum distance of 400 mm shall be kept between instrument / signal cables and power cables.

Cable Trays and Cable trays Routing along with all cable Accessories to the local ACC control room shall be in Bidder Scope.

VI.2 SPECIFICATION OF INSTRUMENTATION CABLE

VI.2.1 COMMON REQUIREMENTS

PROPERTY	REQUIREMENT
Operating Voltage	225 V (peak value)
Codes and standard	All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1, IS-8784, IS-10810 (latest editions) and

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SUPERSEDES INVENTORY NO.	
सामग्री सूची संख्या को अधिकारित करता है	

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Continuous operation suitability	their amendments read along with this specification.
Marking	At 70 deg. C for all types of cables a. Progressive automatic on-line sequential marking of length in meters to be provided at every one meter on outer sheath. b. Marking to read 'FRLS' to be provided at every 5 meters on outer sheath. c. Durable marking at intervals not exceeding 625 mm shall include manufacturer's name, insulation material, conductor's size, number of pairs, voltage rating, type of cable, year of manufacturer to be provided on outer sheath.
Allowable Tolerance on overall diameter	+/- 2 mm (maximum) over the declared value in data sheet
Variation in diameter	Not more than 1.0 mm throughout the length of cable.
Ovality at any cross- section	Not more than 1.0 mm

CAGE-CLAMP suitability	To be provided
Colour	The outer sheath shall be of blue colour.
Others	Repaired cables shall not be acceptable.

VI.2.2 SPECIFIC REQUIREMENTS

TYPE	F & G CABLE
A. CONDUCTORS	
Cross Section Area	0.5 sq. mm
Conductor material	Annealed bare copper
Colour code	As per VDE-815
Conductor Grade	Electrolytic
No & dia of strands	7x0.3 mm (nom)
Max. conductor loop resistance per Km (in ohm) at 20 deg. C	73.4

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	B. INSULATION	
	Material	Extruded PVC type YI 3
	Thickness in mm(Min/Max)	0.25/0.35
	Volume Resistivity (Min) in ohm-cm	1 x 10 ¹⁴ at 20 deg. C & 1x10 ¹¹ at 70 deg. C
	C. PAIRING & TWISTING	
	Max. lay of pairs (mm)	50
	Single layer of binder tape on each pair provided	YES
	Bunch (Unit Formation) for more than 4P	To be provided
	Conductor /pair	To be provided
	D. SHIELDING	
	Type of shielding	Al-Mylar tape
	Individual pair shielding	To be provided for F-type cable
	Minimum thickness of Individual pair shielding	0.028mm (28 micron)
	Overall cable assembly shielding	To be provided
	Minimum thickness of Overall cable assembly shielding	0.055 mm (55 micron)
	Coverage Overlapping	20%
	Drain wire provided for individual shield	Yes (for F - type) Size- 0.5 sq.mm
	Drain wire provided for overall shield	Yes, Size- 0.5 sq. mm, No of strands-7, Dia. of strands-0.3mm, Annealed Tin coated copper
	E. FILLERS (if applicable)	
	Non-hygroscopic, flame retardant	To be provided

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SUPERSEDES INVENTORY NO. सामग्री सूची संख्या को अधिकारित करता है	Flammability	Shall pass flammability as per IEEE-383 read in conjunction to this specification
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सामग्री सूची संख्या को अधिकृतिक करना है SUPERSEDES INVENTORY NO.	VI.2.3 CABLE DRUM:
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Type: Non-returnable wooden drum (wooden drum to be constructed from seasoned wood free from defects with wood preservative applied to entire drum) or steel drum.

Length 1000 m \pm 5% for up to & including 12 pairs
500 m \pm 5% for above 12 pairs

Cables shall be suitable for laying in conduits, ducts, trenches, racks and underground buried installation. Spliced / Repaired cables are not acceptable.

Penetration of water resistance and impact resistance shall be as per IEC standard.

VI.2.4 INSTRUMENTATION CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY


The cable interconnection philosophy to be adopted shall be such that extensive grouping of signals by large scale use of field mounted Group Junction Boxes (JBs) at strategic locations (where large concentration of signals are available) is done and consequently cable with higher number of pairs are extensively used. The details of termination to be followed are mentioned in the given Table A.

TABLE A: CABLE TERMINATION TO BE FOLLOWED

Application		Type Of Termination		Type Of Cable
FROM (A)	TO (B)	END A	END B	
Valves/dampers drives (Integral Junction box)	Local group JB	Plug in connector	Post mount cage clamp type.	G
Transmitters, Process Actuated switches mounted in LIE/LIR	Local Junction box	Plug in connector	Cage clamp (Rail mount) type.	F,G

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सामग्री सूची संख्या को अधिकारित करना है SUPERSEDES INVENTORY NO.	RTD heads	Local junction box	Plug in connector	Cage clamp (Rail mount) type.	F
	RTD	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	F
	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/LIR/ MCC/SWGR	Group JB	Cage clamp (Rail mount) type.	Cage clamp (Rail mount) type.	F,G

Notes

- Normally 10% spare cores shall be provided when the numbers of pairs of cables are more than four pairs.
- For analog signals, individual pair shielding & overall shielding & for Binary signals, only overall shielding of instrumentation cables shall be provided.

VI.2.5 INSTRUMENTATION CABLE INSTALLATION AND ROUTING

Cables shall be segregated as per IEEE Std.-422. In vertically stacked trays, the higher voltage cable shall be in higher position and instrumentation cable shall be in bottom tier of the tray stack. The distance between instrumentation cables and those of other system shall be as follows:

From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm
From 415V tray system	-	610 mm
From control cable tray system	-	305 mm

Cables shall terminate in the enclosure through cable glands. All cable glands shall be properly gasketed. Sealing (to prevent ingress of dust entry and propagation of fire) shall be provided for all floor slots used for cable entrance.

All cables shall be identified by tag. Nos. provided at both the ends as well as at an interval of 5 meters.

The cables emanating from redundant equipment/devices shall be routed through different paths. The above segregation of cables & wiring for redundant equipments/devices shall be in accordance with IEEE-Std-422.

VI.2.6 CABLE LAYING AND ACCESSORIES


- Cables shall be laid strictly in line with cable schedule.
- Identification tags cables: Indelible tags to be provided at all terminations, on both sides of wall or floor crossing, on each conduit/duct/pipe entry/exit, and at every 20 m in cable trench/tray.


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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.		<ol style="list-style-type: none"> 3. Cable tray numbering and marking: To be provided at every 10m and at each end of cable way & branch connection. 4. Joints for less than 250 Meters run of cable shall not be permitted. 5. Buried cable protection With concrete slabs; Route markers at every 20 Meters along the route & at every bend. 	पृष्ठ का Page 73 of 129						
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company स्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं अनावरण रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।		<p>VI.3 SYSTEM DESIGN</p> <p>VI.3.1 GENERAL</p> <p>The work shall be consistent with modern power plant practices and shall be in compliance with all applicable codes, standards, guides, statutory regulations and safety requirements in force.</p> <p>It is to be noted that where equipment or system for the generating units are described, it shall be understood that the quantities described are to be provided per unit basis, i.e., identical sets to be furnished by the Contractor for each of the units unless specifically indicated otherwise</p> <p>VI.3.2 REDUNDANCY CRITERIAL OF SENSORS</p> <p>Redundancy of components and systems shall be dictated by safety considerations in critical applications and also the availability criteria of the control system.</p> <p>Triple redundancy or sensors and transmitters shall be provided for critical control /Protection application. Double redundancy shall be provided for less critical control & interlock and single sensor/transmitters for alarm & monitoring purpose. Separate Cables are to be provided for dual/triple redundant instruments used for protection.</p> <p>VI.3.2.1 TRIPLE MEASUREMENT SCHEME</p> <p>Triple measurement scheme for analog/binary inputs employing three independent transmitters connected to separate tapping points shall be employed for the most critical measurements. Triple sensors shall be provided for Instruments required for auto starting of pumps or pump tripping due to very low level of water.</p> <p>VI.3.2.2 DUAL MEASUREMENT SCHEME</p> <p>For other binary and analog inputs required for modulating control, protection and interlock purpose of other equipment etc., min. dual sensors shall be provided. Dual measurement scheme for analog inputs employing two independent transmitters, connected to separate tapping points/temperature element shall be employed for the remaining measurements used for analog control functions. NOTE: Dual sensing devices are required for de-aerator level and separator level.</p>							
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 इस प्रवेस में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं
 अत्यन्त रूप से गोपनीय की तरह प्रयोग, जो कि सम्पत्ती के हित में होना आवश्यक हो न किया
 जाए।


दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद क्रय विनिर्देश PRODUCT PURCHASE SPECIFICATION	HE 57067
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SUPERSEDES INVENTORY NO.	<p style="text-align: center;">VI.5 SPECIFICATION OF FIELD INSTRUMENTS</p> <p style="text-align: center;">VI.5.1 GENERAL</p> <p>The contractor shall provide electronic transmitters, control valves and analysers with HART protocol for maintenance, diagnostics and record keeping.</p> <p>All the primary Instruments like Microprocessor based transmitters including temperature transmitters employing HART protocol, RTDs, Ultrasonic flow Transmitter / Impact Head type flow elements for CW flow, transducers, Ultrasonic / Guided Radar type level transmitters, Pressure/Diff. Pressure/Temperature/Flow/Level transmitters & Gauges, Flow Sensing Elements(Orifice Plates, Flow Nozzles, Impact Head Type Elements, Coriolis Type Flow Measuring System etc.) , Ultrasonic Flow Transmitters , positive displacement type flow transmitters , Magnetic Flow meter, Vibration sensors, key phasor, etc. shall be provided on as required basis meeting functional redundancy, available and reliability requirements.</p> <p>For temperature elements including bearing / winding temp of motors / pumps temperature transmitters shall be provided, with philosophy as defined below:</p> <ol style="list-style-type: none"> i) Rail mounted/ Rack mounted (Dual input Field mounted temperature transmitters)/Field Bus Compatible temperature transmitters for temperature elements (for all the temperature elements being procured by the contractor) are to be provided by the contractor. ii) Contractor shall provide at least one dual input transmitter for temperature measurements being used in trip/protection/major interlock of Major auxiliaries. Eg. when three/two temperature measurement points are being used to for monitoring one bearing temperature, both elements of one duplex temperature element is to be connected to one dual input temperature transmitter. iii) Remaining temperature transmitters are to be Single Input DIN rail mounting type, mounted in JBs. <p>The Bidder shall furnish all instrumentation control equipment and accessories as per technical specifications, ranges, makes and model numbers approved by the Owner during detailed engineering. When more than one device utilizes the same measurement or control signal, the transmitter or other signal source shall be equipped to provide all signal requirements without affecting the accuracy.</p> <p>All instruments, devices and accessories furnished by the Bidder as per this specification shall be designed and constructed to perform normally and meet all guarantee when subjected to the</p>
सामग्री सूची संख्या को अधिनिर्दिष्ट करना है	

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		जांचकर्ता CHECKED BY	ROHIT BANSAL	28.04.2014

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सामग्री सूची संख्या को अधिकारित करना है SUPERSEDES INVENTORY NO.	<p>environmental and service conditions. The necessary root valves, impulse piping, drain cocks, gauge zeroing cocks, valve manifolds and all other accessories required for mounting/erection of all local field instruments shall be provided by Bidder as per approved hook up drawings.</p> <p>All field instruments shall be weatherproof, drip tight, dust tight and splash proof suitable for use under outdoor ambient conditions prevalent in the subject plant. All field-mounted instruments shall be mounted in suitable locations where maximum accessibility for maintenance is achieved. The enclosures of all electronic instruments shall conform to IP-65 unless otherwise specified (Explosion proof for NEC class 1, Division 1 area) and an anti-corrosive paint shall be applied to the field mounted enclosures / instruments.</p> <p>Following minimum requirement of field instruments shall be fulfilled by Bidder (whichever applicable):</p> <ol style="list-style-type: none"> 1. Level switches / pressure switches / flow switches etc. for Alarms / Interlocks /Protection. 2. Pressure switches at inlet, outlet of individual pumps and discharge header of pumps for protection and auto start / stop & alarms. 3. Level Transmitters for sump/tank level high/normal/ low/very low interlocks. 4. Level Transmitters for open sump/ tank/bunker/vessel/heaters. 5. Pressure gauges and temperature gauges 6. DPG & DPS across the filters/strainers. 7. Tapping points/test points shall be provided. 8. All RTDs shall be Duplex. 9. Temperature Transmitters for all temperature measuring instruments. 10. All Field Instruments used in acid or alkaline atmosphere shall be with standard Anti-corrosion coating i.e. the combination of Polyurethane and epoxy resin baked coating (ANSI/ISA-71.04). 11. All primary instruments installed at "Minus level or Floor" shall be with protection class of IP68. 12. Transmitters (all type) for monitoring & controls purpose. 13. Vibration switches for protection from vibration of fan/motor/gearbox. 14. Instruments for Drain pot Level Control. 15. 3 no. guided wave radar type level transmitters and pressure transmitters including JB/LIR for each condensate Storage tank. <p>Field switches will be micro switch type with auto reset. Switches will have NO and NC contacts. Switch contacts shall be snap acting, SPDT, hermetically sealed, potential-free with a minimum contact rating of 240 V AC, 5A.</p> <p>The instrumentation and control equipment shall have high electro-magnetic and radio frequency interference Immunity and shall not be affected by portable radio transmitters operated in the vicinity of the equipment. Any limitations shall be stated.</p>			पृष्ठ का Page 76 of 129
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>All transmitters, switches etc. shall be suitable grouped together and mounted inside Local Instrument Racks (LIRs). LIRs complete with all fittings, mountings and accessories etc. are to be provided by contractor as on required basis.</p> <p>VI.5.2 TEMPERATURE MEASUREMENTS</p> <p>Temperature gauges and elements shall be provided with SS316 tapered thermowells capable of withstanding the greatest shocks and vibrations that can be imposed upon them in the system piping without deterioration..</p> <p>RTDs shall be of duplex, 4 wire type made with 100 ohm platinum resistance elements.</p> <p>VI.5.3 PRESSURE MEASUREMENTS</p> <p>Pressure transmitters shall be with integral mounted two valve manifolds up to line pressure of 40 bar. Above 40 bar the pressure instruments shall be supplied with adaptor flanges.</p> <p>All pressure transmitters will be capable of withstanding their body rating conditions without permanent damage or loss of calibration.</p> <p>VI.5.4 LEVEL MEASUREMENTS</p> <p>Differential pressure transmitters shall be used in general. Float and tape type level transmitters shall be used for big storage tanks. The accuracy shall be better than 0.04% or better.</p> <p>Displacer type level transmitters wherever used shall be 24V DC powered, with isolated 4-20 mA DC output signals. Displacer type level transmitter shall be of torque tube type. The accuracy shall be better than 0.5%.</p> <p>For measurement of Condenser/Hotwell level, LP heaters level Guided Radar type level instruments shall be provided.</p> <p>For measurement of level of tanks/vessels/ pumps containing oil, chemicals or water, Ultrasonic type level transmitters shall be provided. However, any other type of level transmitters shall be acceptable only if there are constraints on account of process/equipment/device for having an effective measurement using the above. The acceptability shall be subjected to Employers approval.</p> <p>VI.5.5 TRANSMITTERS</p> <p>All transmitters shall be SMART, analogue two-wire type, capable of driving an output Impedance of 600 ohms minimum at 24 V DC, and will be generally powered from the control system I/O cards and provided with integral digital display in percentage or engineering units. All 4-20 mA output</p>												
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SUPERSEDES INVENTORY NO.	signals from transmitters/ other control system shall be able to drive minimum 500 ohms load resistance.
सामग्री सूची संख्या को अधिनिर्दिष्ट करना है	<p style="text-align: center;">VI.5.6 CONTROL VALVE ACCESSORIES AND DEVICES</p> <p>Refer Annexure VI.4.6 for details.</p> <p>The following accessory equipment shall be provided for control valves:</p> <p>VI.5.6.1 AIR LOCKS:</p> <p>Air locks shall be designed to shut off the diaphragm loading airline if the supply air pressure to the associated pilot or Positioner fails. Air locks shall be of the automatic reset type and shall be furnished with alarms.</p> <p>VI.5.6.2 HAND WHEELS:</p> <p>Hand Wheels shall be provided. Hand wheels shall be side mounted unless specified to be top mounted. However the mounting shall be as decided during engineering to offer maximum accessibility.</p> <p>VI.5.6.3 LIMIT SWITCHES:</p> <p>Valves shall be provided with limit switches. Switches shall have not less than two normally open and two normally closed contacts in both open and close directions. Electrical rating of the limit switch contacts shall be 240V AC, 5 amps or 220V DC, 0.5 amps. The enclosures of the limit switches shall be as per NEMA-4 Standard. Limit switches shall be constructed to withstand the temperatures encountered in the actual service. Limit switches shall be factory mounted on the valves with provisions for adjusting the mounting. Limit/micro switches can be offered as an integral part of Smart valve positioner.</p> <p>VI.5.6.4 SMART VALVE POSITIONER:</p> <p>Control valve actuators for modulating and throttling services shall be provided with HART protocol based smart electro pneumatic valve positioner to ensure accuracy & repeatability of response. The valve Positioner shall be designed suitable for vibration and service conditions of a steam electric power station.</p> <p>The Positioner shall have the following features:</p> <ol style="list-style-type: none"> 1. Shall provide a pneumatic output signal of range 0.2 to 1.0 kg/cm² or as desired for the actuator. 2. Shall have integral type position transmitter, input & output gauges, local keypad, display, 4-20 mA input and 4-20 mA output for position indication in DCS.
सामग्री सूची संख्या को अधिनिर्दिष्ट करना है	<p style="text-align: center;">VI.5.6.1 AIR LOCKS:</p> <p>Air locks shall be designed to shut off the diaphragm loading airline if the supply air pressure to the associated pilot or Positioner fails. Air locks shall be of the automatic reset type and shall be furnished with alarms.</p> <p style="text-align: center;">VI.5.6.2 HAND WHEELS:</p> <p>Hand Wheels shall be provided. Hand wheels shall be side mounted unless specified to be top mounted. However the mounting shall be as decided during engineering to offer maximum accessibility.</p> <p style="text-align: center;">VI.5.6.3 LIMIT SWITCHES:</p> <p>Valves shall be provided with limit switches. Switches shall have not less than two normally open and two normally closed contacts in both open and close directions. Electrical rating of the limit switch contacts shall be 240V AC, 5 amps or 220V DC, 0.5 amps. The enclosures of the limit switches shall be as per NEMA-4 Standard. Limit switches shall be constructed to withstand the temperatures encountered in the actual service. Limit switches shall be factory mounted on the valves with provisions for adjusting the mounting. Limit/micro switches can be offered as an integral part of Smart valve positioner.</p> <p style="text-align: center;">VI.5.6.4 SMART VALVE POSITIONER:</p> <p>Control valve actuators for modulating and throttling services shall be provided with HART protocol based smart electro pneumatic valve positioner to ensure accuracy & repeatability of response. The valve Positioner shall be designed suitable for vibration and service conditions of a steam electric power station.</p> <p>The Positioner shall have the following features:</p> <ol style="list-style-type: none"> 1. Shall provide a pneumatic output signal of range 0.2 to 1.0 kg/cm² or as desired for the actuator. 2. Shall have integral type position transmitter, input & output gauges, local keypad, display, 4-20 mA input and 4-20 mA output for position indication in DCS.
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VI.5.6.5 SOLENOID VALVES:

TYPE AND CONSTRUCTION	
Control Valves	3-way single solenoid
Power Cylinders	5-way dual solenoid
MATERIAL	
Body	Brass/Steel
Seat	Stainless Steel
Bonnet Gasket	Teflon
Solenoid internal parts	316 SS /Forged Brass
COIL DETAILS	
Rating	Continuous
Voltage	24 V DC
Connection	Quarter (1/4) inch NPT (F.SCRD)


Solenoid valves shall be selected to incorporate body construction, trim materials, and internal arrangements suitable to the application and shall be acceptable to the Owner. Solenoid enclosures shall be NEMA-4 unless otherwise specified. Solenoid coils shall be Class-H High temperature construction and shall be suitable for continuous duty.

Each solenoid valve shall be furnished with form U internal valve arrangement, Class H high temperature coil, threaded conduit connection, and other electrical and mechanical requirements

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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>valves, valve manifolds, fittings and all other accessories required for proper installation & completeness of impulse piping system, sampling piping system and air supply system, shall be provided by the Contractor on as required basis.</p> <p>Impulse piping and sample piping shall be supported at an interval not exceeding 1.5 meters. Each pipe shall be supported individually using slotted angle mounted clamps with necessary fixtures. Tubing shall run in proper perforated trays with proper cover. Tubing shall be supported inside the trays by aluminium supports. Hangers and other fixtures required for support of piping and trays shall be provided, either by welding or by bolting on walls, ceilings and structures. Hanger clamps and other fastening hardware shall be of corrosion resistant metals and hot-dip galvanized.</p> <p>VI.5.6.12 ELECTRIC ACTUATORS WITH INTEGRAL STARTERS</p> <p>The actuators shall have integral starters along with over load relays with built in SPP (Single Phasing Preventer). Alternatively Smart actuators suitable for digital communication on 2 wire field bus shall also be acceptable.</p> <p>For further details, refer Annexure VI.4.6.12.</p> <p>VI.5.6.13 VIBRATION SENSORS</p> <p>Eddy current / piezoelectric type transducers shall be used. The sensors shall be either velocity or accelerometer type. However, the finally selected sensor type shall also depend on recommendation of the equipment manufacturer & suitable for application requirement which shall be finalised during detail engineering and without any extra price. Transducers shall be furnished in weatherproof housing suitable for field conditions.</p> <p>VI.5.7 MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)</p> <p>Measuring instruments/equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards and shall be subject to Employer's approval.</p> <p>Every panel-mounted instrument requiring power supply shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.</p> <p>All transmitters, sensors, and switches, Gauges for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance as well as for operator and management information (including all computation) of equipment in the system under the scope of specification shall be provided on as required basis with in quoted lump sum price. The Contractor shall furnish all Instrumentation / Control equipment & accessories under this</p>		
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स्थापितिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हो सकारक हो न किया जाए।			
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सामग्री सूची संख्या INVENTORY NO.	Rev. no. 00	निर्माणकर्ता WORKED BY ASHISH GUPTA जांचकर्ता CHECKED BY ROHIT BANSAL	28.04.2014 28.04.2014

विनाम एवं हस्ताक्षर SIGN & DATE		उत्पाद क्रय विनिर्देश	HE 57067
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COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	सामग्री सूची संख्या को अधिकारित करना है	The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, as on required basis. The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg./sq.cm.																		
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	coating
Over Pressure	150% of max. Operating pressure
Connection (Electrical)	Plug and socket type
Process connection	1/2 inch NPT (F)
Span and Zero	Continuous, tamper proof, Remote as well as adjustability manual from instrument with zero suppression and elevation facility.
Accessories	2 valve manifold for absolute & Gauge pressure transmitters, 3-valve manifold for vacuum pressure transmitters & where DP transmitters are being used for pressure measurement and 5 valve manifold for DP/Level/Flow applicable. -For hazardous area, explosions proof enclosure as described in NEC article 500
Diagnostics	Self-Indicating feature
Power supply	24V DC \pm 10%.
Adjustment/ calibration/ maintenance	From hand held calibrator/centralized PC based system (as applicable).

Note:

For primary air/ secondary air/flue gas applications, DP type transmitters shall be provided for pressure measurement.

LVDT type is not acceptable.

Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.

VI.5.7.2 GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER

Guided wave radar type level transmitters shall be provided for level measurements of the vessel under vacuum or low pressure applications.

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Power supply	24 VDC																		
Accuracy	5mm																		
Electromagnetic compatibility	Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2																		
Mounting	External cage mounting																		

VI.5.7.3 ULTRASONIC TYPE LEVEL TRANSMITTER

Features	Essential/Minimum requirement
Type of Transmitter	Non-contact Microprocessor based 2 wire type, HART protocol compatible Ultrasonic transmitter. Also refer note-3
Output signal	4-20mA DC (Analog) along with superimposed digital signal (based on HART protocol)
Sensor Accuracy	+/- 0.5% of calibrated span.
Sensor Repeatability	3mm or better
Power supply	24 V DC +/-10%
Temperature compensation	To be provided within transducer
Housing	Weather proof as per IP-55 with durable corrosion resistant coating
Adjustment/Calibration/maintenance	From hand held calibrators/ centralized PC based system (as applicable)
Zero and Span adjustment	Continuous, tamper proof, remote as well as manual adjustability from instrument. It shall be possible to calibrate the instrument without any level in the tank/sump

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	etc.																			
Sensor Material	Corrosion resistant material to suit individual application requirement																			
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Accessories	All weather canopy for protection from direct sunlight and direct rain. All mounting hardware and accessories required for erection and commissioning mounting fittings materials shall be SS 316. For hazardous area, explosion proof enclosure as described in NEC article 500.																			

Note:-

- 1) Contractor can also provide Radar type transmitter in place of ultrasonic transmitters subject to approval by Employer during detailed Engineering. Sonic frequency based transmitters can also be provided under "ultrasonic transmitters" category for solid / viscous applications.
- 2) The frequency used for Ultrasonic /sonic measurements shall be suitable for envisaged applications and this shall be supported by the standard product catalogue of the instrument manufacture.
- 3) Four wire type transmitters can also be provided subject to Employer's approval during detailed engineering stage. However, in such cases isolated 4-20mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 24V DC.

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These shall be suitable for mounting on DIN-rails in JB's. These temperature transmitters shall be the ones which are especially designed for DIN-rail mounting with IP 20 protection class. These shall have terminals for input/output provided on front side when mounted on DIN-rail.

Head mounted temperature transmitter with clamps to make it suitable for DIN-rail mounting shall not be acceptable under this category.

c. Dual-input Temperature Transmitter With Indicator:

These shall be suitable for mounting on pipes/ support. Indicator shall be provided with these transmitters. These transmitters shall have bump less change over facility to second sensor in case first sensor fails .This change-over is to be alarmed. Protection class shall be IP65 minimum.

d. Common requirements for each of the above type of temperature transmitters.

Output	2-wire (power supply from input card of Control system) with 4-20mA output with superimposed HART protocol signal.
Input	Same transmitter shall be capable to handle Pt-100 RTD, Thermocouples –K&R types (input type to be selectable at site through HART terminal)
Isolation	min. 500 V AC
EMC compatibility	as per EN 61326
Operating ambient temperature	0 to 85 deg. C (without indicator) 0 to 70 deg. C (with indicator)
Power supply	Compatible with input module of Control System.
Accessories	Mounting arrangements including clamps etc.

VI.5.8 MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)

Measuring instruments/equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards and shall be subject to Employer's approval.

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इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अनावरण रूप से किसी भी तरह प्रयोग, जो कि कम्पनी के हित में हानिकारक हो न किया जाए।

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VI.5.8.1 SPECIFICATION FOR ELECTRONIC TRANSMITTERS FOR PRESSURE, DIFF. PRESS AND DP BASED FLOW , LEVEL MEASUREMENTS

FEATURES	MINIMUM REQUIREMENTS
Type of Transmitter	Microprocessor based 2 wire type, Hart protocol compatible
Accuracy	± 0.1% of calibrated span (minimum) (upto turn down ratio of 10:1)
Output signal range	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol)
Turn down ratio	10:1 for vacuum/very low pressure applications. 5:1 for very high pressure application 30:1 for other applications

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COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	<table border="1"> <tr> <td>Stability</td> <td> $\pm 0.1\%$ of calibrated span for six months for Ranges up to and including 70 Kg/cm². $\pm 0.25\%$ of calibrated span for six months for Ranges more than 70 Kg/cm² (g) </td> </tr> <tr> <td>Zero and span drift</td> <td> $\pm 0.015\%$ per deg. C at max span. $\pm 0.11\%$ per deg. C at min. Span </td> </tr> <tr> <td>Load impedance</td> <td>500 ohm (min.)</td> </tr> <tr> <td>Housing</td> <td>Weather proof as per IP-55 with durable corrosion resistant coating</td> </tr> <tr> <td>Over Pressure</td> <td>150% of max. Operating pressure</td> </tr> <tr> <td>Connection (Electrical)</td> <td>Plug and socket type</td> </tr> <tr> <td>Process connection</td> <td>1/2 inch NPT (F)</td> </tr> <tr> <td>Span and Zero</td> <td>Continuous, tamper proof, Remote as well as adjustability manual from instrument with zero suppression and elevation facility.</td> </tr> </table>	Stability	$\pm 0.1\%$ of calibrated span for six months for Ranges up to and including 70 Kg/cm ² . $\pm 0.25\%$ of calibrated span for six months for Ranges more than 70 Kg/cm ² (g)	Zero and span drift	$\pm 0.015\%$ per deg. C at max span. $\pm 0.11\%$ per deg. C at min. Span	Load impedance	500 ohm (min.)	Housing	Weather proof as per IP-55 with durable corrosion resistant coating	Over Pressure	150% of max. Operating pressure	Connection (Electrical)	Plug and socket type	Process connection	1/2 inch NPT (F)	Span and Zero	Continuous, tamper proof, Remote as well as adjustability manual from instrument with zero suppression and elevation facility.
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स्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं अनावरण रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।	<table border="1"> <tr> <td>Accessories</td> <td> 2 valve manifold for absolute & Gauge pressure transmitters, 3-valve manifold for vacuum pressure transmitters & where DP transmitters are being used for pressure measurement and 5 valve manifold for DP/Level/Flow applicable. -For hazardous area, explosions proof enclosure as described in NEC article 500 </td> </tr> <tr> <td>Diagnostics</td> <td>Self-Indicating feature</td> </tr> <tr> <td>Power supply</td> <td>24V DC $\pm 10\%$.</td> </tr> <tr> <td>Adjustment/ calibration/ maintenance</td> <td>From hand held calibrator/centralized PC based system (as applicable).</td> </tr> </table>	Accessories	2 valve manifold for absolute & Gauge pressure transmitters, 3-valve manifold for vacuum pressure transmitters & where DP transmitters are being used for pressure measurement and 5 valve manifold for DP/Level/Flow applicable. -For hazardous area, explosions proof enclosure as described in NEC article 500	Diagnostics	Self-Indicating feature	Power supply	24V DC $\pm 10\%$.	Adjustment/ calibration/ maintenance	From hand held calibrator/centralized PC based system (as applicable).
Accessories	2 valve manifold for absolute & Gauge pressure transmitters, 3-valve manifold for vacuum pressure transmitters & where DP transmitters are being used for pressure measurement and 5 valve manifold for DP/Level/Flow applicable. -For hazardous area, explosions proof enclosure as described in NEC article 500								
Diagnostics	Self-Indicating feature								
Power supply	24V DC $\pm 10\%$.								
Adjustment/ calibration/ maintenance	From hand held calibrator/centralized PC based system (as applicable).								

Note:

For primary air/ secondary air/flue gas applications, DP type transmitters shall be provided for

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सामग्री सूची संख्या को अधिकृतित करना है	SUPERSEDES INVENTORY NO.	<p>VI.5.8.2 GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER</p> <p>Guided wave radar type level transmitters shall be provided for level measurements of the vessel under vacuum or low pressure applications.</p> <table border="1"> <tr> <td>Type</td> <td>Guided wave Radar</td> </tr> <tr> <td>Principle</td> <td>TDR (Time domain reflectometry)</td> </tr> <tr> <td>Probe Type & Material</td> <td>Coaxial, SS316/316L. If required, probe shall be suitable for overflow prevention.</td> </tr> <tr> <td>Signal o/p</td> <td>4-20mA with HART signal suitable for overflow prevention.</td> </tr> <tr> <td>Display</td> <td>Integral</td> </tr> <tr> <td>Power supply</td> <td>24 VDC</td> </tr> <tr> <td>Accuracy</td> <td>5mm</td> </tr> </table> <table border="1"> <tr> <td>Electromagnetic compatibility</td> <td>Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2</td> </tr> <tr> <td>Mounting</td> <td>External cage mounting</td> </tr> </table> <p>The transmitters shall be provided with IP-55 protection class with durable corrosion resistant coating.</p> <p>The transmitters shall be able to provide digital signals super imposed on 4-20 mA signal as per HART protocol.</p> <p>VI.5.8.3 ULTRASONIC TYPE LEVEL TRANSMITTER</p> <table border="1"> <tr> <td>Features</td> <td>Essential/Minimum requirement</td> </tr> <tr> <td>Type of Transmitter</td> <td>Non-contact Microprocessor based 2 wire type, HART protocol compatible Ultrasonic transmitter. Also refer note-3</td> </tr> <tr> <td>Output signal</td> <td>4-20mA DC (Analog) along with superimposed digital signal (based on HART protocol)</td> </tr> </table>	Type	Guided wave Radar	Principle	TDR (Time domain reflectometry)	Probe Type & Material	Coaxial, SS316/316L. If required, probe shall be suitable for overflow prevention.	Signal o/p	4-20mA with HART signal suitable for overflow prevention.	Display	Integral	Power supply	24 VDC	Accuracy	5mm	Electromagnetic compatibility	Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2	Mounting	External cage mounting	Features	Essential/Minimum requirement	Type of Transmitter	Non-contact Microprocessor based 2 wire type, HART protocol compatible Ultrasonic transmitter. Also refer note-3	Output signal	4-20mA DC (Analog) along with superimposed digital signal (based on HART protocol)
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 इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं
 अत्यन्त रूप से गोपनीय के हित में सुरक्षित रखना चाहिए।

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INVENTORY NO.

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SUPERSEDES INVENTORY NO. सामग्री सूची संख्या को अधिकारित करना है	<table border="1"> <tr> <td>Sensor Accuracy</td> <td>+/- 0.5% of calibrated span.</td> </tr> <tr> <td>Sensor Repeatability</td> <td>3mm or better</td> </tr> <tr> <td>Power supply</td> <td>24 V DC +/-10%</td> </tr> <tr> <td>Temperature compensation</td> <td>To be provided within transducer</td> </tr> <tr> <td>Housing</td> <td>Weather proof as per IP-55 with durable corrosion resistant coating</td> </tr> <tr> <td>Adjustment/Calibration/maintenance</td> <td>From hand held calibrators/ centralized PC based system (as applicable)</td> </tr> <tr> <td>Zero and Span adjustment</td> <td>Continuous, tamper proof, remote as well as manual adjustability from instrument. It shall be possible to calibrate the instrument without any level in the tank/sump etc.</td> </tr> <tr> <td>Sensor Material</td> <td>Corrosion resistant material to suit individual application requirement</td> </tr> <tr> <td>False signal tolerance</td> <td>Transmitter shall be capable of ignoring false echoes from internal tank/sumps obstructions such as pipes, heating coils or agitator blades. Also transmitter shall have adjustable damping circuitry</td> </tr> <tr> <td>Range</td> <td>Range of transmitter shall be capable of covering the complete level span of tank taking care of blocking distance, frequency attenuation due to surface, obstructions, vapors etc.</td> </tr> <tr> <td>Display</td> <td>LCD display with integral keypad to be provided</td> </tr> <tr> <td>Diagnostics</td> <td>Loss of echo alarm etc.</td> </tr> <tr> <td>Load Impedance</td> <td>500 ohms minimum</td> </tr> <tr> <td>Electrical Connection</td> <td>Plug and socket</td> </tr> <tr> <td>Accessories</td> <td>All weather canopy for protection from direct sunlight and direct rain. All mounting hardware and accessories required for erection and commissioning mounting fittings materials shall be SS 316. For hazardous area, explosion proof enclosure as described in NEC article 500.</td> </tr> </table>	Sensor Accuracy	+/- 0.5% of calibrated span.	Sensor Repeatability	3mm or better	Power supply	24 V DC +/-10%	Temperature compensation	To be provided within transducer	Housing	Weather proof as per IP-55 with durable corrosion resistant coating	Adjustment/Calibration/maintenance	From hand held calibrators/ centralized PC based system (as applicable)	Zero and Span adjustment	Continuous, tamper proof, remote as well as manual adjustability from instrument. It shall be possible to calibrate the instrument without any level in the tank/sump etc.	Sensor Material	Corrosion resistant material to suit individual application requirement	False signal tolerance	Transmitter shall be capable of ignoring false echoes from internal tank/sumps obstructions such as pipes, heating coils or agitator blades. Also transmitter shall have adjustable damping circuitry	Range	Range of transmitter shall be capable of covering the complete level span of tank taking care of blocking distance, frequency attenuation due to surface, obstructions, vapors etc.	Display	LCD display with integral keypad to be provided	Diagnostics	Loss of echo alarm etc.	Load Impedance	500 ohms minimum	Electrical Connection	Plug and socket	Accessories	All weather canopy for protection from direct sunlight and direct rain. All mounting hardware and accessories required for erection and commissioning mounting fittings materials shall be SS 316. For hazardous area, explosion proof enclosure as described in NEC article 500.
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सामग्री सूची संख्या को INVENTORY NO. अधिकृतित करना है	1) Contractor can also provide Radar type transmitter in place of ultrasonic transmitters subject to approval by Employer during detailed Engineering. Sonic frequency based transmitters can also be provided under "ultrasonic transmitters" category for solid / viscous applications.
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सामग्री सूची संख्या को INVENTORY NO. अधिकृतित करना है	2) The frequency used for Ultrasonic /sonic measurements shall be suitable for envisaged applications and this shall be supported by the standard product catalogue of the instrument manufacture.
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सामग्री सूची संख्या को INVENTORY NO. अधिकृतित करना है	3) Four wire type transmitters can also be provided subject to Employer's approval during detailed engineering stage. However, in such cases isolated 4-20mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 24V DC.
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VI.5.8.4 RESISTANCE TEMPERATURE DETECTOR (RTD)

Feature	Essential/Minimum Requirements
Type of RTD	Four wire, Pt-100 (100 Ohms resistance at zero degree Centigrade).
No. of element	Duplex
Housing/Head	IP-65/Diecast Aluminium. Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable). Plug in connectors are to be provided for external signal cable connection
Sheathing of RTD	Metal sheathed, ceramic packed
Calibration and accuracy	As per DIN-43760 Class-A for RTD
Characteristic	Linear with respect to temp, within $\pm 1/2$ percent of top range value
Accessories	Thermo well (as specified below) and shall be spring loaded for positive contacts with the well
Standard	DIN-43760 for RTD

NOTES:

The specifications for RTDs of winding/ bearings of motor/pump, can be as per their manufacturer standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. However the type of RTD shall be Pt100.

VI.5.8.5 TEMPERATURE TRANSMITTER

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COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	<p>a. Single Input Head mounted Temperature Transmitter</p> <p>These shall be suitable for mounting in the head of temperature element itself. The protection class of head of thermo well along with its plug-in connector shall be min. IP65.</p> <p>b. Single Input DIN-rail mounted Temperature Transmitter</p> <p>These shall be suitable for mounting on DIN-rails in JBs. These temperature transmitters shall be the ones which are especially designed for DIN-rail mounting with IP 20 protection class. These shall have terminals for input/output provided on front side when mounted on DIN-rail.</p> <p>Head mounted temperature transmitter with clamps to make it suitable for DIN-rail mounting shall not be acceptable under this category.</p> <p>c. Dual-input Temperature Transmitter With Indicator:</p> <p>These shall be suitable for mounting on pipes/ support. Indicator shall be provided with these transmitters. These transmitters shall have bump less change over facility to second sensor in case first sensor fails .This change-over is to be alarmed. Protection class shall be IP65 minimum.</p>
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Power supply	Compatible with input module of Control System.												


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SUPERSEDES INVENTORY NO. सामग्री सूची संख्या को अधिकृतित करता है	<table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Accessories</td> <td>Mounting arrangements including clamps etc.</td> </tr> </table>	Accessories	Mounting arrangements including clamps etc.
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COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	<p style="text-align: center;">VI.6 INSTRUMENTATION – TAPPING POINTS</p> <p style="text-align: center;">VI.6.1 GENERAL DESIGN CRITERIA</p> <p>Instrument process tubing and instrument air tubing to be designed in accordance with the instrument tubing line specifications.</p> <p>All instruments, process connections, including isolation valves and associated devices, shall be located in easily accessible locations for maintenance, calibration and replacement. All maintenance, calibration and replacement operations on a given device must be possible without interruption of service to adjacent equipment.</p> <p>Refer Annexure VI.5 for further details.</p> <p>Instrument mounting height shall 1.5m above equipment base or platform.</p> <p>Instrument tubing installations are designed in accordance with ANSI B31.1, “Power Piping”.</p> <p style="text-align: center;">VI.6.2 PRESSURE PARTS</p> <p>The material of thermowell depends upon the process condition. One isolating valve is provided for pressure/level measurements up to 40 Kg/sq.cm (a) and two isolating valves shall be provided for pressure /Level measurements above 40 Kg/sq.cm (a). In addition one number three way valve is provided for local pressure measurement. Pressure test pockets on steam lines shall be provided with condensing loop.</p> <p style="text-align: center;">VI.6.3 INSTRUMENT SENSING LINES</p> <ul style="list-style-type: none"> ❖ Instrument sensing lines shall meet the brief specifications as given below: ❖ For pressure > 40 bar impulse pipe ½ “ NB with weld connection shall be used and material as per pipeline material. For pressure < 40 bar impulse tube ½” OD SS-316 with double compression SS-316 fittings shall be used. ❖ Minimum bending radius of instrument sensing line is 3 times the tube diameter.
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दिनांक एवं हस्ताक्षर SIGN & DATE		<h1>उत्पाद क्रय विनिर्देश</h1> <h2>PRODUCT PURCHASE SPECIFICATION</h2>	<h3>HE 57067</h3>								
सामग्री सूची संख्या को अधिकारित करना है SUPERSEDES INVENTORY NO.			पृष्ठ का Page 95 of 129								
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company इस प्रबंध में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अनावरण रूप से किसी भी तरह प्रयोग, जो कि कम्पनी के हित में हानिकारक हो न किया जाए। स्वामित्विकार एवं गोपनीय		<ul style="list-style-type: none"> ❖ Instrument sensing lines are sloped in their horizontal runs, a minimum of 1/12" per foot. In general, liquid and steam lines slope from their process tap connection down to the instrument. In general, gas and non-condensing vapour lines slope from their process tap connection up to the instrument. ❖ Instrument sensing lines shall be routed as directly as practicable from the process root valve to the instrument. The length of instrument tubing from the root valve to the instrument shall be limited to maximum of 12 meters for compressible fluids and 15 meters for non-compressible fluids. ❖ Instrument sensing lines are grouped together as much as practical to benefit from the use of common support members and to present a finished installation that is routed in a neat and orderly manner. Care is exercised to assure that spacing between adjacent tubes in the same group is maintained uniform and that tubes do not cross under or over one another at any point. Changes in direction of tubing is done by the use of tube bends and not tube fittings. ❖ Compression tube fittings are used in low pressure process systems. Socket weld tube fittings are used in high pressure process systems. A single blow down valve or double blow down valves (if the process root valves are doubled) shall be installed to the sensing lines of all pressure transmitters that are tapped off liquid or steam process systems. These valves shall be located at the instrument and may be brought together to the header. The maximum process temperature for all transmitters shall be limited to 80°C. To dissipate the excess heat, a minimum of 1 meter of tubing for each 30°C of excess heat shall be installed to isolate the process media from the instrument. An additional isolation valve shall be used at the instrument for isolation of those instruments without valve manifolds. ❖ The following points shall be taken care by Vendor: <ol style="list-style-type: none"> 1. ACC Vendor to provide tapping for Specific Conductivity Analyzers (Left and Right side) on the condensate Tank. 2. Instruments for Drain pot Level Control shall be provided by Vendor. <p style="text-align: center;">VI.7 SPARES</p> <p>The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares and indicate these in the relevant schedules of the Bid Form and Price Schedules. The general requirements pertaining to the supply of these spares is given below:-</p> <p style="text-align: center;">VI.7.1 MANDATORY SPARES</p> <p>(a) The list of mandatory spares considered essential by the Employer is indicated in this chapter. The bidder shall indicate the prices for each and every item (except for items</p>									
	सामग्री सूची संख्या INVENTORY NO.	Rev. no. 00	<table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">निर्माणकर्ता WORKED BY</td> <td style="width: 30%;">ASHISH GUPTA</td> <td style="width: 20%;"></td> <td style="width: 30%;">28.04.2014</td> </tr> <tr> <td>जांचकर्ता CHECKED BY</td> <td>ROHIT BANSAL</td> <td></td> <td>28.04.2014</td> </tr> </table>	निर्माणकर्ता WORKED BY	ASHISH GUPTA		28.04.2014	जांचकर्ता CHECKED BY	ROHIT BANSAL		28.04.2014
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सामग्री सूची संख्या को अधिनिर्दिष्ट करना है SUPERSEDES INVENTORY NO.			पृष्ठ का Page 96 of 129						
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. स्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अनावश्यक रूप से किसी भी तरह प्रसारण, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।		<p>not applicable to the bidders design) in the 'Schedule of mandatory Spares' whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item in the Bid Forms and Price Schedules. Whenever the quantity is mentioned in "sets" the bidder has to give the item details and prices of each item.</p> <p>(b) The Employer reserves the right to buy any or all the mandatory spares parts.</p> <p>(c) The prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes.</p> <p>(d) All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit. However, spares shall not be dispatched before dispatch of corresponding main equipments.</p> <p>(e) Wherever quantity is specified both as a percentage and a value, the Bidder has to supply the higher quantity until and unless specified otherwise.</p> <p>VI.7.2 RECOMMENDED SPARES</p> <p>(a) In addition to the spare parts mentioned above, the contractor shall also provide a list of recommended spares for 3 years of normal operation of the plant and indicate the list and total prices in relevant schedule of the Bid Form and Price Schedules. This list shall take into consideration the mandatory spares specified in this Section and should be independent of the list of the mandatory spares. The Employer reserves the right to buy any or all of the recommended spares. The recommended spares shall be delivered at project site at least two months before the scheduled date of initial operation of first unit. However, the spares shall not be dispatched before the dispatch of the main equipment.</p> <p>(b) Price of recommended spares will not be used for evaluation of the bids. The price of these spares will remain valid upto 6 months after placement of Notification of Award for the main equipment. However, the Contractor shall be liable to provide necessary justification for the quoted prices for these spares as desired by the Employer.</p> <p>VI.7.3 START-UP & COMMISSIONING SPARES</p> <p>Start-up and commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares used till the plant is handed over to the employer shall come under this category. The Contractor shall provide for an adequate stock of such start up and commissioning spares to be brought by him to the site for the plant erection and commissioning. They must be available at site before the equipments are energized. The unused spares, if any, should be removed from there only after the issue of Taking Over certificate. All</p>							
	सामग्री सूची संख्या INVENTORY NO.	Rev. no. 00	<table border="1"> <tr> <td>निर्माणकर्ता WORKED BY</td> <td>ASHISH GUPTA</td> <td>28.04.2014</td> </tr> <tr> <td>जांचकर्ता CHECKED BY</td> <td>ROHIT BANSAL</td> <td>28.04.2014</td> </tr> </table>	निर्माणकर्ता WORKED BY	ASHISH GUPTA	28.04.2014	जांचकर्ता CHECKED BY	ROHIT BANSAL	28.04.2014
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>start up spares which remain unused at the time shall remain the property of the Contractor.</p> <p>a) The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares and indicate these in the relevant schedules of the Bid Form and Price Schedules. The general requirements pertaining to the supply of these spars is given below.</p> <p>b) The Contractor shall indicate the service expectancy period for the spares parts (both mandatory and recommended) under normal operating conditions before replacement is necessary.</p> <p>c) All spares supplied under this contract shall be strictly inter-changeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desecrator packs as necessary.</p> <p>d) All the spares (both recommended and mandatory) shall be manufactured along with the main equipment components as a continuous operation as per same specification and quality plan.</p> <p>e) The contractor will provide Employer with cross-sectional drawings, catalogues, assembly drawings and other relevant documents so as to enable the Employer to identify and finalise order for recommended spares.</p> <p>f) Each spares part shall be clearly marked or labelled on the outside of the packing with its description. When more than one spares part is packed in a single case, a general description of the content shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purposes of identification.</p> <p>g) All cases, containers or other packages are to be opened for such examination as may be considered necessary by the Employer.</p> <p>h) The contractor will provide the Employer with all the addresses and particulars of his sub suppliers while placing the order on vendors for items/components/equipments covered under the contract and will further ensure with his vendors that the Employer, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.</p> <p>i) The Contractor shall warrant that all spares supplied will be new and in accordance with the contract Documents and will be free from defects in design, material and workmanship.</p> <p>j) In addition to the recommended spares listed by the contractor, if the employer further</p>		
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The bidder shall extend all necessary assistance in this regard.

VI.7.4 CONTROL & INSTRUMENTATION SPARES- FOR AIR COOLED CONDENSOR

MEASURING INSTRUMENTS	
Electronic Transmitters	
(i) Transmitters of all type, range and model no. (for the measurement of Pressure, differential pressure flow, level, etc.)	10% or minimum 1 No. whichever is more
Temperature elements	
(i) RTD's	10% of each type and length or minimum 1 No. whichever is more
ii) Temperature Transmitters	10%
CONTROL VALVES, ACTUATORS & ACCESSORIES	
(i) Pneumatic and electro-hydraulic actuator assembly	10% or 2 Nos. of each type, model and rating, whichever is more.
(ii) Electric Actuator with integral starter	1 no. each type & Rating

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VI.7.4.1 GENERAL NOTE:

- Wherever quantity has been specified as percentage (%), it shall mean percentage (%) of the total population of the item in the station (project), unless specified otherwise and the fraction will be rounded off to the next higher whole number.


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सामग्री सूची संख्या को अधिकारित करना है सामग्री सूची संख्या को अधिकारित करना है	SUPERSEDES INVENTORY NO.	<p>2. Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc. these shall cover all the items supplied and installed and the break up for these shall be furnished in the bid.</p> <p>3. In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.</p> <p>4. Interchangeability and Packings : All spares supplied under this contract shall be strictly interchangeable with parts for which they are intended for replacements. These spares should include all mounted accessories like components, boards, add or items, fitting, connectors etc. and be complete in all respects so that the replacement of the main items by these spares does not require any additional item. The vendors must conform the pair to pair compatibility of each electrical spares modules with the modules should be supplied in the original package.</p> <p>5. Identification: Each spare shall be clearly marked and labeled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification</p> <p style="text-align: center;">VI.8 TESTS AND TEST REPORTS</p> <p>All routine tests shall be carried out at Manufacturer's works in presence of Owner or his representative. Type test certificates for similar equipment supplied by the Bidder shall be submitted.</p> <p>Refer Annexure VI.7 for details.</p> <p>In case type test certificate for similar equipment is not available, the same shall be conducted in presence of Owner or his representative if Owner so desires.</p> <p>Routine tests shall be carried out on all equipment supplied as per relevant standards. The cost of all tests, packing, freight and insurance charges of any transportation including any repeat tests shall be borne by the Bidder. This also applies to tests and inspections carried out at the Sub-Vendor's works.</p> <p>Before any equipment / plant is packed or dispatched from the Vendor's or his SUB-Vendor's works, all tests called for shall be carried out in the presence of the Owner's representative.</p>	सामग्री सूची संख्या को अधिकारित करना है सामग्री सूची संख्या को अधिकारित करना है
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>The tests carried out in the works shall include electrical, mechanical and hydraulic tests in accordance with the relevant standards as well as the regulations of the Owner, and in addition any test called for by the Owner's representative to ensure that the plant being supplied fulfills the requirements of the specification.</p> <p>Type and Routine test certificates shall be furnished to the Owner / Owner's engineer for review and approval.</p> <p>Vendor's C&I personnel shall be deputed to BHEL for minimum one week during FAT of ACC DCS.</p> <p>Note: All measuring instruments required for Performance testing shall be supplied by the Vendor.</p>		
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<ul style="list-style-type: none"> ❖ Cable Schedule and interconnection diagram. ❖ Spare parts list, Laboratory Instrument list, test & calibration report, special tools & tackle list. ❖ “As Built” status drawings. ❖ Submission of O&M manuals and documentation. ❖ List of all measuring instruments required for performance testing. ❖ List of Mandatory, Recommended, Start-up and Commissioning spares. ❖ Control Valve and other documents as mentioned in Annexure VI.8, Technical Information and Data to be submitted after award of contract. 		पृष्ठ का Page 103 of 129	
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>j. Zero Speed Switch (For Conveyor) DI 1</p> <p>VI.11.3 DCS INTERFACE FOR BIDIRECTIONAL LT DRIVE- For Integral starters (Signal Exchange has been envisaged between Actuator and DCS)</p> <p>a. Open Command DO 1</p> <p>b. Close Command DO 1</p> <p>c. Integral starters Fault (Control supply fail/ O/L relay (operated/L/R selector switch selected in local / Phase loss). DI 1</p> <p>d. Open limit switch feedback DI 1</p> <p>e. Close limit switch feedback DI 1</p> <p>f. Position Transmitter (For inching type Drive) AI 1</p> <p>g. Current input (> 30 KW rating) for DCS & Back up Panel Ammeters. AI 2</p> <p>VI.11.4 DCS INTERFACE FOR BIDIRECTIONAL LT DRIVE-For Non-Integral starters (Signal Exchange has been envisaged between Actuator and DCS.)</p> <p>a. Open Command DO 1</p> <p>b. Close Command DO 1</p> <p>c. Swgr/ MCC Disturbance (Overload relay operated/ control supply fail/Emergency LPBS stop) DI 1</p> <p>d. Switchgear/MCC Available (switchgear/MCC in remote) DI 1</p> <p>e. Open limit switch feedback DI 1</p> <p>f. Close limit switch feedback DI 1</p> <p>g. Open Torque switch feedback DI 1</p> <p>h. Close Torque switch feedback DI 1</p> <p>i. Position Transmitter (For inching type Drive) AI 1</p> <p>j. Current input (> 30 KW rating) AI 1</p> <p>VI.11.5 DCS INTERFACE FOR SOLENOID DRIVE (Single coil)</p> <p>a. Energise or De-Energise DO 1</p> <p>b. Open limit switch feedback DI 1</p> <p>c. Close limit switch feedback DI 1</p> <p>VI.11.6 DCS INTERFACE FOR SOLENOID DRIVE (Double coil)</p> <p>a. Energise DO 1</p> <p>b. De-Energise DO 1</p>		पृष्ठ का Page 105 of 129
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स्वाधिकार एवं गोपनीय


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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>Terminal Point of Construction will be top of RC columns where inserts for fixing structural supporting Truss framework will be provided by ACC bidder while fixing in RCC will be done by Civil contractor. Civil contractor shall be engaged by BHEL. All Structures, base plates, claddings, walkways, etc. above RC Column top will be in scope of bidder.</p>		पृष्ठ का Page 108 of 129
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company स्वाधिकार एवं गोपनीय इस प्रबंध में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अनावश्यक रूप से किसी भी तरह प्रसारण, जो कि कंपनी के हित में हो सके बिना नहीं किया जाये।	<p>VII.2 DESIGN:</p> <p>Bidder has to submit detailed design document for approval of BHEL & NTPC which shall include following design/drawings, however any design/drawing not mentioned in list below but required by Customer shall be furnished as per Customer requirement. The submission shall be done to comply NTPC requirements to obtain approval of all design and drawings. Part of design Specification of NTPC (for EPC work) is attached and relevant part may be referred for ACC. Manufacturing of structures or construction can start only after approval from Customer as being followed in other structures/buildings of this project. The documents should include the following:</p> <p>(a) Design criteria explaining design procedure considering all applicable loads, load combinations, load factors, permissible stresses, reference standards for dead load, Live load, equipment load, wind load, dynamic(gust) wind load, Earthquake load, Thermal loads, maintenance & contingency load, erection load, Dynamic analysis of fan deck structures to ensure vibration control, CFD analysis, construction material specification, analysis & design software used, connection design procedure, painting, etc.</p> <p>(b) Wind Load calculations with all details of reference standards, formulations, assumptions and its basis, detailed step wise calculation of inhouse developed computer program for its validation, various load combinations with permissible stresses/load factors as per Indian standard (as applicable), design with specified wind speed and factors in NTPC specification (Refer VII.5), reference of international standard used (if not available in Indian standard), etc. complete to enable checking of all design calculations to enable approval of design and drawing. For dynamic wind design with gust loads etc., all design calculations with load establishment should be provided to support the design for approval. During conflict of provisions under different standards, stringent of the norms amongst standards used for ACC structure/RC design shall be followed.</p> <p>(c) Earthquake loading shall be as per site specific spectrum provided by NTPC (Refer VII.5). Design standard shall be IS: 1893-Part-4 and IS:800-2007.</p> <p>(d) Thermal loading shall be as per NTPC specification (Refer VII.6) and as required for ACC design.</p> <p>(e) Dynamic analysis check of superstructure for fan operations is to be provided with complete design document, assumptions, loading details, soft copy of model for dynamic analysis to run & check results and output in form of document to establish good dynamic performance of ACC supporting structures.</p> <p>(f) CFD analysis should be conducted to establish wind flow pattern and cooling effect over ACC modules. The analysis should be conducted in internationally accepted software and the document should contain all assumptions, modelling parameters, boundary conditions, various flow conditions under different speed and direction to establish performance of ACC</p>		
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सामग्री सूची संख्या को अधिष्ठीकृत करना है SUPERSEDES INVENTORY NO.	<p>adjoining Power house in Transformer yard area. Details of all adjoining structures shall be provided for modelling. Soft copy of model should be provided to BHEL & NTPC to verify results for approval.</p> <p>(g) Structural analysis for ACC structure should be performed in standard internationally accepted software like STAAD Pro, etc. and should contain all loads and load combinations for analysis & design. The associated design document should contain all load establishments and design parameters for structure design.</p> <p>(h) The drawing & design details of supporting structural steel framework with all structural members to support fan deck structure, A-frame supports, cleaning equipment supports, cladding, walkway, all other equipment supports over & under fan deck level floor, exhaust duct supports, elevator structure, Stair, hanger supports, elevator machine room, floors, condensate pipes, hoists & winches, gearbox & fan motor supports, electrical system supports, drains, gratings between A frames for maintenance approach, etc.</p> <p>(i) Detailed fabrication drawings & design of all steel structures should be submitted with design of connections as per bid specification, Indian/international standards, and good engineering practices and as required by customer. Design of Bolted structural connections & welded joints (shop welded) shall be submitted along with detailed fabrication drawings.</p> <p>(j) Design & drawing of all supports of exhaust duct from Turbine hall to end at top of ACC shall be provided.</p> <p>(k) Procedure for calculation of loads on foundations for supporting exhaust ducts shall be provided.</p> <p>(l) General arrangement & layout drawings of floor supporting Structure and all associated structural steel work shall be provided. Sectional elevation of Supporting Steel Structure / RC Structure, Plan & Elevation of Elevator Supporting Structure, Plan & Elevation of ACC Duct Supporting Structure, Plan & Elevation of Duct evacuation Pit, Support on TG raft for Duct/ Hot Box.</p> <p>(m) Design & drawing of ACC structural anchors/embedment & connection to top of RC Column.</p> <p>(n) Design & drawing of Hollow Reinforced Concrete Columns with RC top head shall be submitted to Customer for approval. For design of foundation, typical design procedure shall be provided by bidder to BHEL for carrying out design and it should include all design steps, assumptions, references, formulations etc. complete to enable BHEL to design foundation of RC Columns of ACC. Bidder shall provide typical drawings of previous projects in editable soft copy to enable BHEL to prepare drawings for foundations of ACC Columns. Necessary interface checking shall be provided by Bidder for foundation of Rc Columns.</p> <p>(o) All soft copy of analysis file shall be provided by bidder to BHEL/NTPC for checking & running of analysis models to verify results and facilitate approval of analysis & designs.</p> <p>All inhouse developed computer programs used for design shall be supported with stepwise calculation with formulations to validate the design program for its correctness & completeness. The drawings for approval need to be submitted in Pdf format also and after approval, it will be stamped "Release for construction" and sent to site/shop for fabrication/construction. Editable soft copy of all approved drawings should be submitted to BHEL.</p> <p>Bidder is required to provide complete analysis, design & drawing details with its assumptions, references, formulations, all steps/procedures documentation etc. which may not be listed above but required to check the design & drawing of all Structural & RC works of ACC for obtaining</p>		पृष्ठ का Page 109 of 129			
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सामग्री सूची संख्या को अधिष्ठीकृत करना है SUPERSEDES INVENTORY NO.	दिनांक एवं हस्ताक्षर SIGN & DATE					
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.			पृष्ठ का Page 110 of 129				
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company स्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अनावरण रूप से किसी भी तरह प्रयोग, जो कि कम्पनी के हित में हानिकारक हो न किया जाए।		<p>approval from Customer to enable manufacturing, erection & commissioning and carry out Performance Guarantee Test of Air Cooled Condensers for 3 X 660MW North Karanpura Thermal Power Station.</p> <p>VII.3 All design and drawings submitted by Bidders at detailed engineering stage has to be got approved by NTPC & BHEL as per owner's requirement. The approved design and drawing will be treated as final design & drawing.</p> <p>VII.4 Drawing submission schedule shall be considered as per attached documents vide Annexure-VII-7.</p> <p>VII.5 Wind Loads, Seismic Loads: Wind and Seismic loads shall be considered as per attached specification (ANNEXURE- VII-2 AND VII-3). Site specific spectra are provided by NTPC for seismic loading.</p> <p>VII.6 Thermal Loads: Ambient thermal load in addition to Equipment thermal load shall be considered as per specification.</p> <p>VII.7 Design of ACC supporting structure shall be considered as per Annexure-VII-9.</p> <p>VII.8 Painting and corrosion protection schedule shall be considered as per ANNEXURE-VII-10.</p> <p>VII.9 Grade of Concrete and reinforcement, fabrication and welding details shall be as per Annexure-VII-11.</p> <p>VII.10 Deck sheet roofing and cladding details shall be considered as per Annexure-VII-6.</p> <p>VII.11 Load cases, load combinations, design factors and design standard shall be considered as per NTPC specification. (ANNEXURE- VII-1).</p> <p>VII.12 Soil data available at present is being provided for reference (ANNEXURE- VII-4), however no foundation base is considered in bidder's scope. In case detailed site geotechnical investigation report at contract stage varies from proposal stage soil report, no extra payment will be admissible.</p> <p>VII.13 Climatological table as per Annexure- VII-5.</p> <p>VII.14 Material & Quality: All Construction material, quality, type of connections etc. shall be as per specification. Painting shall be as per specification.</p> <p>VII.15 Specification for Structural Steel fabrication, erection and quality features in construction shall be as per AnnexureVII-12.</p> <p>VII.16 Safety aspects to be followed by the contractor shall be as per Annexure-VII-8.</p>					
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ASHISH GUPTA	28.04.2014						
ROHIT BANSAL	28.04.2014						

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Sl. No.	Description	Terminal Point	Remarks
1	Mechanical		
1.1	Exhaust steam	At the outlet of Exhaust Transition Device / Hot Box	Scope starts from Horizontal steam Duct, pressure drop in HotBox shall be provided.
1.2	Drain tank/pot	Connection nozzle at inlet of Drain pot	For Hot Box, the connection nozzle at Hot Box
1.3	Condensate from Condensate storage tank(CST) of ACC	At the outlet of CST nozzle for CEP suction.	
1.4	Minimum re-circulation system of CEPs	At the inlet of CST	Suitable connections to be provided on CST
1.5	Make-up / DM water	At the inlet of CST	Suitable connections to be provided on CST
1.6	Condensate storage tank drain piping	To the nearest drain pit	
1.7	All drains	Nearest Drain trench	
1.8	Tube cleaning system	Service water line at 2M from A-row of TG Building	

1.9	CW line for Vacuum Pump Heat Exchanger	2M from A-row of TG Building	
1.10	Instrument Air for Vacuum Pump	2M from A-row of TG Building	
2	Electrical	LV side of the transformer	HT Feeder for Hogging pump is in BHEL scope
3	Structure		
3.1	Main support structure (RCC columns)	Top surface of RCC pillars / columns	Design for RCC columns to be provided by Bidder
3.2	Other Steel structure	On top surface of RC pedestals at EL-1.2M. Grouting will be done alongwith steel structure erection by ACC vendor	Bidder to provide the details of embedment and BOQ of concrete
4	Instrumentation and Control	Field JB	
3.1	Cable and JB	Field JB	

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दिनांक एवं हस्ताक्षर SIGN & DATE	सामग्री सूची संख्या को अधिकृतित करना है	The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company

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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<h2 style="color: blue;">IX. Layout and safety considerations</h2> <h3 style="color: blue;">IX.1 Layout Considerations</h3> <h4 style="color: red;">IX.1.1 General</h4> <p>a. The constraint and details of area for layout for ACC is as per Annexure-IV.3-2. The location of various facilities/ buildings as marked on this drawing is only tentative and the exact location shall be finalised during the detailed engineering stage.</p> <p>b. The finished floor level at ground level of the TG building shall be designated at EL.0.0M and shall be 500mm above the finished ground level (FGL) off-site area. The finished floor level for various areas / facilities shall be as follows :-</p> <ol style="list-style-type: none"> i. FFL of Main Plant Building El.. 0.00M ii. Top of paving for Transformer Yard and ACC area El. (-)0.10M iii. FFL of offsite buildings 500 mm above FGL of respective area. <p>c. The pipes in ACC area shall be routed on trestle at a height of about 8.0m bottom of steel (B.O.S.). The pipes/ cables routed over ground on trestles shall have minimum clearance of 8.0 m bottom of steel (B.O.S.) at road crossing. For cables/pipes routing of the system engineered by Purchaser/ Owner, space provision in bridges, trestle/cable conduit may be required and these shall be finalised during detailed engineering stage. Structural steel above concrete pedestals and pipe racks to maintain the requisite pipe elevation and slope are to be provided by bidder as per requirement.</p> <p>d. The entire construction activity shall take into account the commissioning of the plant in phases matching the phased commissioning of the plant.</p> <p>e. Each equipment room, if provided, shall be provided with alternate exits in case of fire/accidents as per requirements of factory act and TAC.</p> <h4 style="color: red;">IX.1.2 Equipment Layout</h4> <p>While developing the layouts, bidder must give due considerations to the following requirements:</p> <ol style="list-style-type: none"> a. All equipment except, drain tank/pot and drain pump shall be placed in an open shed. b. Adequate numbers of stairs (minimum width 1200mm) and platforms shall be provided at suitable locations to provide easy & effective approach to various equipment, valves and any other equipment requiring manual operation or maintenance during plant running. c. Clear headroom of 2.5 m are to be maintained during pipe, cable routings. Clear walkways in congested areas are to be maintained. d. Insulation of equipments/ piping for personnel protection are to be provided if the temperature exceeds 60 deg C. e. A clear passage (walkway) of about 1500 mm width shall be provided from one end to the other end. f. Electrical equipment such as switch gears, panels and control panel shall be housed in separate rooms for each ACC unit. Dimension of electrical and control room shall be finalized during detailed engineering. 	सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.
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अधिकृतित करना है
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स्वत्वाधिकार एवं गोपनीय

इस प्रलेख में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में अधिकारक हो न किया जाए।


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सामग्री सूची संख्या को अधिकारित करना है SUPERSEDES INVENTORY NO.	<p>k. Where cold pulls are envisaged the Bidder shall develop cold pull procedures specific to the requirements of that system and submit the same for BHEL/ Owner's approval.</p> <p>l. All workmanship shall be accomplished using accepted methods and procedures of the highest recognized fabrication and erection standards and shall be done in a neat and workmanlike manner in accordance ANSI B31.1 and other applicable standards of ASME, PFI and MSS.</p> <p>m. NTPC specification as per Annexure-X-1 shall be followed in conjunction with requirement specified herein where ever applicable.</p> <p>X.2 Erection Instructions</p> <p>a. All pipes of sizes 65 mm NB and above shall generally be shop fabricated and delivered to site in pre-fabricated conditions. The contractor shall carry out any modification required at site to accommodate minor alternations in pipe routing.</p> <p>b. All pipes of size 50 mm NB and below shall be regarded as field run. The bidder shall prepare the layouts for these lines in situ and submit the isometric drawings, showing the layout.</p> <p>c. All pipelines shall be given proper slope towards the drain points such that the slope is maintained in both hot and cold conditions.</p> <p>d. The Bidder shall erect all instrument connections upto and including the piping root valves.</p> <p>e. It is responsibility of the Bidder to ensure correct orientation of all valves, specialties; instrument stubs etc. and ensure that all valves are easily accessible to maintenance and operation.</p> <p>f. Yard piping layout along with erection drawings are to be submitted by bidder. For field run piping, the Bidder shall take into account the following</p> <p>i. Piping shall be routed to avoid interferences with other pipes, hangers, structures, equipment, electrical trays, ventilation ducts etc., with sufficient clearance to accommodate thermal insulation and /or piping movements as required.</p> <p>ii. The pipe routing shall also provide sufficient clearance for removal and maintenance of equipment, easy access to valves, instruments and other accessories. The piping shall not encroach on the withdraw space of the various equipments.</p> <p>iii. Piping shall be grouped together where practicable and routed to present a neat appearance. The routing shall generally be above ground but where specifically approved by the owner, pipes may be arranged in trenches.</p> <p>iv. Clear headroom of not less than 2.5 meters above walkways, platforms and other working areas and not less than 8.0 meters bottom of steel (B.O.S.) above roadways shall be provided unless otherwise approved by the owner.</p> <p>v. Tap offs on main lines for the field run piping shall be suitably located by the Bidder to suite the layout prepared by him.</p> <p>vi. The Bidder shall provided auxiliary steel required.</p>		
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>vii. Field run piping shall be erected only after completion of erection of all other piping system, structures and equipment unless otherwise approved/ directed by the BHEL.</p> <p>viii. The setting and logging of all supports, restraints, spring hangers etc. is the responsibility of the Bidder. The initial setting on all hangers and supports and clearances on restraints and limit stops shall correspond to the cold values. The contractor shall check all readings after completion of welding, cold pulling where required and application of insulation and carry out readjustment as necessary.</p> <p>ix. The Bidder shall monitor the behavior of all hangers, supports, restraints etc. during the initial stages of plant operation. When the unit has attained its rated load and all piping systems have attained their rated temperatures, the Bidder shall log all load conditions, hangers and snubber deflections and clearances at restraints/ limits stops.</p> <p>x. Before performing any welding, all valves shall be opened full.</p> <p>xi. All tack welds shall be ground smooth or chipped to remove all objectionable projections and all weld spatter shall be removed prior to the welding of joint.</p> <p>xii. Piping on both side of the joints shall be adequately supported during all welding, preheating and stress relieving operations to avoid possible cracking of the tack weld or shall be so designed that no stress due to pipe weight comes on the joints during the joining and subsequent stress relieving operations. Where a pipe is subjected to cold spring during the welding and stress relieving operations, the adjacent pipe sections shall be firmly clamped together to prevent straining of the metal at the high temperature. Spacing between joints shall be as per the requirement of the code for the type of backing ring used.</p> <p>xiii. When "C" clamps are tack welded to the pipe for the purpose of alignment of the joint, preheating for the tack welding shall be performed if the main joint adjacent to it is to be preheated as per the requirements of this specification. After the joint is completed, all tack welds shall be removed, flushed with the adjacent surface of pipe by chipping and/or grinding. The tack welded areas of the pipe shall be subjected to stress relieving as required.</p> <p>xiv. All piping which is buried shall be laid and protected as per the requirements of this specification.</p> <p>xv. The anticipated steps during erection of the systems are as follows</p> <ol style="list-style-type: none"> Receiving at site, inspecting, storing and maintaining inventory of items supplied by the contractor under this specification Reloading and transporting of materials to erection site as per schedule of erection. Studying proposed routings at site and checking for interferences, clearances etc. Fixing up of starting terminals. Erection of pipe spools in place using hangers and supports. Temporary hangers may be used, if necessary. Checking alignment of pipe spools. 			
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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>XII. Field Quality Requirement during Erection, commissioning, Start-up, Trial operation and Performance Tests</p> <p>The bidder shall submit to the BHEL/ Owner field welding schedule for field welding activities. The field welding schedule shall be submitted to the Purchaser/Owner along with all supporting procedures, like welding procedures, heat treatment procedures, NDT procedures etc., at-least thirty days before schedule start of erection work at site.</p>
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XII.1 Erection


स्वत्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है, इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।	<p>Within the frame-work of site services, erection contractor will provide all measure and equipment to ensure proper erection and commissioning of the system in conformance with the contractual stipulations such as</p> <ul style="list-style-type: none"> - Construction site equipment - Establishment of a functional site organisation - Personnel, tools and equipment required for the erection - Administrative activities (site organisation etc.)
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सामग्री सूची संख्या INVENTORY NO.	<p>Firefighting arrangement shall be arranged by Bidder at work site as per requirements. Bidder shall build temporary site facilities necessary for storage, prefabrication, accommodations and for office and administrative purposes in area provided by purchaser/ Owner.</p>
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COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company स्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं अत्यन्त रूप से गोपनीय की तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।		<ul style="list-style-type: none"> - Mounting and installation of all electrical equipment such as switchgear, control panels, breakers and all auxiliary equipment - Assembling and aligning at site of all the equipment and material included in the scope of supply. Piping material and insulation, electrical conduits, wire and cable will be assembled and connected as described in the approved erection drawings - Conducting pressure and mechanical tests as required to demonstrate the physical completion of all parts of the work performed - Testing of all systems, instruments and equipment before and after installation - All tests and examination which were performed during erection i.e. alignment records, non-destructive examinations, pressure tests etc. will be listed and complied as part of the erection documentation and handed over to the purchaser / Owner. - The completion of systems or parts of the plant will be documented in an Erection Clearance Certificate (ECC). <p>XII.2 Commissioning</p> <p>Commissioning of the power plant will be carried out stepwise. Before starting test runs, with the entire plant the individual systems with their components must be tested and commissioned carefully.</p> <p>All necessary commissioning steps are to be performed according to the corresponding commissioning procedure which is to be prepared in advance. The results of these commissioning activities are to be documented properly too.</p> <p>Bidder shall prepare a comprehensive commissioning program for the system including commissioning instructions, commissioning checklists, logic diagrams etc. All pre-commissioning tests & activities as required for successful running of the equipment or as mentioned in the technical specification elsewhere shall be performed by the contractor.</p> <p>The system specific commissioning programmes shall include</p> <ol style="list-style-type: none"> 1.0 System inspection 2.0 Cleaning 3.0 Pressure test/ leak test 4.0 Electrical commissioning activities 5.0 Interlock checks 6.0 Components test 7.0 System specific process test as per approved commissioning procedure 8.0 Records of commissioning results and handed over to the purchaser/ Owner. 													
	दिनांक एवं हस्ताक्षर SIGN & DATE		<table border="1" style="width: 100%;"> <tr> <td style="width: 15%;">Rev. no.</td> <td style="width: 15%;"></td> <td style="width: 15%;">निर्माणकर्ता WORKED BY</td> <td style="width: 15%;">ASHISH GUPTA</td> <td style="width: 15%;"></td> <td style="width: 15%;">28.04.2014</td> </tr> <tr> <td>00</td> <td></td> <td>जांचकर्ता CHECKED BY</td> <td>ROHIT BANSAL</td> <td></td> <td>28.04.2014</td> </tr> </table>	Rev. no.		निर्माणकर्ता WORKED BY	ASHISH GUPTA		28.04.2014	00		जांचकर्ता CHECKED BY	ROHIT BANSAL		28.04.2014
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SUPERSEDES INVENTORY NO. सामग्री सूची संख्या को अधिकारित करना है	XII.3 Commissioning Clearance Certificate This document is prepared when commissioning of the system has been completed. It confirms that all the tests required for safe operation have been completed and that the system concerned is available for plant operation. XII.4 Start up and initial operation Following the satisfactory completion of the inspection and checking of complete system, the same will be started up and placed in initial operation with cycle operation of respective steam turbine. The time consumed in start up and initial operation shall be considered as a part of the erection and installation period. Upon completion of system checking/tests and as a part of commissioning of facilities, complete plant/facilities shall be put on initial operation. The Contractor shall conduct all the commissioning tests and undertake commissioning activities pertaining to all equipments including Electrical & C&I equipment/systems not specifically brought out above but are within the scope of work and facilities being supplied & installed by the Contractor and follow the guidelines indicated above or elsewhere in specifications. XII.5 Trial operation The Bidder will be responsible for running a trail operation period at the site for his system during the trial operation of each steam turbine generating unit and module along with their respective individual systems including all auxiliaries and controls. Each steam turbine generating unit and module shall operate not less than fourteen (14) days out of which at least seventy two (72) hours shall be continuous operation on full load in the automatic position of the control system. The fourteen days of automatic position shall consist of operation in increasing, decreasing as well as steady load conditions. The duration provided is indicative only. XII.6 Performance and Guarantee tests During performance and guarantee tests being conducted as per Owner's requirements, Bidder of this system shall remain present throughout the period even if this system is not directly involved in performance and guarantee tests of steam turbine. XII.7 Taking Over The Owner shall issue to the Bidder a Taking Over Certificate as a proof of the final acceptance of the equipment after successful completion of all the tests to be performed at site during operation of the plant.
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दिनांक एवं हस्ताक्षर SIGN & DATE	इस प्रवेश में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में अधिकारक हो न किया जाए।
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स्वाधिकार एवं गोपनीय

इस प्रवेष्ट में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।

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XV. Project Monitoring Schedule

All activities of ACC package for unit no.1 has to be synchronized by Oct, 2017 and subsequently, phase shift of six months shall be available for synchronization of Unit 2 and 3. The indicative project schedule is attached as per Annxure-XV-2.Bidder to provide the project schedule along with the Bid.

XV.1 Engineering Information Submission Schedule

Prior to the award of contract, a detailed engineering information submission schedule shall be tied up with the purchaser / owner. For this, the bidder shall furnish a detailed list along with the proposed submission schedule and it shall be tied up for engineering data/ drawings/ information for all bought out items and manufacturing items. The information shall be categorised into the following parts.

- i. Information that shall be submitted for the approval of the purchaser/ owner before proceeding further, and
- ii. Information that would be submitted for Purchasers/ owners information only.

The schedule should allow adequate time for proper review and incorporation of changes/ modifications, if any, to meet the contract without affecting the equipment delivery schedule and overall project schedule. The early submission of drawings and data is as important as the manufacture and delivery of equipment and hardware and this shall be considered while determining the overall performance and progress.

XV.2 Engineering Progress and Exception Report

The Bidder shall submit every month an Engineering Progress & Exception Report giving the status of each engineering information including:

- i. A list of drawings/ engineering information which remains unapproved for more than four (4) weeks after the date of first submission. Should any drawing remain unapproved for more than four (4) weeks after it's first submission, this shall be brought out in the monthly Engineering Progress and Exception Report with reasons thereof.
- ii. Drawings, which are not submitted as per agreed schedule.

The draft format for this report shall be furnished to the purchaser/ owner within four (4) weeks of the award of contract, which shall be discussed and finalised with the purchaser/ owner.

XV.3 Manufacturing Schedule

- a. The supplier shall submit, within 30 days after the date of Notice of award of Contract, PERT network covering various key phases of the work such as design, procurement, manufacturing, shipment, erection, commissioning, and interface facilities to be provided by Bidder. Such schedules shall be reviewed, up-dated and submitted to the purchaser/ owner, once every two (2) months by the bidder. The schedule shall also include the materials and equipment purchased from outside supplies.

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सामग्री सूची संख्या INVENTORY NO.	<table border="1"> <tr> <td>Rev. no.</td> <td></td> <td>निर्माणकर्ता WORKED BY</td> <td>ASHISH GUPTA</td> <td></td> <td>28.04.2014</td> </tr> <tr> <td>00</td> <td></td> <td>जांचकर्ता CHECKED BY</td> <td>ROHIT BANSAL</td> <td></td> <td>28.04.2014</td> </tr> </table>	Rev. no.		निर्माणकर्ता WORKED BY	ASHISH GUPTA		28.04.2014	00		जांचकर्ता CHECKED BY	ROHIT BANSAL		28.04.2014
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सामग्री सूची संख्या को अधिकारित करना है SUPERSEDES INVENTORY NO.	सामग्री सूची संख्या को अधिकारित करना है SUPERSEDES INVENTORY NO.	<p>XVI. PACKAGING AND TRANSPORTATION</p> <p>All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. While packing all the materials, the limitation from the point of view of the sizes of railway wagons available in India should be taken account of. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. The Contractor shall ascertain the availability of Railway wagon sizes from the Indian Railways or any other agency concerned in India well before effecting despatch of equipment. Before despatch it shall be ensured that complete processing and manufacturing of the components is carried out at shop, only restricted by transport limitation, in order to ensure that site works like grinding, welding, cutting & preassembly to bare minimum. The Employer's Inspector shall have right to insist for completion of works in shops before despatch of materials for transportation.</p> <p>Bidder shall provide following during detail engineering:</p> <p>(i) Bidder shall submit the details and method of seaworthy packing of various equipment in order to prevent damage or deterioration during transit, handling and storage at site till the time of erection for BHEL review / approval.</p> <p>(ii) Bidder shall provide detailed package list with reference to part number of erection drawings for ease of correlation at site.</p>	दिनांक एवं हस्ताक्षर SIGN & DATE सामग्री सूची संख्या को अधिकारित करना है SUPERSEDES INVENTORY NO.
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स्वाधिकार एवं गोपनीय


इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ति के हित में हानिकारक हो न किया जाए।

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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.	<p>XVII. List of Annexure to this specification</p> <ol style="list-style-type: none"> 1. General <ol style="list-style-type: none"> a. Annexure-II-1 Project Information b. Annexure-III-1 Formats for Functional Guarantee Tests 2. Mechanical <ol style="list-style-type: none"> a. Annexure-IV.1-1 Mechanical Scope between BHEL & Bidder b. Annexure-IV.3-1 Input Data for ACC at Guaranteed Back Pressure c. Annexure-IV.3-2 Layout Constraints d. Annexure-IV.3-3 Suggestive P&ID e. Annexure-IV.3-4 Input Data for ACC at Guaranteed Power Consumption Condition f. Annexure-IV.3-5 Expected Steam/ water Quality during Normal Operation g. Annexure-IV.4-1 Terminal point: Hot Box h. Annexure-IV.4-2 Specification for Service Elevator, Crane, Monorail & Hoist i. Annexure-IV.4-3 Fan Data sheet j. Annexure-IV.4-4 Fan Bell Data sheet k. Annexure-IV.4-5 Gear Box Data sheet l. Annexure-IV.4-6 Specification for Vacuum Pump : HE57016 m. Annexure-IV.4-7 Specification for Pipe Fittings and Valves n. Annexure-IV.4-8 Specification for Rating Plates, Name plates & Lables o. Annexure-IV.4-9 Specification for Thermal Insulation p. Annexure-IV.4-10 Allowable force and moments q. Annexure-IV.5-1 Specification for Surface Preparation and painting r. Annexure-IV.7-1 Quality Plan Format s. Annexure-IV.7-2 Quality plan for structural steel t. Annexure-IV.7-3 Quality Assurance of Valves, Rubber Expansion Joints, Hanger, Thermal Insulation and Piping system u. Annexure-IV.7-4 Quality Assurance of Cranes and Hoist v. Annexure-IV.8-1 Feeder Load Format w. Annexure-IV.8-2 Instrument Air Format x. Annexure-IV.8-3 Cooling Water Requirement y. Annexure-IV.8-4 Condenser data sheet z. Annexure-IV.9-1 Check list 3. Electrical <ol style="list-style-type: none"> a. Annexure-V.1-1 Electrical Scope between BHEL & Bidder b. Annexure-V.1-2 Load Data Format c. Annexure-V.1-3 Specification for LT switchgears & LT bus ducts d. Annexure-V.1-4 Specification for Motors e. Annexure-V.1-5 Specification for Cabling, Earthing and Lightning Protection f. Annexure-V.1-6 Specification for Station Lighting g. Annexure-V.1-7 Specification for Fire proof cable penetration sealing system 		
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दिनांक एवं हस्ताक्षर SIGN & DATE			
सामग्री सूची संख्या INVENTORY NO.	Rev. no. 00	निर्माणकर्ता WORKED BY ASHISH GUPTA जांचकर्ता CHECKED BY ROHIT BANSAL	28.04.2014 28.04.2014

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सामग्री सूची संख्या को अधिकृतित करना है SUPERSEDES INVENTORY NO.		PRODUCT PURCHASE SPECIFICATION		पृष्ठ का Page 128 of 129		
स्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि सम्पत्ती के हित में हो सकेगा नहीं न किया जाए। COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company		<p>h. Annexure-V.1-8 Specification for LT power cables</p> <p>i. Annexure-V.1-9 Specification for LT control cables</p> <p>j. Annexure-V.1-10 Specification for Instrumentation and power supply cables</p> <p>k. Annexure-V.1-11 Quality Assurance of Cabling, Earthing, Lightning and protection</p> <p>l. Annexure-V.1-12 Quality Assurance of LT power cable</p> <p>m. Annexure-V.1-13 Quality Assurance of LT control cable</p> <p>n. Annexure-V.1-14 Quality Assurance of LT switchgear</p> <p>o. Annexure-V.1-15 Quality Assurance of Motors</p> <p>p. Annexure-V.1-16 Quality Assurance of Station lighting</p> <p>q. Annexure-V.1-17 Quality Assurance of Instrumentation cable</p> <p>r. Annexure-V.1-18 Data Sheet of LT switchgear</p> <p>s. Annexure-V.1-19 Data Sheet of Motors</p> <p>t. Annexure-V.1-20 Data Sheet of Cabling and earthing</p> <p>u. Annexure-V.1-21 Data Sheet of Lighting</p> <p>v. Annexure-V.1-22 Data Sheet of LT power cables</p> <p>w. Annexure-V.1-23 Data Sheet of LT control cables</p> <p>x. Annexure-V.1-24 Data Sheet of FCPS</p> <p>y. Annexure-V.1-25 Data Sheet of Screened control cable</p> <p>z. Annexure-V.1-26 Mandatory Spare List for lighting system & LT Switchgear</p> <p>aa. Annexure -V.1-27 List of documents to furnish after award of contract.</p> <p>bb. Annexure -V.1-28 Specification for Numerical Relay and Data Concentrator</p> <p>4. Control & Instrumentation</p> <p>a. Annexure-VI.4-6 Control Valve and Actuators</p> <p>b. Annexure-VI.4-6-12 Electrical Actuators with Integral Starters</p> <p>c. Annexure-VI-5 Process Connection and Piping</p> <p>d. Annexure-VI-7 Type Test Requirements</p> <p>e. Annexure-VI-8 Technical data and Information to be furnished after award of contract</p> <p>f. Annexure-VI-10 Interfacing of Field instruments, MCC, Switchgears drawings</p> <p>g. Annexure-VI.10-1 Drive Control Philosophy for Breaker operated Motor</p> <p>h. Annexure-VI.11-1 Quality Assurance of C&I Based System</p> <p>i. Annexure-VI.12-1 Specification of LT motor</p> <p>5. Civil</p> <p>i. Annexure-VII-1 Design Criteria for Civil Works</p> <p>ii. Annexure-VII-2 Data for Wind Loads</p> <p>iii. Annexure-VII-3 Data for Seismic Loads</p> <p>iv. Annexure-VII-4 Soil Data</p> <p>v. Annexure-VII-5 Climatological Data</p> <p>vi. Annexure-VII-6 Metal Deck sheet and Cladding</p> <p>vii. Annexure-VII-7 Drawing Submission schedule</p> <p>viii. Annexure-VII-8 Safety Requirements during erection / installation</p> <p>ix. Annexure-VII-9 Design of ACC supporting structure</p>				
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सामग्री सूची संख्या को अधिकृतित करना है	SUPERSEDES INVENTORY NO.	x. Annexure-VII-10 Painting and Corrosion Protection xi. Annexure-VII-11 Grade of concrete, fabrication and welding requirements xii. Annexure-VII-12 Specification for structural steel fabrication, erection and Quality features in construction		पृष्ठ का Page 129 of 129	
स्वाधिकार एवं गोपनीय इस प्रवेश में दी गई सूचना भारत हेवी एलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कम्पनी के हित में होना आवश्यक हो न किया जाए।	COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	6. Other Services i. Annexure XIV.1-1 Training Module 7. Erection Guidelines i. Annexure-X-1 Erection Conditions of Contract 8. Project Monitoring & Schedule i. Annexure-XV-1 No. of copies of drawing and documentation ii. Annexure- XV-2 Project schedule bar chart			
		सामग्री सूची संख्या INVENTORY NO.	दिनांक एवं हस्ताक्षर SIGN & DATE	Rev. no.	निर्माणकर्ता WORKED BY
		00	जांचकर्ता CHECKED BY	ROHIT BANSAL	28.04.2014

FORMAT FOR NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)

BHARAT HEAVY ELECTRICALS LIMITED,
 Power Sector - Eastern Region,
 Plot no 9/1, DJ Block, Sector – II, Salt Lake City,
 Kolkata – 700 091

Sub	No Deviation Certificate.	
Job	Package A - Civil works of AIR COOLED CONDENSER OF 50% of UNIT 1 & 3 for 3x660 MW North Karanpura STPP, Jharkhand. Package B - Civil works of AIR COOLED CONDENSER OF 50% of UNIT 1 & 2 for 3x660 MW North Karanpura STPP, Jharkhand. Package C - Civil works of AIR COOLED CONDENSER OF 50% of UNIT 2 & 3 for 3x660 MW North Karanpura STPP, Jharkhand.	
Ref	1.0	Tender no. PSER:SCT:NKP-C1772:16.
	2.0	BHEL's NIT, vide reference no PSER:SCT:NKP-C1772:5231, Dated 19-09-2016.
	3.0	BHEL's TCN-01, vide reference no PSER:SCT:NKP-C1772:TCN-01, Dated 28-09-2016.
	4.0	BHEL's TCN-02, vide reference no PSER:SCT:NKP-C1772:TCN-02, Dated 07-10-2016.
	5.0	BHEL's TCN-03, vide reference no PSER:SCT:NKP-C1772:TCN-03, Dated 19-10-2016.
	6.0	BHEL's TCN-04, vide reference no PSER:SCT:NKP-C1772:TCN-04, Dated 21-10-2016.
	7.0	All other pertinent issues till date.

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification, integrity pact (if applicable) and acceptance to reverse auctioning process.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted/uploaded offer/documents in accordance with tender instructions with acceptance of the terms & conditions of the tender by us and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized representative of the bidder)

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)

POWER SECTOR EASTERN REGION DJ-9/1, SECTOR-II, SALLAKE CITY, KOLKATA - 700 091

फैक्स/Fax : (033) 23211960

फोन/Phone : बोर्ड/EPABX : (033) 2339-8000/ 2339-8231