Domain :	bhel.abcprocure.com
Parent department:	BHEL Trichy

Unit name	:	BHEL Trichy			
Purchase group	:	FB Sub-Dely(Mech).	RFQ/NIT/Enquiry Officer	:	SRIKESH NAYAR
Event ID	:	46102	RFQ/NIT/Enquiry no.	:	1802000454
Enquiry Date	:	27/07/2020 05:30:00			
Tender Description	:	SCANNER AIR FAN WITH ACCESSORIES AND SPARES FOR PANKI PROJECT			

Terms & Conditions :

Offers from only Indigenous Suppliers areinvited in this Tender

01) The Tender will be operated on TWO PART BID basis and you are requested to submit Techno-commercial bid and Price bids in E-procurement site.(Vendors who are not having DSC, shall obtain the same & quote accordingly). For details related to bidding through e-procurement site (abcprocure) please visit URL - https://bhel.abcprocure.com. Refer the following documents in the site -minimum system requirement & Bidder manual.

02) The supply shall be as per BHEL specification: For Fan - TOS: PANKI:1811, Rev.00, SAF:PANKI:OS/REV 00, AC Motor Specification- TDC:TCI:140, Rev. 12, DC Motor Specification TDC:TCI::223C MOTOR/Rev.05-Project specific transmittal for LT AC Motors & DC Motors TR:AC-DC MOTOR:1728, RQP:0000-999-QVM-P-164 Rev.No:02 and Annexure- A attached with the enquiry, without deviation.. Any deviation may lead to rejection of the offer.

03)Please give point wise confirmation tothe abovespecifications.

04) Please fill up the PQR(Annxure-1) and applicable commercial terms and conditions (Annexure-A) and submit the same along with the techno- commercial bid for evaluation. Pls. note that, **offers not meeting the PQR criterias, will not be considered for further evaluation.**

05) The tender will be considered as a single package basis for evaluation and ordering .

06) Delivery term:

For maim items: FOR Panki project site basis (Uttar Pradesh state) Packing & forwarding and Freight to yours account.

For mandatory spares:FOR BHEL Trichy Stores basis (Tamil Nadu state) Packing & forwarding and Freight to yours account.

Transit Insurance is on BHEL scope. Ex-Works Contracts will not be entertained.

07) The materials are required for Panki project

08) Please take note of loading factors for commercial deviations indicated in the Annexure - A. Offer will be evaluated on total cost to BHELand after all loadings as applicable..

9) Bid should be free from correction, overwritting, using corrective fluid. etc. Any interlineation, cutting, erasure or overwritting shall
be valid only if they are attested under full signature (s) of person (s) signing the bid.

10) The bidder has to keep track of any changes by viewing the addendum /

Corrigendum's issued by the Purchaser on time-to- time basis in the E-Procurement platform. The Company calling for tenders shall not be responsible for any claims/problems arising out of this.
11) Before uploading scanned documents, the bidders shall sign on all the statements, documents, certificates uploaded by him, owning responsibility for their correctness / authenticity.
12) Disclaimer Clause : The Organization (Bharat Heavy Electricals Ltd.) nor the service provider (ABC procure.) is responsible for any failure of submission of bids due to failure of internet or other connectivity problems or reasons thereof.
Enclousers:
01) Annexure1 (Pre - Qualification Criteria).
02) Annexure A (Commercial terms & conditions and Loading Factors)
04) BHEL Technical specifications For Fan - TOS: PANKI:1811, Rev.00, SAF:PANKI:OS/REV 00, AC Motor Specification- TDC:TCI:140, Rev. 12, DC Motor Specification TDC:TCI::223C MOTOR/Rev.05-Project specific transmittal for LT AC Motors & DC Motors TR:AC-DC MOTOR:1728,
5) NTPC RQP:0000-999-QVM-P-164 Rev.No:02
07) Annexure C for MSE conditions
08) Make in India declaration format
09) CA certificate format
10) No deviation certificate
11) third party non disclouser agreement

Product / service / work keywords	:	Air Fan,

No. of Bid Parts	:	Multiple	Envelope	:	Techno-commercial bid , Price bid
Type of contract	:	Goods	Project duration / delivery or completion period	:	03 months from document approval
Download document	:	Before login	RFQ floated under the policy	:	PP-PURCHASE POLICY
Estimated Category	:	F	Delivery/Location At	:	Main supply: DTS, Spares :BHEL Trichy
Delivery Date	:	24/02/2021 05:30:00	Inspection by Agency	:	BHEL TPIA/BHEL/NTPC/Customer
Inspection Location	:	At vendor works, before dispatch	Min. bid required	:	01

Bid submission configuration

Bid evaluation	:	Grand Total Package	Bidding access	:	Open Tender
Base currency	:	INR	Bidding type	:	NCB/Indigenous

Key configuration

Pre-bid meeting	:	Don't allow

Dates configuration

Document downloading start date	:	28/07/2020 16:30:00	Document downloading end date	:	24/08/2020 14:00:00
Bid submission start date	:	28/07/2020 16:30:00	Bid submission end date	:	24/08/2020 14:00:00
Bid opening date	:	24/08/2020 14:01:00			

Document / EMD / Security fee detail

Document fees	:	Not required	EMD	:	Not required

Bidding forms

Price Bid

Price Bid 1

Material Code	Item description	Quantity	Unit
L172814320001001	SCANNER AIR FAN WITH AC MOTOR 415V AC	1.00	NO
L172814320001002	SCANNER AIR FAN WITH DC MOTOR 220V DC	1.00	NO
L172814320001003	ANTI VIBRATION PADS	12.00	NO
L172814320001004	INLET TRANSITION PIECE	2.00	SET
L172814320001005	OUTLET TRANSITION PIECE	2.00	SET
L172814320001006	FIX.BOLTS,NUTS&WASHERS & GASKETS FITTED	2.00	SET
L172814320001007	EXPANSION /VIBRATION ISOLATOR	2.00	NO
L172814320001008	EXPANSION /VIBRATION ISOLATOR	2.00	NO
L1728S4399701001	COMPLETE FAN ASSY (EXCLUDING FAN BODY)	1.00	NO

Price Bid 2

Sl No	Item name
1	Refer Table 1

Corrigendum details

Corrigendum / Amendment No :1 (Published)

Types of corrigendum :	1) Dates
Corrigendum Text :	**Tender due date extension up to 24.08.2020**

Field name	Old value	New value
Document downloading end date	11/08/2020 14:00:00	24/08/2020 14:00:00
Bid submission end date	11/08/2020 14:00:00	24/08/2020 14:00:00
Bid opening date	11/08/2020 14:01:00	24/08/2020 14:01:00

Information for Online Participation

Bidder who wish to participate in this tender needs to procure Digital Certificate as per Information Technology Act-2000 using that they can digitaly sign their electronic bids. Bidders can procure the same from any or the CCA approved certifying agencies, or they may contact e-Procurement Technologies Ltd. at below mentioned address and they will assist them in procuring the same. Bidders who already have a valid digital Certificate need not to procure the same. In case bidders need any clarification regarding online participation, they can contact,

e-Procurement Technologies Ltd.
Corporate Office:
Address : A-201/208, Wall Street - 2, Opp. Orient Club,
Nr. Gujarat College, Ellis Bridge,
Ahmedabad - 380006, Gujarat(INDIA)

Digital Certificate Contacts

Contact Person : Mr. Himalay Vaishnav
Cell : +91-9099090830
Phone Nos. : +91-9099090830
Fax No :
e-Mail : info@abcProcure.com

Support Team Contacts

Contact Person : BHEL Support Team Ahmedabad
Cell : +91-9265562819
Phone Nos. : +91-79-68136849/50/48
Fax No :
e-Mail : Bhel.Support@abcProcure.com

Bidder who wish to participate in e-Tender need to fill data in predefined forms of Price bid available in respective tender only. After filling data in predefined forms bidders need to click on final submission link to submit their encrypted bid.Bidder need to submit Document Fees, EMD & Reference Documents in hard copy if such instruction are given by tendering authority.As Per the new Inter-operability guidelines released by Controller of Certifying Authorities(CCA), the Secured Socket Layer(SSL) certificate for a e-procurement application is generated on a new algorithm, SHA2.

Also, the Digital Certificates that will be applicable for these platforms have to be SHA2 algorithm complaint. For the same, the users have to ensure that they have Windows XP(SP3)/Windows Vista/Windows7 installed in their respective PC/Laptop.In case of Windows XP Service pack - 3, if you get any issue you can install the SSL patch, which is available at our download section of our e-Tender/e-Auction Portal and also at our corporate website www.abcprocure.com just below the label of "Knowledge section".

Fraud Prevention

Bidder along with its associate/collaborators/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL

Management about any fraud or suspected fraud as soon as it comes to their notice.

Preference to Make in India

For this procurement, Public Procurement (Preference to Make in India), order 2017 dated 15.06.2017 & 28.05.2018 and subsequent orders issued by the respective Nodal ministry shall be applicable even if issued after issue of this NIT but before finalization of contract/PO/WO against this NIT. In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement, same shall be applicable. Default margin of purchase preference shall be 20% to local suppliers with default minimum local content of 50%.

An ISO 9001
Company

Bharat Heavy Electricals Limited
(High Pressure Boiler Plant)
Tiruchirappalli-620 014, Tamil Nadu, India
Dept: MATERIALS MANAGEMENT/BOI

Annexure – A - Terms and Conditions

ACCEPTANCE OF TECHNO - COMMERCIAL TERMS & CONDITIONS BY THE BIDDERS

Description of the Equipment:	**SA fan , its accessories & Mandatory Spares for Panki project**
Enquiry No:	**Enq No 1802000454/14 dt. 27.07.2020**

Sl. No.	**Terms and conditions**	**Vendor's confirmation**
1 (a)	**Technical:** The supply shall be as per BHEL specification: For Fan - TOS: PANKI:1811, Rev.00, SAF:PANKI:OS/REV 00, AC Motor Specification- TDC:TCI:140, Rev. 12, DC Motor Specification TDC:TCI::223C MOTOR/Rev.05-Project specific transmittal for LT AC Motors & DC Motors TR:AC-DC MOTOR:1728, RQP:0000-999-QVM-P-164 Rev.No:02 and Annexure- A attached with the enquiry, without deviation. Pl note that document approval (Drawings/Technical documents and QP) by BHEL and NTPC/Customer is applicable.	
1 (b)	Inspection by BHEL Approved Third Party Inspection Agencies/BHEL/NTPC/Customer at vendor works before dispatch is applicable. Shipment shall be made only after obtaining despatch clearance from BHEL/MDCC from NTPC/Customer.	
1 (c)	Confirmation & submission of all PQR documents as per annexure -1 (Technical pre-qualification requirements) **Note: Vendors not meeting PQR will be rejected.**	
1 (d)	Offer will be considered as package basis for evaluation & ordering, as indicated in the tender. Evaluation will be on total cost to BHEL, after all loadings as applicable.	
1 (e)	Pl note that your offer consideration is **subject to Techno- Commercial Suitability & customer approval before Price bid opening**.	
2	**Firm Price:** The quoted / finalised rates shall be Firm till execution of the supplies. Offer with Price Variation Clause (PVC) will not be considered.	
3	The tender will be operated in two part bid system. One-part consisting of Technical bid with Commercial terms & conditions and other part is Price Bid. Based on the above and other conditions, as well as technical capability, vendors will be short-listed. The Techno-commercial bid will be opened on the due date and based on the suitability of techno-commercial bid, the price Bid of the techno-commercial suitable qualified vendors will be considered and opened on a suitable date with due intimation to vendors.	
4	**Delivery term** For maim items: FOR Panki project site basis (Uttar Pradesh state) Packing & forwarding and Freight to yours account. For mandatory spares: FOR BHEL Trichy Stores basis (Tamil Nadu state) Packing & forwarding and Freight to yours account.	

	Transit Insurance is on BHEL scope **Ex-Works Contracts will not be entertained.**	
5	**Payment terms:** **1. For DTS items** "100% direct EFT payment after 60 days from the date of dispatch against site acknowledgement. **2. For Trichy Store items (Mandatory Spares)** "100% direct EFT payment after 60 days from the date of receipt & acceptance of material at our stores.	
6 (a)	**Liquidated damages:** Delivery of the goods specified in the purchase order should be made within the time prescribed. Failure to dispatch the materials in the time as per the delivery quoted in our Purchase Order would make the supplier liable to an un-conditional LD at the rate of 0.5% of the order value per week of the delay or part thereof subject to a maximum of 10% of the total order value. In case of PO placements, required documents have to be submitted for approval within 15 days from the date of PO & reply for any further clarification has to be within 7 days. Any delay beyond the above specified period will be considered during LD calculation.	
6 (b)	**Loading Criteria on LD term for arriving the L1 rate:** Any deviation on BHEL LD clause, loading (Offered Value) will be applied to the extent to which it is not agreed by the bidder. *Acceptance of LD on undelivered portion will be loaded at the rate of 10% (max).	
7 (a)	**Guarantee / Warranty Period:** The offered system shall be guaranteed for 18 months from the date of supply or 12 months from the date of commissioning, whichever is earlier	
7 (b)	**Loading Criteria:** **Guarantee / Warranty Period:** No Deviation is permitted. If still vendor offered any deviation on the Guarantee / warranty period, it may lead to rejection of offer.	
8	**Risk purchase:** If the supplier fails to deliver the goods within the delivery specified in the Purchase Order, BHEL will be entitled to terminate the contract and to Purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or despatch within the delivery period mentioned in the Purchase Order.	
9	**Delivery Period:** 03 months from document approval	
10	LR date will be considered for LD calculation.	
11	**Validity:** 120 days minimum from techno commercial bid opening (Part-1). Any Deviation with respect to validity your offer is liable for rejection. Ensure your quoted rates will have 120 days minimum validity from techno commercial bid opening. The delay in responding to BHEL technical	

	clarification beyond four days will be subsequently added to the validity period, Revised Price Bids will not be encouraged.	
12	**Inspection and testing requirements:** Inspection and testing requirements are to be carried out as per the specification and BHEL/Customer approved Drawing (All documents shall be submitted within 15 days from the date of PO for our approval), Technical spec &QP and all test certificates are to be submitted in complete set. Inspection notice period: For TPI inspector visit to vendor works, a minimum of 3 working days' notice period for indigenous vendors and 30 working days' notice period for import vendors is required well in advance from the proposed date of inspection	
13	**Repair & replacements:** Within the guarantee period vendor has to replace / rectify the defective/ damaged items on free of cost within a reasonable time of reporting from our end.	
14	Documents are to be submitted along with technical bid (Part-1) 01. Covering letter 02. Unpriced offer. 03. Filed technical specification 04. Filed BHEL Terms and condition sheet (Annexure-A) 05. Catalogue's 06. PQR (Special Conditions annexure -1) 07. List of Spare parts 08. Third party non-disclosure agreement Documents are to be submitted along with Price bid (Part-2) 01. Priced offer Note: All the pages of documents are to be signed and stamped by authorized signatory of the company.	
15	**MSE Applicability as per Annexure C. The vendors shall furnish valid certificates (Latest audited CA certificate & UAM) as per annexure C, for availing the benefits of MSE with deemed validity in the offer itself.** **Note:** As per Gazette Notification no. S.O. 2119(E) dated 26.06.2020 issued by Ministry of MSME regarding change in definition of Micro, Small & Medium Enterprises (MSMEs) applicable w.e.f. 01.07.2020, you are hereby requested to obtain 'UDYAM Registration' and submit the same.	
16	**Make in India:** For this procurement, Public Procurement (Preference to Make in India), order 2017 dated 15.06.2017, 28.05.2018 & 04.06.2020 issued by DPIIT and subsequent orders issued by the respective Nodal ministry shall be applicable even if issued after issue of this NIT but before finalization of contract/PO/WO against this NIT. In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement, same shall be applicable. Default margin of purchase preference shall be 20% to local suppliers with default minimum local content of 50%.	

	"For this procurement, the local content to categorize a supplier as Class I local supplier/ Class II local Supplier/ Non- Local supplier and purchase preference to Class I local supplier, as defined in Public Procurement (Preference to make in India), Order 2017 dated 04.06.2020 issued by DPIIT. In case of subsequent orders issued by the nodal ministry, changing the definition of local content for the items of the NIT, The same shall be applicable even if issued after issue of This NIT, but before opening of part-II bids against his NIT" For more details, pls. refer the Public Procurement (Preference to Make in India), order 2017 dated 15.06.2017 & 28.05.2018 and subsequent orders issued by the respective Nodal ministry.	
17 a	**<u>Important Information for Indigenous Suppliers</u>:**	
	Kindly indicate the GST No of your Firm	
	Kindly Indicate the HSN Code for the Enquiry item.	
	Please indicate the applicable GST % (IGST, SGST, CGST)	
	Kindly Note the BHEL Trichy Unit GST NO : 33AAACB4146P2ZL	
	Response to Tenders for Indigenous supplier will be entertained only if the vendor has a valid GST registration number which should clearly have mentioned in the offer. If any specific exemption is available, a declaration with due supporting documents need to be furnished for considering the offer.	
17 b	**<u>In Case of Order Placement</u>**: Supplier shall mention their GSTN registration number in all their invoices and invoices shall be in the format as specified/prescribed under GST laws. Invoices shall necessarily contain Invoice number (in case of multiple numbering system is being followed for billing like SAP invoice no, commercial invoice no etc., then the Invoice No which is linked/uploaded in GSTN network shall be clearly indicated), item description as per PO, Quantity, Rate, Value, applicable taxes with nomenclature (like IGST, SGST, CGST & UTGST) separately, HSN/ SAC Code, etc.	
	All invoices shall bear the HSN Code for each item separately (Harmonized System of Nomenclature)/ SAC code (Services Accounting Code).	
	A declaration to the effect that all invoice particulars are/were uploaded in the GSTN network/ portal & all tax liability as per GST rules and regulations have been and will be discharged, shall be mentioned in the invoice. If not mentioned in the invoice, a separate declaration shall be submitted as per the requirement of BHEL.	
	All dispatch and quality documents like Mill Test Certificate, LR copy, Guarantee/Warrantee certificate, work completion certificate, any other document mentioned in PO, shall be sent along with the vehicle/consignment. For all consignments received within the calendar month, input credit will be availed within that month in line with monthly returns filing cycle. In case of any discrepancy in the document or non-submission of documents mentioned in the PO, then BHEL will not be able to accept or account the material, in such case availing of tax credit will be deferred to next month or so	
	In case of discrepancy in the data uploaded by supplier in the GSTN portal	

	or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note (details to be uploaded in GSTN portal) for the shortages or rejections in the suppliers, within the calendar month notified by BHEL	
	For any such delay in availing of tax credit for reasons attributable to supplier (as mentioned above), interest (calculated @ SBI Base Rate + 6%) along with penalty if any will be deducted for the delayed period i.e. from the month of receipt till the month tax credit is availed, from the running bills.	
	Under GST regime, BHEL has to discharge GST liability on LD recovered from suppliers/contractors. Hence applicable GST shall also be recoverable from suppliers/contractors on LD amount. For this Debit note will be issued by BHEL indicating the respective supply invoice number. For this, Debit note will be issued by BHEL indicating the respective supply invoice number. Debit note will be available on our B2B portal.	
Note:	BHEL may negotiate the L1 rate, if not meeting our budget/estimated cost. BHEL may re-float the tender opened, if L1 price is not the acceptable price to BHEL. Any deviation in specified commercial terms- Annexure B, will lead to rejection of offer. **Any other Techno –Commercial Terms indicated by the vendor in their offer elsewhere will be ignored. BHEL will proceed with tender evaluation as per Annexure A only.**	

Vendor's Seal and Signature

/ On Bidder's office letter pad /

Self-Declaration

Enquiry No.	**1802000454/14**
Enquiry Date	**28.07.2020**

In line with Government public procurement order Number P-45021/2/2017-B.E-II dated 15.06.2017, and further modified order dt. 28.05.2018 & order 04.06.2020 issued by DPIIT

I / We hereby declare that I / We are a "Local Supplier" meeting the requirement of minimum local content (.....%) defined in the above government notification for the goods against above mentioned enquiry Number.

Details of location at which local value addition will be made is as follows:

Door No.	
Street / Address 1	
Street / Address 2	
District	
State	
Country	
PIN Code	

We also understand that the false declarations will be considered as breach of Integrity and liable for action.

For Company Name:
Seal:
Signature:

Date:
Place:

(Please fill all the yellow color field)

429-024	**PURCHASE / MM / FB** **SUB DELIVERY – ENQUIRY - DEVIATION**		
	Page	OF	
	DATE		
DESCRIPTION	SA Fan, its accessories & Spares		
SPECIFICATION	1.For Fan - TOS: PANKI:1811, Rev.00 2. SAF:PANKI:OS/REV 00 3.AC Motor Specification-TDC:TCI:140, Rev. 12 4. DC Motor Specification TDC:TCI::223C MOTOR/Rev.05- 5. Project specific transmittal for LT AC Motors & DC Motors TR:AC-DC MOTOR:1728	DRG. No.	
QUALITY PLAN	RQP:0000-999-QVM-P-164 Rev.No:02		
DOC. REFERENCE	BHEL ENQ. CALLED FOR	FIRM'S ALTERNATE OFFER	

CERTIFIED THAT OTHER THAN THE ABOVE DEVIATIONS, WE ARE ACCEPTING ALL THE OTHER SPECIFICATIONS AND REQUIREMENTS IN FULL TO YOUR ENQUIRY

STATION:

DATE: SIGNATURE OF FIRMS REPRESENTETIVE FIRM SEAL

NOTE: 1. Deviations should be taken only in the extreme case.

2. If necessary, use additional sheets with page control number.

Annexure C

Clause: Special Provisions for Micro and small Enterprises (MSE):

1. In case MSE vendor participating in the tender quotes within the price band of L1+15%, they will be allowed to supply the complete package requirement subject to acceptance of L1 price by MSE vendor.

2. In case of more than one such MSE, the counter offering will be to the lowest quoted MSE vendor subject to fulfilment of Point No.1

3. MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either EM II certificate having deemed validity (Five years from the date of issue of acknowledgement in EM II) or valid NSIC certificate or EM II certificate along with CA certificate (Format enclosed) applicable for the year, certifying quantum of investment in plant and machinery within the permissible limit as per the act for relevant status (Micro or small) where the deemed validity of EM II is over. Date to be reckoned for determining the deemed validity will be the last date of technical bid submission. Non submission of such documents will lead to consideration of their bids at par with other bidders and MSE status of such suppliers shall be shifted to Non MSE supplier till the supplier submits these documents.

4. Declaration of UAM number by MSE bidders is mandatory. Failing which, such bidders will not be able to enjoy the benefits as per Public Procurement Policy for MSEs Order, 2012.

5. Payment for MSE Indigenous vendors will be as per MSMED Act 2006

Technical Pre-Qualification Requirement (PQR) for Scanner Air Fan & Motor assembly.

1. The vendor shall be an established Centrifugal fan (radial backward curved) supplier and having adequate Engineering, Manufacturing, testing and servicing facilities for fan and shall furnish technical backup documents in proof for above requirements.
2. The vendor shall have experience of having supplied Centrifugal Fan of radial backward curved type with AC/DC motor assembly, capable of handling the dust-laden air, designed for developing a head and capacity as per the technical specification for boiler/refinery or application of similar severity. The supplied fan & motor shall be in operation for at least one year as on the date of enquiry. Supplier shall submit documents in proof of the same.
3. The fan & motor assembly offered shall be from the existing regular supply range of the vendor. Vendor shall provide the product catalogue and general reference list for the fan & motor assembly indicating Application, Capacity, Head, Type of Fan, Customer Name, Purchase order date along with offer.
4. Proven track record is required. Minimum One end user certificate for the satisfactory operational performance of their equipment's supplied.
5. In case of ordering, the Vendor shall have the responsibility for the following and same to be confirmed point wise.
   i) Vendor should have the component replacement responsibility in case of defect / failure.
   ii) Experts from Vendor's side shall associate in commissioning activities at site, if required.
   iii) Vendor should ensure the product performance during erection & commissioning and ensure performance guarantee.

SPECIFICATION FOR SCANNER AIR FANS

(To be read with TOS: PANKI:1811/ Rev 00)

1. Intent:

To design manufacture, test and supply of scanner air fans.

2. Scope:

The scanner air fan shall be supplied with the drive motor as per the LT motor specification enclosed.

3. Functional and Terminal condition:

To supply required air for scanner purging and cooling.

4. Constructional Features and Special requirements:

a) Refer enclosed fan data sheet (TOS: PANKI:1811 / Rev 00)

b) The motor shall be as per the approved L.T motor specification.

5. Applicable drawing:

Manufacturer's drawing.

6. Inspection and Testing:

The scanner air fan with the drive shall be inspected and tested as the approved Customer quality plan.

All tests as per the customer approved QP for centrifugal fans should be done and inspection calls shall be made 15 days in advance for customer/BHEL to witness tests envisaged as customer hold points in the QP shall be given. No further operation by vendor shall proceed till necessary written clearance is provided by customer for the hold points.

Exhaustive test certificates as with QP shall be furnished by vendor to customer/BHEL for review and clearance prior to despatch.

For Bharat Heavy Electricals Ltd.

PREPARED	CHECKED	APPROVED	DATE

7. Packing:

Fan and motor assembled completely and packed in a weather proof box with the required supports to avoid and transit damages.

8. Information to be furnished:

a) QP shall be furnished in customer format.
b) 3 sets of catalogue and drawing showing the overall dimensions and cross sectional view of the fan and with the foundation detail.
c) Test certificates of materials used.
d) Performance test of fan with motor as per the approved customer QP.
e) In the event of order, provide 6 sets of above documents.

For Bharat Heavy Electricals Ltd.

PREPARED	CHECKED	APPROVED	DATE

Controls & Instrumentation/Fossil Boilers
Project Specific Transmittal for LT AC motors and DC motors

Transmittal Ref.: TR: LT AC-DC MOTOR: 1728

Project Details:

Project/Rating : PANKI TPS 1 X 660 MW
Customer Number : 1728

The project specific transmittal has to be referred along with the technical specification of the motor.

a) Efficiency Class of LT motor and Cable Entry Details of LT AC Motor and DC Motor

Energy efficient level: IE3 as per IS 12615 – 2018 (For LT AC Motors).

Table - 1, Power cable size for LT AC motors: -

Vendor to provide the cable entry and supply cable-glands, lugs as per the technical specification requirement and suitable for the power cable sizes as indicated below. The cable sizes indicated below are tentative. The actual power cable size based on the run length will be intimated during technical evaluation stage, before placement of purchase order.

Sl. No.	From (KW)	To (KW)	Power Cable size in sq. mm. (#)
1.	0.01	2.21	3C-2.5mm^2(CU)
2.	2.21	7.5	3C-16mm^2(AL)
3.	7.51	11.00	3C-16mm^2(AL)/3C-35mm^2(AL)
4.	11.10	18.50	3C-35mm^2(AL)
5.	18.51	45.00	3C-95mm^2(AL)
6.	45.01	75.00	3C-185mm^2(AL)
7.	75.01	90.00	2-3C-185mm^2 (AL)
8.	90.01	110.00	3C-300mm^2 (AL)

Table-2 (applicable to LT AC, Flame proof Motors only): -

Sl. No.	Motor rating (KW)	Minimum Distance between centre of motor terminal and the gland plate (mm)
1	Up to 3 KW	As per manufacturers' practice
2	Above 3 KW – Up to 7 KW	85
3	Above 7 KW – Up to 13 KW	115
4	Above 13 KW – Up to 24 KW	167
5	Above 24 KW – Up to 37 KW	196
6	Above 37 KW – Up to 55 KW	249
7	Above 55 KW – Up to 90 KW	277
8	Above 90 KW – Up to 125 KW	331

Table-3 Applicable for LT AC motors: -

Minimum inter-phase and phase-earth air clearance for LT AC motors with lugs installed shall be as follow

Sl. No.	Motor MCR in KW	Clearance (in mm)
1	Up to 110 KW	10
2	Above 110 KW – Up to 150 KW	12.5

Table-4 (Power cable size for DC motors): -

Vendor to provide the cable entry and supply cable-glands, lugs as per the technical specification requirement and suitable for the power cable sizes as indicated below.

Sl. No.	Full Load current (Amp)	Power Cable, Armoured
1.	30-50	2C-95mm^2 (Cu)
2.	50-80	2-2C-95mm^2 (Cu)

b) Relevant sheets of the contract specification.

The contract specification will supersede the respective clauses of the technical specification, if the requirements are spelt in both technical specification and contract specification.

CHAPTER 17 : AC & DC MOTORS

1.00 MOTORS

1.1 SCOPE

This specification is intended to cover design, manufacture, assembly and testing of AC Squirrel Cage Induction Motors for use in Thermal Power Plants and is supplement to the driven equipment specifications under which these motors are being procured for the project.

SITE CONDITIONS

Site conditions are covered in 'Project Data', contained in specification of the driven equipment.

1.2 Gases, Fumes & Dust Particles

1.2.01 General - Sulphur dioxide and/or trioxide fumes mildly present. Climate is tropical, conducive to fungus growth.

1.2.02 **Dust Particles**

1 Outdoor locations - Heavily dusty with abrasive dust and coal particles of size five (5) to hundred (100) microns present in atmosphere in large quantity.

2 Indoor Locations.

2.1 Coal conveyors - As for outdoor as per clause 1.02.02.1 above.

2.2 Other locations - Lightly dusty with abrasive dust and coal particles of size five (5) to twenty (20) microns present in atmosphere.

1.2.03 **Special Fumes**

1 Water treatment plant and acid cleaning room - Acid and alkali fuses present.

2 Fuel oil pumping areas & Hydrogen generation plant - Explosive fuses (flameproof motors required).

1.2.04 For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.

1.3 **LOCATION OF MOTOR** - As required

1.4 **SPECIFICATIONS & STANDARDS**.....Motors shall comply with the latest revisions of all relevant standards of BIS (IS-325, IS-900, IS-996, IS-1231, IS-1885, IS-2148, IS-2223, IS-2253, IS-2254, IS-2848, IS-3202, IS-4029, IS-4691, IS-4722, IS-4728, IS-4889, IS-6362, IS-7816, IS-8223, IS-8789 , IS: 12615, IS:3177 and IEC : 60034 3Φ Induction motor) except as modified herein or in driven equipment specification.

Motors conforming to BS or IEC Publications, which ensure equivalent quality shall also be acceptable.In case of any difference between IS Specification/International Standards (IEC; NEMA etc.), this motor specification prevails.

1.5 TYPE

1.5.1 AC Motors:

a) Squirrel cage induction motor suitable for direct-on-line starting.

b) Continuous duty LT motors upto 160 KW Output rating (at 50 deg. C ambient temperature), ~~shall be **Efficiency class-IE2**~~, conforming to IS 12615, or IEC:60034-30. EFFICIENCY CLASS IE3

c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.

1.5.2 DC Motors Shunt wound.

1.6 **VOLTAGE (NOMINAL)**

1.6.1 **LV Motors**

For motors upto and including 200 KW - Four hundred fifteen (415) V.

1.6.2 **MV MOTORS**

~~For motors above 200kW upto and including 1500kW, Three point three (3.3) kV.~~

For CHP conveyors motor above 160 kW, 3.3 kV, AC supply is to be used. However all the motors on stacker reclaimer shall be on 415 V AC only.

1.6.3 ~~**HV Motors**~~

~~For motors above 1500kW eleven(11) kV~~

1.6.4 All motors are to be designed for system grounding described in "System Particulars" under site information of the Driven Equipment Specification.

1.7 **FREQUENCY (NOMINAL)** - fifty (50) Hertz

1.8 NUMBER OF PHASES - Three (3)

1.9 SPEED - As required by the driven equipment

1.10 TYPE OF STARTING :

Direct on-line (VFD/Soft-starter/star/delta starting in special cases)

1.11 DUTY

Applicable only if enquiry calls for supply of motor along with load such a fan or pump.

1.11.1 Continuous motor rating shall be arrived at considering 15% margin over the duty point input or 10% over the maximum demand of the driven equipment,

whichever is higher, considering highest system frequency and voltage variation. Crane motors shall be rated for S4 duty, 40% cyclic duration factor. If however, a higher margin is stipulated in the accompanying driven equipment specification, the higher stipulated margin shall prevail.

~~1.11.2~~ ~~All HT motors shall have vibration pads for mounting vibration detectors.~~

1.11.3 All motors shall be designed to withstand hundred twenty (120) percent of rated speed without any mechanical damage for two (2) minutes.

1.11.4 Motors shall be designed to keep torsional and rotational natural frequencies of vibration of the motor and driven equipment atleast twenty five (25) percent above or below, preferably above the motor operating speed (to avoid resonance in vibration over the operating speed) range.

1.11.5 * All LV motors rated 0.37kW and higher with S1 duty shall be compulsorily be of energy efficiency level IE 2 as per IS 12615:2011.

Motors rated above 37kW shall have efficiency higher than 0.92 and high power factor of atleast 0.88.

1.12 **SUPPLY VARIATIONS**

Motors shall be capable of running continuously at full load under following variations in power supply:

1.12.1 All equipments shall be suitable for rated frequency of 50 Hz with a variation of (+) 3% and (-)5%, ~~voltage variation of (±) 6% for 11 kV & 3.3 kV~~ and (±)10% for 415V and 10% (absolute sum) combined variation of voltage and frequency unless specifically brought out in the specification.

1.13 **ABNORMAL CONDITIONS CAPABILITY**

Motor shall have following capabilities as specified design ambient temperature:

1.13.1 The motors shall also be capable of running up again after voltage collapse to about 40% for approximate duration of 0.5 sec. Subsequent rise in voltage to 70% and further to 80% and 100%, the total duration not exceeding 20 sec.

1.13.2 Low Voltage Running :

Motor shall be capable of running satisfactorily at seventy five (75) percent nominal voltage for five (5) minutes.

1.13.3 Momentary Low Voltage Withstanding :

Motor, when running at full load, shall not stall when voltage drops down to seventy (70) percent nominal voltage for one (1) minute.

1.14 **STARTING CAPABILITY**

1.14.1 Low Voltage Starting :

Motor shall be capable of starting and accelerating to full speed at full load (including loaded equipment e.g. mills and conveyors etc) at eighty (80)

percent nominal voltage at motor terminals. Mill motors may be permitted to start with terminal voltage not below 90%.

1.14.2 Cold Motor Starting ..... Under specified voltage variations two (2) starts in quick succession and third start five (5) minutes thereafter, all with full load (including loaded equipment eg mills and conveyors etc) of driven equipment. No additional start will be made till lapse of further thirty (30) minutes.

1.14.3 Hot Motor Starting ..... Under specified voltage variations, one (1) immediate and two (2) fifteen (15) minutes interval starts all with full load (including loaded equipment e.g. mills and conveyors etc) of driven equipment. No additional start will be made till lapse of further thirty (30) minutes.

1.14.4 Motor shall also be suitable for three (3) equally spread starts per hour when the motor is under normal service condition.

1.14.5 Break-away Starting Current .....Breakaway starting current as percent of full load current for various motor ratings shall not exceed the values given below:

1.14.5.1 Motors above 1500 KW upto 4000kW ..... 600% without any positive tolerance except for ID Fan Motor.

1.14.5.2 Motors above 4000 KW ..... 450%. Not subject to any positive tolerance.

1.14.5.3 For D.C. Motors the starting current shall be limited to 2 times full load current.

1.14.5.3 **Starting voltage requirement**

a) All Motors (except Mill Motors)

- 80% of rated voltage for Motors upto 4000 kW
- 75% of rated voltage for Motors above 4000 kW

~~b) For Mill Motors:~~

- ~~85% of rated voltage for Motors above 1000 kW~~
- ~~90% of rated voltage for Motors below 1000 kW~~

Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.

1.14.5.4 **Starting Time**

1.14.5.4.1 For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.

1.14.5.4.2 For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.

1.14.5.4.3 For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.

1.14.5.5 **Torque Requirements:-**

1.14.5.5.1 Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10%. Motor full load torque.

1.14.5.5.2 Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty Motors.

1.15 **SAFE STALL TIME**

1.15.1 To avoid problem in selecting standard protective relays without using speed switches, safe stall time under hot conditions (corresponding to 110% nominal voltage at motor terminals) shall be more than the accelerating time (corresponding to 80% nominal voltage at motor terminals) by the following minimum values :

1.15.1.01 Two (2) seconds, where accelerating time (at 80% nominal voltage) does not exceed 20 seconds.

1.15.1.02 Three (3) seconds, where accelerating time (at 80% nominal voltage) exceeds 20 seconds.

1.15.1.03 At no stage, speed switch shall be provided to achieve the above requirements mentioned under Clause No. 1.14.5.4

1.16 **CLASS OF INSULATION**

1.16.1 LV Motors ..... Class F.

~~1.16.2 MV & HV Motors ..... Class F~~

1.16.03 However temperature rise shall be restricted to limits corresponding to Class 'B' insulation for ~~both HT &~~ LT motors. The temperature under abnormal running conditions shall be limited to 5°C above class 'B' limits.

1.16.04 ~~The value of the polarization index for motors above 200kW should not be less than 2 when determined according to IS: 7816.~~

1.17 **TEMPERATURE RISE UNDER NORMAL CONDITIONS**..... Temperature rise over specified design ambient temperature when motor is running with full load at nominal supply voltage & frequency shall not exceed the values given below:

S.No.	Specified Design Ambient Temperature	Thermometer Method	Resistance Method
1.17.01	50°C	60°C	70°C
~~1.17.02~~	~~45°C~~	~~65°C~~	~~75°C~~
~~1.17.03~~	~~40°C~~	~~70°C~~	~~80°C~~

1.18 **BUS TRANSFER WITHSTAND CAPABILITY**

Motors will be connected to an automatic bus transfer system and hence may be subjected to one hundred and fifty (150) percent of the nominal voltage during changeover of buses due to the vector difference between the residual voltage and incoming supply voltage and the duration of this condition may be one second. Motors shall be capable of withstanding the voltage and torque stresses developed under such conditions without damage. The manufacturer/ vendor shall indicate the special precautions taken to meet the above requirements and confirm.

1.18.01 That about 5000 bus transfers, in lifetime of motor, shall not puncture its insulation.

1.18.02 That motor shall be capable of withstanding heavy inrush transient current caused by such bus transfers without damage.

1.18.03 That the motor windings shall be adequately braced to satisfactorily withstand mechanical stresses under these conditions.

1.18.04 The motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torques under these conditions.

1.19 **TYPE OF ENCLOSURE**

1.19.01 Outdoor Motors ..... IP 55 (Additional canopy to be provided by EPC contractor.

1.19.02 Indoor Motors ..... IP 55

1.19.03 IP-55 degree of protection shall be achieved without application of any compound, putty etc.

1.19.04 Motor located in hazardous area shall have flameproof enclosure conforming to IS: 2148 /Equiv. as detailed below:

a) Fuel Oil area : Group IIB
b) Hydrogen generation plant area : Group IIC (or Group-I, Div-II as per NEC or Class-1, Gr-B, Div-II as per NEMA/IEC60034).

1.20 **METHOD OF COOLING**

1.20.1 Method of cooling shall be IC 411 (TEFC), IC 511 (TETV) or IC 611 (CACA). However, motors rated 3000kW or above can be closed air circuit water cooled (CACW).

1.20.2 Large capacity motors not available with above types of cooling may be accepted with IC 81 W for IC 91 W (CACW) cooling subject to the approval of the Owner.

1.21 **TYPE OF MOUNTING** ..... As required for the driven equipment.

1.21 **MAXIMUM MECHANICAL VIBRATIONS**

1.21.01 Noise level for all the motors shall be limited to 85dB(A) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits

prescribed in IS: 12075 / IEC 60034-14. Motors shall withstand vibrations produced by driven equipment. ~~HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.~~

1.21.02 Noise level

*

The noise level of motors shall not exceed 85 db (A) at 1m from operating motor measured in accordance with IS: 10265.

1.21.03 Motor body shall have two earthing points on opposite sides.

1.21.04 11 KV motors shall be offered with Separate Insulated Connector (Elastimould or Equivalent make) as per IEEE 386. The offered Elastimould terminations shall be provided with protective cover and trifurcating sleeves. Elastimould termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.

1.21.05 3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Suitable termination kit shall be provided for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.

1.21.06 The spacing between gland plate & centre of terminal stud shall be as per Table-I.

TABLE - I

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

Motor MCR in KW	**Minimum distance between centre of stud and gland plate in mm**
UP to 3 KW	**As per manufacturer's practice.**
Above 3 KW - upto 7 KW	85
Above 7 KW - upto 13 KW	115
Above 13 KW - upto 24 KW	167
Above 24 KW - upto 37 KW	196
Above 37 KW - upto 55 KW	249
Above 55 KW - upto 90 KW	277
Above 90 KW - upto 125 KW	331

Above 125 KW-upto 200 KW 203

~~For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.~~

1.21.07 All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.

1.21.08 ~~For motors rated 1500 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.~~

1.21.09 The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP motor.

(a)	Below 110KW	:	10.0
(b)	From 110 KW & upto 200 KW	:	9.0
(c)	Above 200 KW & upto 1000KW	:	10.0
(d)	From 1001KW & upto 4000KW	:	9.0
(e)	Above 4000KW	:	6 to 6.5

1.22 **WINDING & INSULATION**

(a)	Type	:	Non-hygroscopic, oil resistant, flame resistant
(b)	Starting duty	:	Two hot starts in succession, with motor initially at normal running temperature.
(c)	11kV & 3.3 kV : AC motors		Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Presure Impregnated i.e resin poor method. Thelightning Impulse& interturn insulation surge withstand level shall be as per IEC-60034 part-15
(d)	240VAC, 415V : AC & 220V DC motors		Thermal Class(B) or better

1.23 **DIRECTION OF ROTATION**

1.23.1 As needed by driven equipment.

1.23.2 The 3 phase motor shall, however, be suitable for operation in both directions of rotation. A plate showing direction of rotation as determined by the phase sequence on the terminals marking shall be screwed at non-driving end of the body of the motor.

1.23.3 If, in the case of HT motors, fan is suitable for only one direction of rotation, the fan shall be so designed that with the slight modification work, it can be made suitable for other direction of rotation also. No extra material shall be required for doing above modification work.

1.24 **BEARINGS**

1.24.1 General ..... Greased ball, roller and/or sleeve bearing shall be rated for minimum standard life of 20,000 hours taking bearing and driven equipment loads into account. Loss of grease shall be scarce and it shall not creep along shaft into motor housing.

Bearing shall be effectively sealed against dust ingress and shall be pressure grease gun lubricated.

If the bearings are oil lubricated, a drain plug shall be provided for draining residual oil and oil level gauge shall be provided to show precisely oil level required under standstill and running conditions.

Unless otherwise approved, bearing lubricating system shall be such that no external forced oil or water is necessary to maintain required oil supply to keep bearing temperature within design limits.

~~For MV & HV motors, the bearings shall be insulated wherever necessary to prevent damage to motor bearings from shaft current.~~

When pressure oiling is required for horizontal motors, bearings shall be sleeve type arranged for pressure oiling supplied from lubrication system of driven machine, with ring oiling for starting and emergency duty. Ring oiling system shall be adequate for starting and continuous operation of motor for at least half an hour, without pressure oiling system in operation. Oil sight flow gauges shall be provided to indicate oil flow through each bearing.

Lubricants shall be selected for prolonged storage and normal use of motors in tropical climate and shall contain corrosion and oxidation inhibitors. Greases shall have suitable bleeding characteristics to minimize setting. The selected lubricants shall be indigenously available.

Sleeve bearings for use with motors having flexible coupling with limited end play, shall have adequate axial end play to prevent transmission of thrust from driven equipment to motor bearings.

Bearings shall be of reputed make subject to the approval of the Owner/Consulting Engineer.

1.24.2 Large motors ..... Large motors shall preferably have spherically seated babitted, ring forced, feed lubricated, water-cooled bearings. If anti-friction bearings are provided, these shall be roller bearings rated for a minimum standard life of 30000 hours taking all bearing and driven equipment loads into account.

1.25 **SHAFT EXTENSION** ..... Key slotted bare shaft extension of required length with key on driving end.

1.26 **DRAIN HOLES** ..... Two (2) drain holes with plugs, one (1) on either end of motor at the bottom most point.

1.27 **LIFTING DEVICES** ..... Motors shall be provided with eyebolts, lugs or other means to facilitate safe lifting.

1.28 **DOWEL PINS**..... It shall be possible to drill holes vertically inclined through motor feet or mounting flange for installing dowel pins after assembling motor and driven equipment, before despatch (for completed driving + driven

equipment assembly) or at site after erection (for separate supplies of above equipment).

1.29 **CENTERING SPIGOT**..... Flange mounted motor shall have centering spigot to match driven equipment socket.

1.30 **EASE OF MAINTENANCE**..... Motor shall be so constructed that it can be de-assembled and reassembled with ease.

1.31 **NAMEPLATES**..... Motor shall have nameplate(s) showing diagram of connections, all particulars as per IS: 325 and following additional information:

In addition, an arrow block shall be screwed on to the body of motor on the non-driving end to indicate direction of rotation of motor.

1.31.1 Temperature rise under normal/abnormal conditions.

1.31.2 Type of bearing and recommended lubricants.

1.32 **FINISH**..... Motor shall have glossy, light grey finish No. 631 as per IS: 5 for withstanding site conditions as per Clause 1.00 above.

All sharp edges and scales shall be removed from the surface, which shall then be thoroughly degreased, de-rusted and given two (2) coats of primer and two (2) coats of finish paint. It is preferred that a phosphate coat is given to motor prior to application of primer coat. Motors for water treatment plant shall have Zinc Chromate base with acid resistant Epilex 4 paint.

1.33 **TERMINAL BOXES**

1.33.1 General .....Motors shall be provided with separate terminal boxes for main, space heaters, embedded temperature detectors, bearing temperature indicators and moisture detectors terminals. When it is not possible to provide LT motors with separate terminal box for space heater terminals, space heater terminals shall be adequately segregated from the main terminals in the single box. Terminal boxes shall be weatherproof and water-tight confirming to minimum IP-55 degree of protection with removable front cover for making connections. IP-55 degree of protection shall be achieved without application of compound. Space between and around terminals shall be adequate for easily connecting aluminium conductor cables. Terminal box arrangement shall be to the approval of the Owner /Consulting Engineer. All terminal boxes shall be suitable for proper termination of the type and tentative size of cables specified in Clause 1.34 below, however, exact size of cables shall be furnished by Owner during engineering stage.

The terminal boxes shall be complete with cable glands and termination accessories as required. Suitable non-magnetic material construction shall be adopted for terminal boxes where single core cables are to be terminated. All HT motors shall be provided with phase segregated terminal box.

Terminal bushings and clamps shall be non-absorbent, non- inflammable, insulated material for connecting with cable.

1.33.2 **Main Terminal Box**

1.33.2.1 LV Motors ..... Main terminal box shall be capable of being turned through 360 degrees in steps of 90 degrees.

1.33.2.2 ~~MV & HV Motors ..... Motor shall be provided with two (2) terminal boxes for stator terminals. One (1) terminal box shall be for phase terminals while other one for forming star connection. These should be interchangeable to facilitate cable routing.~~

~~Neutral terminal box for HT motors rated above 1500 KW shall be suitable for mounting of three (3) Nos. wound/bar primary/ring type cast resin insulated current transformers for differential protection. These transformers shall be supplied and mounted in the motor terminal box. In addition to above, 3 Nos. of identical current transformers shall be supplied loose for mounting in the switchgear. Stator phase terminal box may either be phase segregated of standard terminal box suitable for both top and bottom entry of cables (i.e. they should be capable of being turned through 180 Degrees). The terminal box shall be designed for termination of XLPE cables using heat shrinkable or push on type terminating Kit. Terminal leading shall be stud type or leading wire type.~~

1.33.2.3 Cable End Boxes.....Terminal Boxes shall be provided with cable end boxes having cable lugs and cable glands for cables of sizes as specified in Clause 1.34 below.

Cable box shall be suitable for glanding the cables; and shall have adequate space between cable glands terminating studs to allow suitable bends of cable inside the cable box for all 3 phases of relevant cable sizes specified.

1.33.2.4 The terminal boxes shall be capable of withstanding at the terminals the system fault level (as indicated below) without rupture for a duration of atleast 0.25 seconds.

~~Min. fault level for MV Motors 40 KA~~

Min. fault level for LV & HV Motors - 50 KA

1.33.2.5 **PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:**

NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:

Motor MCR in KW	**Clearance**
UP to 110 KW	10mm
Above 110 KW and upto 150 KW	12.5mm
Above 150 KW	19mm

1.33.2.6 Terminal Accessories.....Each terminal end shall be furnished with bimetallic washers, spring washers, nuts and crimp type aluminium (preferably tinned) lugs suitable for cables of sizes as specified in Clause 1.34 below.

1.34 **TYPE AND SIZE OF CABLES**

1.34.1 **Space Heaters**

1.34.1.1 For LV Motors: Two point five (2.5) mm^2, two (2) core copper conductor PVC insulated, armoured and FRLS PVC sheathed heavy duty 650/1100 V grade cable to IS: 1554 (Part-I).

1.34.1.2 ~~For MV & HV Motors: Six (6) mm^2 two core aluminium conductor PVC insulated armoured and FRLS PVC sheathed heavy duty 650/1100V grade cable to IS: 1554 (Part-I).~~

1.34.2 For Embedded Temperature Detectors two sets of six (6) Twisted triad 0.5 mm^2 ATC copper conductor armoured, shielded cable, 650/1100 V Grade IS: 1554 (Part-I). For bearing temperature, RTDS, two (2) sets of four (4) twisted triad 0.5 mm^2, ATC copper conductor armoured shielded 650/1100 V Grade, IS: 1554 (Part-I).

1.34.3 Bearing Temperature Indicators - For each indicator, 0.5 mm^2 six (6) tarnished triad ATC copper conductor, PVC insulated, shielded armoured and FRLS PVC sheathed heavy duty 650/1100 V grade cable as per IS: 1554 Part-I. Two (2) cables one (1) for each bearing temperature indicator.

1.34.4 For Moisture Detectors.....As for space heaters as per Clause 33.01.01 above.

1.34.5 **For Main Terminals**

LT Motors

1. Three (3) core cables .....Stranded aluminium conductor, XLPE insulated, colour coded, laid up, PVC sheathed, GI wire / strip armoured, FRLS PVC jacketed overall, 650 / 1100V grade, heavy-duty cables as per IS: 1554 (Part-I).

2. Single core cables .....Stranded aluminium conductor, XLPE insulated, hard drawn aluminium wire/ strip armoured FRLS PVC jacketed overall, 650 / 1100V grade, heavy duty cable as per IS: 1554 (Part-I).

HT Motors

1. Three (3) core cables ..... stranded aluminium conductor, XLPE insulated, screened colour coded, laid up, PVC sheathed, GI wire/strip armoured FRLS PVC jacketed overall, 6.6 KV / 11 KV grade, heavy duty cables as per requirement for unearthed system as per IS: 7098 (Part-II).

The size and no. of cable to be intimated to the successful bidder during detailed engineering and the contrcator shall provide terminal box, cable gland and lugs suitable for the same.

Cable size may be increased in some cases because of large number of cables in under-ground ducts or because of vaoltage drop consideration. The supplier shall supply with terminal box and cable accessories suitable for higher size of cable at no extra cost.

1.35 **EARTHING**

1.35.01 General..... Two (2) grounding terminals one (1) on either side at the bottom suitable for connecting mild steel/GI flat/GI wire grounding conductor, size of grounding conductor shall be decided during detailed engineering.

1.35.02 LV Motors.....At each earthing point, two (2) drilled and tapped holes with hexagonal head bolts, plain washers, spring washers and tinned lugs (for motors upto 5.5 KW) for size of conductor specified shall be provided.

1.35.03 ~~MV & HV Motors.....Non-corrodible metallic grounding pad shall be welded or brazed at each earthing point. The size of grounding pad shall be 75x65x25 mm. Grounding pad shall have 40 mm apart two (2) drilled and tapped holes with hexagonal head bolts, plain washers and spring washers for size of conductor specified. In addition, one suitable earthing terminal shall be provided inside the stator phase terminal box for earthing metallic shield of XLPE cables.~~

1.36 ~~**EMBEDDED TEMPERATURE DETECTORS**.....HT motor shall be provided with six (6) Nos. duplex resistance temperature detectors (RTDs) embedded in stator winding at locations where high temperatures are expected. In addition one (1) duplex type RTD shall be provided in each bearing. The RTDs shall be 3 wire duplex platinum resistance type having a value of 100 ohms at 0 Deg.C~~

1.37 ~~**BEARINGS TEMPERATURE INDICATORS**..... HT motors shall be provided with dial type two (2) bearing temperature indicators and will have two (2) sets of contacts, each set having 2 NO + 2 NC contacts rated for 5A at 240V AC and 0.5A at 220V DC. One set will be set to operate at lower value to give alarm and other set at a higher value to trip the motor.~~

1.38 **SPACE HEATERS**.....Valve / Damper actuator motors; and Motors above 30 KW shall be provided with one (1) or two (2) space heaters suitable for 240V, 50 Hertz single phase AC supply and of adequate capacity to maintain motor internal temperature above dew point to prevent moisture condensation or deterioration of insulation during shut down. Heaters shall be mounted inside the motor in accessible locations so that their removal and replacement is simple. Motors upto 30 kW shall have stator windings suitable for connections to 24V, 50 Hz AC supply for space heating.

Motors upto 30 kW shall have stator windings suitable for connection to 24V, 50 Hz ac supply for space heating

The terminals of space heaters shall be brought out to a separate totally enclosed dust proof and weatherproof terminal box.

~~1.39 **HOT AIR TEMPERATURE DETECTOR**~~

~~If the motor is of CACA or CACW enclosure, a thermometer with alarm contracts in hot air circuit shall be provided.~~

~~1.40 **WATER FLOW INDICATOR**~~

~~If the motor is of CACW enclosure a provision shall be made for visual indication of water flow and flow switch shall also be provided with alarm contacts. Thermometers shall be provided in water inlet and outlet circuits.~~

~~1.41 **MOISTURE DETECTORS**.....Motors with type of cooling 1C 81W or 1C 91 W shall be provided with moisture detectors for raising alarm in the event of water tube failure.~~

1.42 **BED PLATE**.....Whenever motor is supplied with driven equipment the Supplier shall ensure that bed plate suits both motor and driven equipment and is adequately braced to keep vibration and misalignment within allowable limits to the approval of driven equipment and motor manufacturers.

1.43 **OTHER ACCESSORIES**..... Motor shall be supplied with all accessories and parts other than those, specified above which are necessary and/or useful for efficient operation.

1.44 **TYPE TEST**

1.44.01 **HT MOTORS**

a) The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract.

b) The type tests shall be carried out in presence of the Purchaser's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the Purchaser'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.

c) In case the contractor has conducted such specified type test(s) within last five years as on the date of bid opening, he may submit during detailed engineering the type test reports to the Purchaser's for waival of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Purchaser's reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.

d) Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last five years from the date of bid opening. These reports should be for the test conducted on the equipment similar 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. However if the contractor is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the Purchaser's either at third party lab or in presence of client representative and submit the reports for approval.

e) **LIST OF TYPE TESTS TO BE CONDUCTED**

The following type tests shall be conducted on each type and rating of HT motor

i) No load saturation and loss curves upto approximately 115% of rated voltage

ii) Measurement of noise at no load.

iii) Momentary excess torque test (subject to test bed constraint).

iv) Full load test(subject to test bed constraint)

v) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.

f) **LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED**

The following type test reports shall be submitted for each type and rating of HT motor

i) Degree of protection test for the enclosure followed by IR, HV and no load run test.

ii) Terminal box-fault level withstand test for each type of terminal box of HT motors only.

iii) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15

iv) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15

1.44.02 **LT Motors**

a) LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Purchaser's approval the reports of all the type tests as listed in this specification and carried out within last five years from the date of bid opening. These reports should be for the test conducted on the equipment similar 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.

b) However if the contractor is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the Purchaser's shall conduct all such tests under this contract at no additional cost to the Purchaser either at third party lab or in presence of client representative and submit the reports for approval.

1.44.03 **LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED**

The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only

i) Measurement of resistance of windings of stator and wound rotor.
ii) No load test at rated voltage to determine input current power and speed.
iii) Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors)
iv) Full load test to determine efficiency power factor and slip .
v) Temperature rise test.
vi) Momentary excess torque test.
vii) High voltage test.
viii) Test for vibration severity of motor.
ix) Test for noise levels of motor(Shall be limited as per clause no 1.21.01 of this section)
x) Test for degree of protection and
xi) Over speed test.
xii) Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1

1.44.04 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

1.45 **INFORMATION WITH PROPOSAL**

1.45.1 AC Motor Data Sheet.

1.45.2 Dimension Drawing/Foundation load details of motor and driven equipment.

1.45.03 Manufacturer's catalogue showing constructional details.

1.46.00 **INFORMATION ON AWARD OF CONTRACT**.....Within six (6) weeks from the date of award of the Contract, following shall be furnished:

1.46.01 Motor Data Sheet.

1.46.02 Certified binding dimension drawing of motor complete with all accessories and fittings specifically showing terminal boxes, terminal spacing and sizes, earthing connections and sizes thereof, mounting details, lifting lugs, final foundation loads and dimensions with tolerances of centering spigot (where needed), shaft extension and key.

1.46.03 Following characteristics curves:

1.46.03.01 Torque-speed curves for motor at eighty (80), hundred (100) and hundred ten (110) percent rated voltage as well as torque-speed curve for driven equipment.

1.46.03.02 Current-speed curves at eight (80), hundred (100) and hundred ten (110) percent rated voltage

1.46.03.03 Current-time curves at eighty (80), hundred (100) and hundred ten (110) percent rated voltage.

1.46.03.04 Thermal withstand curves for hot and cold at eighty (80), hundred (100) and hundred ten (110) percent rated voltage.

1.46.03.05 Efficiency, power factor, current and speed versus power output curves.

1.46.03.06 Speed-time curves at eight (80), hundred (100) and hundred ten (110) percent rated voltage.

1.46.03.07 Negative phase sequence current withstand characteristics.

1.47 COMMISIONING CHECK LIST (HT MOTORS)

A PRELIMINARY CHECKS

Check the following:

1. Check the name plate details according to specification. Discrepancies, if any, to be satisfactorily resolved.
2. Check tightness of all bolts, clamps and connecting terminals.
3. Check body earthing
4. Check whether bearing lubrication is adequate
5. Check clearance inside terminal box
6. Checking stator (motor air gap) Check – Grease lubrication (for ball or roller bearing) is adequate if the motor was in storage for very long period replace the grease, by fresh grease after flushing the bearing clean. Excess grease in the bearing (housing ... is overheat of bearings) Check 0 the free rotation of the rotor in decoupled condition. Check the air gap between stator and rotor at four positions 90o apart at driving and non-driving end. Compare the recorded values with factory results. For slip ring motors : with starting resistances.

   a) Check the variation of resistance
   b) Check brush lifting and slip ring short.

B COMMISSIONING CHECKS

1. Meggar tests of motor winding and cables
2. Continuity check of motor windings control and power cables
3. Measure resistance of motor winding (in case of large motors)
4. Control and interlocks should be checked
5. Motor protection relay to be calibrated
6. Phase sequence and direction of rotation
7. Other than DOL scheme to be checked example trafo starts
9. Measure starting current starting timer and no load current
10. On load operations starting and running currents (observed vibrations, temperatures of bearings and body)
11. On load operation, starting and running currents (observed vibrations, temperatures of bearings and body)
12. In case of forced water cooling of start or check winding temperatures as ready by built in RTDs.
13. Water level (start up cooling) low to be checked for limit switch operation.

1.48 COMMISIONING CHECK LIST (LT MOTORS)

A PRELIMINARY CHECKS

Check the following:

1. Check the name plate details according to specification. Discrepancies, if any, to be satisfactorily resolved.
2. Check tightness of all bolts, clamps and connecting terminals.
3. Check body earthing
4. Check whether bearing lubrication is adequate
5. Check clearance inside terminal box

B COMMISSIONING CHECKS

1. Meggar tests of motor winding and cables
2. Continuity check of motor windings control and power cables
3. Over load and short circuit relay tests and settings
4. Control and interlocks should be checked
5. Phase sequence and direction of rotation
6. Operation of timer in case of star delta starting
7. Measure starting current starting timer and no load current
8. On load operations starting and running currents

1.49 DC MOTOR SPECIFICATION

DC Motor will be of continuous duty type totally enclosed fan cooled (TEFC) having IP-54 degree of protection suitable for 220 V DC supply. DC motor will be shunt wound type having high torque characteristic suitable for Bi-directional rotation at rated speed and output. The general constructional features and details of DC motor will be in line with details/ particulars stipulated in the specification for AC squirrel cage induction motors.

Contractor will furnish the data in respect of DC motors.

DATASHEET

	Auxiliary power supply	
1.1	**HV supply**	
	11kV, 3Φ, 3W, 50 Hz non effectively earthed	Motors rated above 1500 kW
	Fault level	50 kA for 1 second
1.2	**MV supply**	
	3.3kV, 3Φ, 3W, 50 Hz non effectively earthed	Motors above 200kW upto and including 1500kW
	Fault level	40 kA for 1 second
1.3	**LV supply**	
	415V, 3Φ, 3W, 50 Hz effectively earthed	Motors below and including 200kW
	Fault level	50kA for 1 second
	110V, 1Φ, 2W, 50 Hz effectively earthed	Lighting, space heating, AC control and protective devices
1.4	**DC supply**	
	220V,2W, unearthed	DC alarm, control and protective devices.
	Fault level	25 kA for 1 second
2	Range of variation	As indicated in the specification'
2.1	AC supply	
	voltage	------
	Frequency	------
	Combined voltage & frequency	--------
2.2	DC supply	198 to 240 V
Note: During starting of largest motor, the voltage may drop to 80% of the rated voltage for a period of 60 seconds. All electrical equipment while running shall successfully ride over such period without affecting system performance.		

BHARAT HEAVY ELECTRICALS LIMITED

HIGH PRESSURE BOILER PLANT, TIRUCHIRAPALLI-620 014

CONTROLS & INSTRUMENTATION/FB

TECHNICAL SPECIFICATION OF

LT AC MOTORS (SAFE AREA)

SPECIFICATION REFERENCE – TCI : 140, Rev. 12

Revision History

Rev. No.	Date	Description	Prepared	Reviewed	Approved
01 -11		Earlier Revisions	-Sd-	-Sd-	-Sd-
12	22-08-19	General Revisit			

Sl. No.	Description	Requirement
1	Site Conditions :-	
	Altitude above MSL	500 metres
	Ambient temperature	50° C
	Relative Humidity	100 %
	Atmosphere	Tropical, dusty, salty, corrosive and highly polluted environment.
2	Motor type	Squirrel cage type induction motor suitable for direct on line starting through any type of breaker.
3	Applicable Standards	IS-325, IS-1231, IS-6362, IS-2253, IS-5572, IS-12065, IS-12075, IS/IEC-60079, IS-12615, IS/IEC-60529 & IEC-60034. (Latest version of relevant standards shall be referred).
4	Type of Enclosure and degree of protection	Totally Enclosed Fan Cooled (TEFC), IP-55 as per IS/IEC-60529
5	Duty Cycle	Continuous, S1
6	Energy Efficiency Class	IE-3 as per IS-12615/IEC 60034-30.
7	Rated Voltage & Tolerance	415 V, AC, 3 Phase, ± 10 %.
8	Rated Frequency & Tolerance	50 Hz, ± 5 %
9	Combined voltage & frequency tolerance	10 % (absolute sum)

Sl. No.	Description	Requirement
10	General Requirements	a. All motors shall be so designed that maximum inrush currents, locked rotor and pull out torque, developed at the extreme voltage and frequency variations do not endanger the motor and driven equipment. b. Motor shall be designed to keep the torsional and rotational natural frequencies of vibration, at least 25 percent above the motor rated speed ranges to avoid resonant vibration over the operating speed range of the motor and driven equipment. c. Maximum continuous rating (MCR) of the motor shall have at least 15 % margin over the maximum load demand of the driven equipment including voltage and frequency variation. (Applicable only if vendor supplies motor along with the driven equipment or load).
11	Torque requirements	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% of motor full load torque. Pull Out torque at rated voltage shall not be less than 205 % of full load torque.
12	Requirements during Starting & Running	• Motor shall start with rated load and accelerate to full speed with 80 % rated voltage at motor terminals • The motor shall be capable of withstanding the stresses imposed if started at 110 % rated voltage. • The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75 % rated voltage at motor terminals. • The motor shall be designed to withstand momentary over-load of 60% of full load torque for 15 seconds without any damage. • The motor shall be designed to withstand 120 % of rated speed for 2 minutes without any mechanical damage.
13	Class of Insulation	Class-F insulation with temperature rise limited to Class-B. Temperature rise of the motor shall be limited to 70° C (by resistance method) over an ambient temperature of 50° C.

Sl. No.	Description	Requirement
14	Stress withstanding capability during Bus Transfer	The motor may be subjected to sudden application of 150 % rated voltage during bus transfer, due to the phase difference between the incoming voltage and motor residual voltage.
15	Capacity to restart for rated voltage	a. Two successive starts from cold condition. b. Three equally spread starts per hour. c. Two hot starts in succession, with motor initially running at normal temperature.
16	Starting Current	The starting current (% of FLC) shall be limited as per the standard IS-12615.
17	Locked Rotor Condition	The ratio of Locked Rotor KVA at rated voltage to rated KW shall not exceed as indicated below (without any further tolerance) For Motor rating < 110KW : 11
18	Locked Rotor with-stand time	For motor with starting time up to 20 seconds at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 seconds more than starting time.
		For motor with starting time more than 20 seconds but not exceeding 45 seconds at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 seconds more than the starting time.
		For motor with starting time more than 45 seconds at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be 10% more than the starting time
		Vendor to provide Speed switches mounted on the motor shaft in case the above requirement is not met with.
19	Type of balancing of rotor	Dynamic balancing
20	Method of cooling	IC-0411 as per IS-6362
21	Direction of cooling air flow	NDE side to DE Side

Sl. No.	Description	Requirement
22	Winding wire	Enameled Copper Wire, Grade-2, as per IS-13730, Part-3. Windings shall be non-hygroscopic, oil resistant and flame resistant.
23	Treatment on Winding Insulation	Winding Insulation shall be given tropical and fungicidal treatment for operation of motor in hot, humid & tropical climate.
24	Noise level	Noise level shall be limited to 85 dB at 1 metre distance.
25	Vibration level	The peak amplitude of vibration shall be as per IS-12075 (Limits of Severity-Normal grade shall be followed).
26	Shaft extension	Motor shall be provided with key slotted bare shaft extension, with key at the drive end.
27	Terminal box	Weather proof terminal box shall be provided as per IS/IEC-60079. The terminal box shall be capable of being turned through 360° in steps of 180° or 90°. Shall meet IP 55 protection class requirements as per IS 60529. 1 No. Earth terminal shall be provided inside the terminal box. Minimum Distance between centre of the terminal stud & the gland plate and Minimum inter-phase/phase-earth air clearance shall be provided as per IS standards. Terminal box shall have adequate space to terminate the Power cable applicable to the motor by using suitable lugs. Connection diagram shall be marked inside the terminal box.
28	Cable Entries, Cable Glands & Lugs	Cable entries, Cable glands and Lugs shall be provided suitable for the power cable size as indicated in the annexure (project specific transmittal). Double Compression type, brass with nickel plated, weather proof cable glands shall be provided – Quantity to be matched with the number of entries. 6 Nos. of Tinned Copper Lugs shall be provided.

Sl. No.	Description	Requirement
29	Terminals	Separate Terminals for Space heaters and Windings with suitable connecting links shall be supplied.
30	Body Earth	Shall have 2 Nos. of earth points (Threaded hole with suitable GI Bolt) at appropriate location (in motor base frame).
31	Space heater for motors rated 30 KW and above	Separate space heater suitable for 240 V AC, Single Phase supply shall be provided.
32	Lifting device	Eye bolt.
33	Project specific requirements	Vendor to take care of the project specific requirements indicated in the annexure - "Project specific transmittal".
34	Name Plates	Motor shall have name plate as per relevant IS and in addition, Manufacture's name, frame size, Energy Efficiency class, Insulation class shall also be indicated.
35	Quality assurance, Inspection & Testing	Motors up to 30 KW, Inspection by Vendor meeting the IS/IEC standard requirements, as applicable. Routine & type test reports shall be submitted for review and acceptance by BHEL. For Motors >30 KW, Inspection by BHEL/Third party Inspection TPI agency as per BHEL/Customer approved VQP/RQP. Routine tests will be witnessed by BHEL/TPI. Type test reports shall be submitted for review and acceptance by BHEL. In case the vendor is not able to submit report of the type test(s) conducted within last 5 years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the vendor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract, free of cost to the Owner and submit the reports for approval.

Sl. No.	Description	Requirement
36	Type test reports	Type test reports shall be produced for the following tests as per the requirements spelt in the standards, • Measurement of resistance of windings of stator. • No load test at rated voltage to determine input current power and speed • Full load test to determine efficiency, power factor and slip. • Temperature rise test. • Momentary excess torque test. • High voltage test. • Test for vibration severity of motor. • Test for noise levels of motor. • Test for degree of protection. • Over speed test. • Energy Efficiency test.
37	Confirmation and Documents to be submitted by the vendor, during Purchase Enquiry.	Vendor to indicate the references of the technical specification, project specific annexure and indicate "No Deviation" in the Sub-Delivery Enquiry deviation form. Any deviation shall only be indicated in the Sub-Delivery Enquiry deviation form. Deviations indicated elsewhere in the offer will not be considered.
38	Documents to be submitted by the vendor for approval by BHEL/Customer, after placement of purchase order.	3 Sets of the following :- a. Final technical Data sheet as per the format submitted by BHEL. b. Motor GA drawing indicating details of foundation, shaft dimensions and terminal box arrangement with complete dimensions. c. Motor Characteristic curves (Torque Vs. Speed, Current Vs. Speed, Speed Vs. time, Current Vs. time, Efficiency and PF Vs. load, Thermal withstand characteristic) d. O & M manuals.
39	Packing	The packing shall be suitable for safe transport, safe delivery at site and shall avoid damages due to environmental conditions during storage at site.

Sl. No.	Description	Requirement
40	Painting	Paint shade shall be as per the purchase enquiry. The finish shall be corrosion resistant, epoxy based paint.

BHARAT HEAVY ELECTRICALS LIMITED

HIGH PRESSURE BOILER PLANT, TIRUCHIRAPALLI-620 014

CONTROLS & INSTRUMENTATION/FB

TECHNICAL SPECIFICATION FOR DC MOTORS (NON FLAME PROOF)

SPECIFICATION REFERENCE – TDC: 223/DC MOTOR

Revision History

Rev. No.	Date	Description	Prepared	Reviewed	Approved
05	12-06-2019	Initial revision	-Sd-	-sd-	-sd-

Sl. No.	Characteristics	Requirement
1	Site Conditions :-	
	Altitude above MSL	50 metre
	Ambient temperature	50° C
	Relative Humidity	100 %
	Atmosphere	Tropical, dusty, salty, corrosive and highly polluted
2	General Description	DC Shunt Motor. Maximum continuous rating (MCR) shall have at least 10 % margin over maximum load demand including voltage variation, temperature rise and other variations.
3	Applicable Standards	IEC-60034 (part 1,2,5,6,7,8,9,11,14,30), IEC 60072, IEC-600[illegible] IEC-60529 etc. (Latest version of relevant standards shall be referred). For all the requirements, international standards IEC/ISO shall be followed.
4	Application	Scanner Air fan
5	Constructional Features	Poles and armature shall have fully laminated construction with low loss silicon steel sheet. Yoke shall be made of cast steel or thick rolled steel plates and shaft shall be forged from special high tensile steel (Solid Yoke).
6	Brushes	a) The brushes shall be of graphite of high quality and the pressure on the brush shall be adjustable, if necessary b) The brush holder shall be of non-ferrous material and constructed to maintain constant pressure, regardless of wear and tear and to ensure sparkless commutation at top speeds and during over load. c) Provision shall be made available for maintenance of brushes. d) Motor shall have double shaft extension for mounting brakes and tachometers on the non- driving end.
7	Duty Cycle	Continuous, S1
8	Rated Voltage & Tolerance	220V DC -15% to +10%
9	Method of motor starting	3 step resistance cutting method is adopted for motor starting. The external resistors are placed in series to the armature resistance and are cut off in steps through control circuit. Starter Box will be supplied by BHEL. AS per the fan starting time, vendor to calculate the starting resistance values and shall furnish to BHEL.

Sl. No.	Characteristics	Requirement
10	Capacity to restart	3 starts spread over an hour and 2 consecutive hot starts
11	Type of balancing of rotor	Dynamic balancing
12	Enclosure protection & Method of cooling	IP 55 as per IEC 60529 and IC-0411 as per IEC 60034 - 6
13	Direction of cooling air	NDE side to DE Side
14	Winding wire	Enameled Copper Wire, Grade-2, as per IEC 60317. Windings shall be non-hygroscopic, oil resistant and flame resistant.
15	Winding Treatment	Winding Insulation shall be given tropical and fungicidal treatment for operation of motor in hot, humid & tropical climate.
16	Class of Insulation	Class-F insulation with temperature rise limited to Class-B. Temperature rise of the motor shall be limited to 70° C (by resistance method) over an ambient temperature.
17	Starting Current	180% of Full Load Current.
18	Shaft extension	Motor shall be provided with key slotted bare shaft extension with key at the drive end
19	Terminal box	Weather proof IP 55 as per IEC-60529, capable of being turned through 360° in steps of 90°.
20	Size of Terminal box	Size of Terminal box shall have adequate space which shall be suitable to terminate the Power cable applicable to the motor by using the suitable crimping lugs. The power cable size is indicated in project specific transmittal.
21	Terminals	Separate Terminals for Windings and Space heaters. Stud type terminals with plain washers, spring washers & check nuts Solder type/Crimping type Crimping lugs shall also be supplied for connecting the power cable and cable for space heaters, if applicable.
22	Earthing terminals	1 Number External and 1 Number inside the terminal box
23	Lifting device	Eye bolt
24	Noise level	Noise level shall be limited to 85 dB at 1 metre distance as per IEC 60034 - 9.
25	Vibration level	The peak amplitude of vibration shall be as per IEC 60034 - 14 (Limits of Severity-Normal grade shall be followed).

Sl. No.	Characteristics	Requirement
26	Over speed	a) 20% above rated maximum field working speed in both direction of rotation without any mechanical damage to the rotor. b) Provision shall be available for measuring the speed of motor, while the motor is running.
27	Painting	Paint shade shall be as per the purchase enquiry. The finish shall be corrosion resistant, epoxy based paint.
28	Inspection & Testing	Motors up to 30 KW- Inspection by Vendor meeting IEC standard requirements, as applicable. Routine & type test reports shall be submitted for review and acceptance by BHEL. In case the vendor is not able to submit report of the type test(s) conducted within last 5 years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the vendor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract free of cost to the Owner and submit the reports for approval.
29	Documents (along with offer)	a. Vendor to indicate the references of technical specification and project specific annexure and indicate "No Deviation" in the Sub-delivery Enquiry deviation form. Any deviation shall only be indicated in the Sub-delivery Enquiry deviation form. Deviations indicated elsewhere in the offer shall not considered. b. Motor GA drawing indicating foundation, shaft details and terminal box arrangement with complete dimensions.
30	Documents for approval by BHEL/Customer (after placement of purchase order)	a. Final technical Data sheet as per the format submitted by BHEL. b. Motor GA drawing indicating foundation, shaft details and terminal box arrangement with complete dimensions. c. Motor Characteristic curves (Torque Vs. Speed, Current Vs. Speed, Speed Vs. time, Current Vs. time, Efficiency and PF Vs. load, Thermal withstand characteristic) d. O & M manuals
31	Packing	The packing shall be as per manufacturers standard meeting the Transport, environment and Storage hazards

Note :-

Vendor to indicate "Yes" or "Confirmed" in the Vendor's Compliance columnfor all the clauses and submit along with the offer.

SPECIFICATION FOR

TECHNICAL DELIVERY CONDITIONS FOR SCANNER AIR FANS

1. SCOPE

This technical delivery conditions specify the design, construction and testing requirements of centrifugal fans.

2. APPLICABLE STANDARDS:

BS 848 part-I: Methods of testing performance; IS 4894: Specification for centrifugal fans; ISO 1940: Balance quality of rotating rigid bodies. In case of any information not specified in this technical delivery conditions, the above standards will be binding.

3. DESIGN AND CONSTRUCTIONAL REQUIREMENTS:

a) Type:

Radial, backward curved blade type; directly coupled to the motor and mounted on a common frame; designed for continuous duty. Fan will be mounted on ground or on structural floor as indicated in the vendor enquiry data sheet.

b) Fan suction:

Fan suction shall be side axial with transition piece.

c) Fan Discharge:

Fan discharge shall be vertically upwards with transition piece.

d) The transition pieces shall be less than 300 mm length. The taper angle shall not exceed 15 degrees to give smooth transition. The fan to transition piece shall be flanged. The suction and discharge ends shall be provided with flanges and counter flanges to match with the pipe sizes specified.

d) Fan regulation:

Flow and pressure are regulated by inlet and outlet dampers arranged by purchaser, if necessary.

f) Motor Capacity :

Motor capacity shall be 20% more than the BHP required by the fan. Motor shall be of reputed make and conform to the attached LT motor specification.

- The starting current of the motor shall not exceed the value indicated in the LT motor specification when started with fan inlet and outlet dampers fully open.

- The starting time for the fan assy.,to reach the full load current shall not exceed the value indicated on LT motor specns., when input/output dampers are open.

g) Fan Impeller :

The fan impeller shall be directly mounted on the shaft with the impeller hub keyed to the shaft and axially bolted to motor shaft to prevent axial movement of impeller. The thickness of impeller shroud shall not be less than 3mm. Material of construction shall be IS 2062 or better. The shaft shall be fully enclosed in the impeller hub. RPM shall be as indicated in the fan data sheet (TOS:PANKI:1811).

h) Casing :

Casing shall be of single construction suitably stiffened for minimum vibration. Inspection door and drain plug shall be provided. Efficient clearance shall be given between impeller and suction mouth. A stainless steel flow direction arrow plate shall be fixed permanently on the casing; casing thickness shall be 5 mm (min).

i) The static and dynamic balancing tests shall be done as per ISO 1940. The residual up balance shall be limited to the group C 6.3 of ISO-1940. The ωe shall be less than 6.3 mm/e, where e = permissible residual unbalance and ω is the angular velocity. The above testing shall be made with all the vibration pads mounted under the frame.

j) Necessary damping (vibration) pads with bolts shall be provided in case of fans to be mounted on steel structure. In case of ground mounted fans necessary foundation bolts, nuts and washers shall be provided.

k) Bearings shall be provided with the facility for greasing.

4.0 INSPECTION AND TESTING:

All fans are to be inspected by the purchaser at the manufacturer's works for its constructional and dimensional details.

The following tests are to be done by the manufacturers witnessed by purchaser:

a) Performance test on one fan in each type as per BS 848 part I or IS 4894/1968. However, the tolerance on pressure, capacity and power absorbed shall be as per BS 848-part I class C only.

The following is the variations permitted when tested at rated pressure:

Inlet volume of flow : - 7.5%

Power input : ± 15%

b) Vibration measurement, when mounted on vibration isolation pads.

c) Continuous running test for 8 Hrs. (Temperature rise on bearings)

d) Starting current when started with no inlet and outlet dampers or the inlet and outlet dampers completely open.

e) Starting time.

f) MPI / LPI shaft < 2.5" & UT for ≥ 2.5"

5.0 The following documents shall be supplied in triplicate :

a) Filled in technical data sheet (TOS:PANKI:1811)
b) Fan operating characteristics.
c) Assy. Drg. of motor and fan with transition piece, foundation details and material specifications.
d) Test certificates as mentioned under section 4.
e) Erection, operating and instruction manuals with trouble shooting guide & spares identification drawings.
f) Material test certificates for impeller and shaft.
g) Test certificates and characteristics as called for under LT motor specification.

6.0 GUARANTEE:

The equipment shall be guaranteed against manufacturing defects. The performance guarantee shall be for a period of 12 months from the date of commissioning or 18 months from the date of delivery of equipment, whichever is earlier.

7.0 PAINTING :

a) Surface Preparation & Surface Profiles: SSPC-SP3/Power tool cleaning.

b) Primer coat: No. of coats=2

Paint: Red oxide zinc phosphate Primer (Alkyd base) to IS 12744;

DFT=30µm per coat.

c) Finish coat: No. of coats=1

Paint: Syn. Enamel paint (Long oil Alkyd) to IS2932; DFT=20µm per coat.

Shade: Smoke Grey Shade No. 692 of IS5.

e) Total DFT = 80µm (minimum).

f) Bearings, shaft, parts with running clearances are coated with rust preventive.

8.0 PACKING:

a) The fan and motor shall be packed in assembled condition. All components shall be identifiable with packing lists with BHEL material codes mentioned.

b) All opening shall be covered with blanks/caps and the total assembly is to be covered with rain proof sheet to avoid water entry into motor winding and fan. The total assembly shall be packed firmly in wooden box.

ANNEXURE – A

TECHNICAL DATA SHEET OF SCANNER AIR FAN

(To be furnished by fan supplier to the motor supplier for selection of Motor)

01.	Fan Type	:	Radial backward curved blade
02.	Power consumption in KW	:	
03.	Rated fan speed in rpm	:	1500
04.	Direction of fan rotation	:	
05.	Moment of inertia (GD^2) in kg-m^2	:	
06.	Starting torque in kg-m	:	
07.	Full load torque in kg-m	:	
08.	Permissible starting time :		
	a) When inlet & outlet dampers are opened	:	
	b) When inlet &outlet dampers are closed	:	
09.	Recommended motor rating	:	
10.	Fan characteristic curves	:	

PREPARED	CHECKED	APPROVED	DATE

ANNEXURE – B

TECHNICAL DATA SHEET OF SCANNER AIR FAN DRIVE MOTOR

(To be obtained by fan supplier from the motor supplier for furnishing to BHEL)

01. Motor rating, type and frame size :

02. Rated voltage, phase and frequency :

03. Rated motor speed in rpm : 1500

04. Moment of inertia (GD^2) in kg-m^2 :

05. Starting torque in kg-m :

06. Full load torque in kg-m :

07. Starting time at minimum permissible starting voltage :

08. Max. permissible starting time :

09. Method of starting :

10. Recommended starter scheme :

11*. Calculation of starting resistances in case of recommendation for reduced voltage starting for DC motors.

* ***Relevant documents shall be enclosed with this data sheet.***

PREPARED	CHECKED	APPROVED	DATE

TECHNICAL DATA SHEET FOR SCANNER AIR FAN

BHEL MATERIAL CODE: L172814320001001-008 ENQUIRY No.
**

1.TYPE :		RADIAL, BACKWARD CURVED BLADE, SINGLE SUCTION	
2.MAKE & MODEL No.			
3.MOUNTING		ON STRUCTURAL STEEL FLOOR	
4.MEDIUM TO BE HANDLED		DUST LADEN AIR	
5.Max. DUST CONCENTRATION		300 mg/m^3	
6.AMBIENT CONDITION		760mm Hg ; 50^{0}C	DENSITY: 1.09 kg/m^3
7.OPERATING CONDITIONS		NORMAL	TEST BLOCK
7.1 CAPACITY :	Cum/ Hr	8000	
7.2 PRESSURE DEVELOPED :	mmwc	250	
7.3 AIR TEMPERATURE :	^{0}C	45	
7.4 SUCTION PRESSURE :	mmwc	0 to 295	
7.5 POWER CONSUMPTION :	kw	*	
7.6 FAN SPEED :	Rpm	1500 rpm	
7.7 DIRECTION OF ROTATION :		CLOCKWISE (SEEN FROM DRIVE END)	
7.8 FAN MOVEMENT OF INERTIA (GD^2) :	Kgm ^{2}	*	
7.9 FAN STARTING TORQUE :	Kgm	*	
7.10 FAN FULL LOAD TORQUE :	Kgm	*	
7.11 EFFICIENCY OF FAN :	%		
7.12 MOTOR RATING :		* KW, 415VOLTS, 50 Hz AC; *KW, 220 V DC	
7.13 MAKE / FRAME SIZE:		*	
7.14 MOTOR DATA SHEET No.		*	
7.15 FAN STARTING TIME:		*	
7.16 FIRST CRITICAL SPEED :		* > 150% OF NORMAL SPEED	
7.17 VIBRATION LEVEL AT CASING:		< 4.5 mm/s as per ISO 10816	
7.18 NOISE LEVEL :	dBA	< 85 AT 1 M DISTANCE	
8.0 CONSTRUCTIONAL DETAILS :		MATERIAL	SIZE
8.1 SPIRAL CASING SIDE WALL ;		*	
8.2 SPIRAL CASING PERIPHERAL WALL ;		*	
8.3 IMPELLER BLADE :		*	
8.4 IMPELLER BACK PLATE:		*	
8.5 IMPELLER COVER PLATE:		*	
8.6 IMPELLER HUB :		*	
8.7 SHAFT :		*	
8.8 BEARING MAKE & TYPE No. :		*	
8.9 SEAL TYPE :		*	
8.10 VIBRATION PADS PROVIDED :		YES	No. OFF / ASSY. :
8.11 BALANCING :		STATIC & DYNAMIC BALANCED TO C 6.3 OF ISO : 1940	
8.12 BASE FRAME PROVIDED :		YES	
8.13 WEIGHT PER ASSY. :	Kg	*	
8.14 SUPPLIERS DRG No.:		*	
9.0 LUBRICANT TO BE USED :		*	
9.1 FREQUENCY OF LUB. & QTY. :		*	
10.0 O & M MANAUL REFERENCE:		*	
FAN INLET TRANSITION PIECE TO MATCH THE PIPE		OD x T : 508 x 6.08 mm	
FAN OUTLET TRANSITION PIECE TO MATCH THE PIPE		OD x T : 508 x 6.08 mm	

PREPARED	CHECKED	APPROVED	DATE

TECHNICAL DATA SHEET FOR SCANNER AIR FAN

BHEL MATERIAL CODE: L172814320001001-008 ENQUIRY No.

SPECIAL CONTRACT REQUIREMENT, IF ANY	
BHEL REQUIREMENT	**VENDOR CONFIRMATION**
1) Rotor components i.e shaft and hub shall be subjected to ultrasonic test at mill and magnetic particle examination after rough machining. 2) 10% of butt and fillet welds both in rotor and static components of the fan shall be subjected to MPI/DPT after stress relieving. 3) Fan impeller shall be balanced dynamically to quality grade 2.5 of ISO 1940. 4) Full range performance test shall be carried out as per BS 848, Part-1. (USE AN ANNEXURE IF THIS SPACE IS INADEQUATE)	

*Vendor to specify.

PREPARED	CHECKED	APPROVED	DATE

बी एच ई एल BHEL	MANUFACTURER'S NAME AND ADDRESS: BHEL TIRUCHIRAPPALLI & NTPC APPROVED SUB-SUPPLIERS	REFERENCE QUALITY PLAN			एनटीपीसी NTPC	TO BE FILLED IN BY NTPC	
		ITEM : SCANNER AIR FANS WITH ACCESSORIES SUB-SYSTEM : Steam Generator and Auxiliaries	CQP NO.: 2678 REV. NO.: 02 DATE : PAGE: 1 OF 3	SIGN. OF MFRR. R Venkanna (VENKANNA RUPANI)	QP NO.: 0000-999-QVM -P-164 REV. NO.: 02 DATE: 12.07.2016 PAGE: 1 OF 3 *VALID UPTO:* 11.07.2019	REVIEWED BY: R. Sivakumar	APPROVED BY: Approved

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			Dt.REMARKS
										M	C	N	
1	2	3	4	5	6	7	8	9	D*	**10			11
1.0	**RAW MATERIALS**												
1.1	Raw material sheets / Plates for casing & Impeller	Chemical, Mech. Properties surface defect.	B	Chem.Analysis, Mech. test, Visual	Sample/Heat test 100%	BHEL Apprd. Drg	BHEL Apprd. Drg	MTC		P	V	V	See Note-1
1.2	Hub	Chemical, Mech. Properties	B	Chem.Analysis, Mech. Test	Sample/Heat test	BHEL Apprd. Drg	BHEL Apprd. Drg.	MTC	√	P	V	V	See Note-2
		Internal soundness	B	UT*	100%	ASME V / ASTM A388 Freq. 2-4MHz	See Note-3		√	P	V	V	*For dia. More than 40mm
1.3	AC motor / DC motor	MAKE/TYPE/ RATING	B	Review	100%	BHEL Apprd Drg/Datasheet	NTPC Apprd Data Sheet	QCR	√	P	V	V	
		Routine test	A	Measurement	See note-4	IS: 325-1996/ IS: 4722-2001	IS: 325-1996/ IS: 4722-2001	QCR	√	V*	V	V	*See Note-9 & 10
2.0	**INPROCESS CONTROLS**												
2.1	Welding Qualifications	Procedure Qualification	B	Review of Documents	100%	ASME Sec IX / AWS D 1.1		WPS & PQR	√	P	V	V	See Note-5
		Personnel Qualification	B					WQR	√	P	V	V	
2.2	Casing Fabrication Welding	Dimensional conformity	B	Measurement	100%	BHEL Apprd. Drg.		Log		P	-	-	
		Surface defects	B	Visual	100%	No defects	See note-6	Log		P	-	-	
		NDT	B	LPI	20%	ASME-E-165	No defects*	IR	√	P	V	V	*See Note-6
2.3	Impeller Fabrication Welding	Dimensional conformity	B	Measurement	100%	Mfg. Drg.		Log		P	-	-	
		Surface defects	B	Visual	100%	No defects	See note-6	Log		P	V	V	
		NDT	B	LPI	20%	ASME-E-165	No defects*	IR	√	P	W	W	*See Note-6
	Machining of HUB	Dimensional	B	Measurement	100%	Mfg. Drg.		Log		P	-	-	
2.4	Static & Dynamic balancing of impeller	Amount of unbalancing	A	Balancing	100%	ISO: 1940-1	ISO: 1940 Balancing GR.6.3	IR	√	P	W	W	
2.5	Assembly	Completeness dimensional	B	Visual Measurement	100%	BHEL Apprd. Drg.		IR	√	P	V	V	

LEGEND: * **RECORDS**, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
** M: MANUFACTURER/SUB-SUPPLIER, **C:** MAIN SUPPLIER//NOMINATED INSPECTION AGENCY, **N:** NTPC; **P:** PERFORM **W:** WITNESS AND **V:** VERIFICATION. AS APPROPRIATE; **CHP:** NTPC SHALL IDENTIFY IN COLUMN AS 'W'; MTC- MILL / MANUFACTURER'S TEST CERTIFICATE, D : RECORD OF DATA FOLDER, QCR- QUALITY CONTROL RECORD, HC- HISTORY CARD; **LEGEND : CI : Class (A: Critical, B:Major, C:Minor); IR: Inspection Report**

Note:# NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of Inspection

बी एच ई एल BHEL	MANUFACTURER'S NAME AND ADDRESS: BHEL TIRUCHIRAPPALLI & NTPC APPROVED SUB-SUPPLIERS	REFERENCE QUALITY PLAN			एनटीपीसी NTPC	TO BE FILLED IN BY NTPC	
		ITEM : SCANNER AIR FANS WITH ACCESSORIES SUB-SYSTEM : Steam Generator and Auxiliaries	CQP NO.: 2678 REV. NO.: 02 DATE : PAGE: 2 OF 3	SIGN. OF MFRR. R. Venkanna (VENKANNA RUPANI)	QP NO.: 0000-999-QVM -P-164 REV. NO.: 02 DATE: 12.07.2016 PAGE: 2 OF 3 *VALID UPTO:* 11.07.2019	REVIEWED BY:	APPROVED BY: अनुमोदित Approved

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
										M	C	N	
1	2	3	4	5	6	7	8	9	D*	**10			11
3.0	**Final Inspection:**												
3.1	Fan Assembly	1. Performance test 2. Capacity, S.P., 3. Power consumption, 4. Speed, 5. Efficiency, 6. Bearing temp rise (For 4 hr. or till establishing the bearing temp.)	A	Performance Test for each size & type of fan (See note-7) (See note-8)	1 unit of each size / type	BHEL Apprd. Drg. IS: 4894-1987 NTPC Appd. Data sheet	BHEL Apprd. Drg. & Tolerance as per IS: 4894. NTPC Appd. Data sheet	Performance test result with curve.	√	P	W	W	See Note 11
		7.Run test a) Vibration b) Noise & c) Current Drawn	B	Routine test	100%		a) 60 Microns (Max) b) 85 dBA (Max) at 1.0 Mtr. Dist. c) NTPC Appd. Data sheet	IR	√	P	W	W	
3.2	Other Accessories like transition pieces, anti-vibration pads, foundation / fixing bolts, vibration isolators, etc.	Visual & Dimensional	B	Verification / Measurement	100%	BHEL Approved. Drg.		IR	√	P	W	W	
3.3	Document Review	Verification	B	Review	As noted in Column "D"			-		P	V	V	
3.4	Surface Preparation & Protection	Cleaning & Painting	B	Visual & Measurement	100%	NTPC Technical Specification / Datasheet / BHEL Specification • See Note-12		IR	√	P	V	-	
3.5	Marking	Name Plate	B	Visual	100%	BHEL Approved. Drg.				P	V	-	
3.6	Packing	Tightness & Stability	B	Visual	100%	BHEL Specn.		Packing Slip		P	V	-	

LEGEND; • RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
** M: MANUFACTURER/SUB-SUPPLIER, C: MAIN SUPPLIER//NOMINATED INSPECTION AGENCY, N: NTPC, P: PERFORM W: WITNESS AND V: VERIFICATION AS APPROPRIATE; CHP: NTPC SHALL IDENTIFY IN COLUMN AS 'W'; MTC- MILL / MANUFACTURER'S TEST CERTIFICATE, D - RECORD OF DATA FOLDER, QCR- QUALITY CONTROL RECORD, HC- HISTORY CARD; LEGEND : CI : Class (A: Critical, B:Major, C:Minor); IR: Inspection Report

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	MANUFACTURER'S NAME AND ADDRESS: BHEL TIRUCHIRAPPALLI & NTPC APPROVED SUB-SUPPLIERS	REFERENCE QUALITY PLAN				TO BE FILLED IN BY NTPC								
		ITEM : SCANNER AIR FANS WITH ACCESSORIES SUB-SYSTEM : Steam Generator and Auxiliaries	CQP NO.: 2678 REV. NO.: 02 DATE : PAGE: 3 OF 3	SIGN. OF MFRR. R Venkanna (VENKANNA RUPANI)	QP NO.: 0000-999-QVM -P-164 REV. NO.: 02 DATE: 12.07.2016 PAGE: 3 OF 3 VALID UPTO: 11.07.2019	REVIEWED BY:	APPROVED BY:							
	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS	
										M	C	N		
	2	3	4	5	6	7	8	9	D*	**10			11	

Notes:

1) For Plates/ Sheets, in case Mfr's TC is not available, one sample from plate of each heat shall be tested at approved lab by Vendor & TC shall be submitted to NTPC for review.
2) For Hub, in absence of correlated TC, one sample from each bar shall be tested by Vendor & TC shall be submitted to NTPC for review.
3) The defect echo height more than 20% of FSH when back wall echo initially set to 100% (FSH) in sound area of material shall be unacceptable. Also, fall in back wall echo to less than 80% of FSH when back wall echo initially set to 100% (FSH) shall not be acceptable. For other defects which are acceptable as scanned above.: Total number of defects permissible are five in one meter long & distance between two defects shall not be less than 3 times the dia. of probe.
4) Type test certificate for similar motor rating of more than 50 KW & frame size from same manufacturer is to be submitted to NTPC for verification.
5) Only qualified welders as per ASME Section IX/AWS D1.1 are engaged and approved consumables are to be used. Records to be shown for verification. WPS shall be approved by BHEL.
6) No defects like pin hole, under cut, linear indication.
7) "AC Motor FAN" shall be tested with actual job motor.
8) "DC Motor FAN" shall be tested with equivalent AC motor.
9) **Motors to be procured from** NTPC approved sources.
10) **Motors:**
    a) **For motors less than 30KW:** Acceptance of motor less than 30KW is based on COC of the manufacturer and the contractor confirming as follows:
    "It is hereby confirmed that the above mentioned motor(s) was /were manufactured taking care of NTPC specific requirements regarding ambient temperature, voltage and frequency variation , hot start, pull out torque, starting KVA / KW, temperature rise, distance between centre of the stud and gland plate, space heater and tested in accordance with approved drawing / data sheet".

    b) **For motors of 30KW and above:** Acceptance of motor rating between 30KW and 50KW is based on NTPC review of routine test inspections. Report as per IS 325 witnessed by main contractor along with COC of the manufacturer and the contractor confirming as follows:
    "It is hereby confirmed that the above mentioned motor(s) was /were manufactured taking care of NTPC specific requirements regarding ambient temperature, voltage and frequency variation , hot start, pull out torque, starting KVA / KW, temperature rise, distance between centre of the stud and gland plate, space heater and tested in accordance with approved drawing / data sheet".

11) **Scanner Air Fans to be procured from NTPC Approved vendors.**
12) In absence of specific NTPC requirement/Datasheet requirement, BHEL spec. maybe followed.

LEGEND: * **RECORDS**, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. M: MANUFACTURER/SUB-SUPPLIER, C: MAIN SUPPLIER//NOMINATED INSPECTION AGENCY, N: NTPC; P: PERFORM W: WITNESS AND : VERIFICATION. AS APPROPRIATE; **CHP:** NTPC SHALL IDENTIFY IN COLUMN AS 'W'; MTC- MILL / MANUFACTURER'S TEST CERTIFICATE, : RECORD OF DATA FOLDER, QCR- QUALITY CONTROL RECORD, HC- HISTORY CARD; **LEGEND : Cl : Class (A: Critical, B:Major, C:Minor);** R: Inspection Report

Note:# NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of Inspection

BHARAT HEAVY ELECTRICALS LIMITED
Tiruchirappalli - 620 014

UPRVUNL - PANKI THERMAL POWER STATION EXTN., 1X660MW, KANPUR NAGAR DIST, U.P.
CUSTOMER NO: U6/1728
PAINTING SCHEDULE

NTPC Drawing No: 9962-001-TR-102-PVM-B-800

Prepared by	**K. Srinivasan** **Senior Engineer/ Plant Lab**		**Document No: PL: C3 - PS/ 1728**
Reviewed by	**S Thiagarajan** **AGM/ PE/ FB**		**Revision No: 03 Dated: 21-01-2019**
Approved by	**A. Santhakumari** **AGM / Plant Lab**		**Sheet No. 01 of 13**

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RECORD OF REVISIONS

Rev. No	Date	Details of revision	Remarks
00	**15-09-2018**	**New**	**Prepared in line with bid resolutions between UPRVUNL/ DCPL & BHEL on BID spec No. 14A14-SPC-G-0001 Ref: Annexure – I C, SG-Quality, SG-Paints 1x660MW PANKI TPS.**
01	**19-11-2018**	Sheet 3, Sheet 4, Sheet 5 – Scheme modified in sl.no.1 & 4. Sheet 8 – DFT indicated in sl. no. 11. Sheet 9 – Scheme modified in sl.no.13. Sheet 13 – Painting of damaged areas included.	**Modified as per comments for CAT. II approval by NTPC 'Transmittal for comments on subject PANKI, EPC-SG painting scheme – Boiler Ref: null 102: 408 Dt. 25.10.2018 & NTPC drawing no: 9962-001-TR-102-PVM-B-800.**
02	**11-12-2018**	Sheet 3 – Scheme modified in sl.no.3. Spec. clause indicated in sl.no.1 & 3. Sheet 4 – insulated components included in sl.no.4 Sheet 5 – two coats of primer indicated in sl.no.7. Sheet 6 – bid resolution reference indicated in sl.no.8 Sheet 7 – comments included in sl.no.10. Sheet 8 - Grade I & II indicated according to temperature. Sheet 12 – DFT changed in sl.no 9 & 10.	**Modified as per comments for CAT. II approval by NTPC 'Transmittal for comments on subject PANKI, EPC-SG painting scheme – Boiler Ref: null 102: 814 Dt. 07.12.2018 & NTPC drawing no: 9962-001-TR-102-PVM-B-800.**
03	**21-01-2019**	Sheet 4 – (min) included for all coats of sl. no. 3.	**Included as per comments for CAT. II approval by NTPC 'Transmittal for comments on subject PANKI, EPC-SG painting scheme – Boiler Ref: null 102: 1132 Dt. 09.01.2019 & NTPC drawing no: 9962-001-TR-102-PVM-B-800.**

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
1 PS1Z3	Collector & Separator Vessels, temperature >400^{0}C & <500^{0}C (Except Internals), (Spec. Sl. No. 3, sheet 12 of 15, chapter 7, Vol.II) 04 –321,323;	Blast cleaning to SA2 ½ (Near white metal) with surface profile 35-50 µm	Inorganic Ethyl Zinc Silicate Primer DFT=60µm per coat	1	--	--	--	--	GREY	60
2 PS5B	Collector & Separator Vessels internals and DD (Direct dispatch) items (threaded and machined surfaces only) 04-347;07-331,360,361,362,393; 08-911,912,913;09-304; 12-306,314,317,324,327,328,344,348,354,393; 17-304,306,319;19-306,307;21-602,605,700; 24-352,700,803,818,827,842;28-700; 32-700;35-190,700,701;36-700;39-700; 41-710;42-700,710;43-710;45-710; 47-710;48-019,700;65-710;67-710; Foundation materials: 35-010, 39-012	SSPC – SP3 Power Tool Cleaning	Rust Preventive Fluid to PR: CHEM: 09 – 04 DFT=20µm per coat	2	--	--	--	--	--	40
3 PS19C5	Structural components, temperature <120^{0}C (Spec. Sl. No. 1, sheet 12 of 15, chapter 7, vol. II) Buck stays 08-001,003,006,007,111,501,503,901, 910; Boiler supporting structures, Columns, Girders, Bracings 34-100,200,300,390,400,500;35-111,112, 35-121,122,130,140,141,150,211, 35-212,213,214,221,222,231,232,311,312, 35-321,322,331,332,341,342,351,352,361, 35-362,381,382,383,384,385,386,387,390, 35-441,442,443,444,445,446,447,451,452, 35-453,454,455,456,457,511,512,513,514,	Blast cleaning to SA2 ½ (Near white metal) with surface profile 35-50 µm	Inorganic Ethyl Zinc Silicate Primer DFT=80µm per coat. (min)	1	Epoxy Based MIO Pigmented Intermediate Coat DFT=120µm per coat (min)	1	Aliphatic acrylic Polyurethane paint to DFT 30µm (min)	2	Dark admiralty Grey Shade No: 632 of IS5	260

S. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
3 PS19C5 (Contd.)	35-515,516,517,521,522,523,524,525,526,527 35-531,532,533,534,535,536,537,993,995; Galleries, Stair-ways & inter connecting Walkways 36-110,130,150,311,312,313,314,315,316,321, 36-322,323,324,325,326,331,332,333,334,335, 36-336,337,338,341,342,343,344,345,346,351, 352,353,354,355,356,361,362,363,364,365, 36-366,391,392,393,394,395,610,613,620,740; 38-210,299,310,381,410,510,610,611,710; ID system structures. 39-101,102,141,142,150,299,300,301,304, 39-305,306,993; Duct supports 48-015,115,145,205,225,235,265,345,355, 48-365,385,435,465,485,495,665;	Blast cleaning to SA2 ½ (Near white metal) with surface profile 35-50 µm	Inorganic Ethyl Zinc Silicate Primer DFT=80µm per coat (min)	1	Epoxy Based MIO Pigmented Intermediate Coat DFT=120µm per coat (min)	1	Aliphatic acrylic Polyurethane paint to DFT 30µm (min)	2	Dark admiralty Grey Shade No: 632 of IS5	260
4 PS1Z3	Components >95° C Insulated other than components in Sl.No.7 &9 (Spec. Sl. No. 3, sheet 12 of 15, chapter 7, vol.II) Ring Headers, Down Comers, Hot air Headers outside the gas path etc. 05-155,227,231,251,327,330,350; 07-102,110,125,217,223,231,232; 10-135,174,176,178,191,235,274,276,278, 10-283,284,285,291;12-178,850,852,900; 15-136,178,236,278;17-407,476,807; 18-001,002,010,701;19-701,702,903;21-600; 24-800, 805, 808,809,811,815,824,828, 836, 24-837,840; 42-020,030,065,070,120,128,150,154,158; 45-802,804,805; Cold air duct: 48-012,014,112,114; Tempering Air: 48-142,144;	Blast cleaning to SA2 ½ (Near white metal) with surface profile 35-50 µm	Inorganic Ethyl Zinc Silicate Primer DFT=60µm per coat	1	--	--	--	--	GREY	60

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
4 PS1Z3 (Contd.)	Hot Air: 48-018,202,204,207,208,212,214; 48-222,224,232,234,262,264,267,662,664,667; Flue Gas: 48-342,344,352,354,362,364,372,382,384,388, 48-389,432,434,462,464,482,484,492,494,498;	Blast cleaning to SA2 ½ (Near white metal) with surface profile 35-50 µm	Inorganic Ethyl Zinc Silicate Primer DFT=60µm per coat	1	--	--	--	--	GREY	60
5 PS 9	<u>Components >95° C uninsulated other than components coming in gas path.</u> (bid resolutions annexure – I C (SG quality), Sl. No. 4.) <u>Temp: >95°C & <400°C</u> 20-511;24-807,820,860,865,867;42-200,300,358; Instrument tappings, doors: 48-200,915;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. II DFT=20 µm per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. II 20 µm per coat	1	Aluminum	40
6 PS 10	Components uninsulated other than components coming in gas path. Temp: >400°C & <600°C (bid resolutions annexure – I C (SG quality), Sl. No. 4.) 09-003,004,005; 28-220;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. I DFT=20 µm per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. I 20 µm per coat	1	Aluminum	40
7 PS2A	<u>Loose tubes, SH, RH & Eco. Coils (exposed to gas path)</u> 11-074,078,374,378,406,467,469,487,491,494,606, 11-608,684,694,716,717,718,767,768,769,787,791, 11-916,917,918,967,968,969,987,991;12-179,181, 12-184,187,368,405,514,524,544,554,600,800,803, 12-805,862,903,914,917,924,927,928,944,948,954, 12-968;16-201,202,203,270,278,379; 19-092,402,804,814,824,853,914,924;	SSPC – SP2 or SSPC – SP3 Hand tool / Power tool cleaning	Red Oxide Zinc Phosphate Dip coat primer to PR: CHEM: 09 – 03 DFT=35µm per coat	2*	--	--	--	--	Red Oxide	70

*-Wherever dip painting is not possible, 2 coats of brush painting of Red oxide Zinc Phosphate primer to a coating thickness of 60µ is also permitted in line with Sr.No.9.

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
8 PS1A	Components uninsulated < 95° C –Other than components in Sl.No.3. (bid resolutions annexure – I C (SG quality), Sl. No. 2.) **Miscellaneous and casing sheets** 04-147,547; 07- 409,431,460,461,462,502,503,509,531,560; 12-506,906,907;17-919;21-601,604,606; 24-350,351,354,801,804,806, 24-810,817,825,826,835,841,855, 24-950,955,960;30-233,234;36-611,621; 39-302; 45-806; 95-088; 97-585;24-855; Spares: 41-997;42-997;43-997;45-997; 47-997;65-997;67-997; Fuel firing: 41-350,390,500; Steam blowing piping 42-001,002,005,010,046,152; 42-157; 43-004,104, 200; 45-200,801, 858; 47- 261,263,858; Duct plates, expansion joints: 48-911,912; $ Handling Equipments: 99-099,100,300,400,502,600; Coal Feeding 65-736;67-204,272,276,283,801,802,803;95-088,089,091,485;96-186;97-585,591,592; **Seal air ducting: 43-005, 105;** Cold Air duct: 48-141;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744 DFT= 30µm per coat	1	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20µm per coat	2	Smoke Grey Shade No: 692 of IS5	70

$ - Final Shade is Golden yellow for Under hung crane, Chain Pulley Block, Ratchet Lever and Trolley with hoist. Black shade for Hook.

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
9 PS3	**Components >95° C coming in the gas path, Headers, Commissioning Spares &erection Materials etc.,** (bid resolutions annexure – I C (SG quality), Sl. No. 7.) 05-137,147; 06-400,401,431,434,437,441,444,447, 06-451,453,455,500,501,515,731,732,734,735, 06-737,741,744,745,747,751,752,753,755,759; 07-309,315,316,318,423,883,993; 10-182,183,184,185; 11-474;12-993; 17-174,504,506,900,903; 19-704,753,763,783,793,802,850,851,852; 20-998; 24-822,823,993; 30-103,105,211,215,219,223,224,235; 31-010,104; 32-010,210; 37-010; 42-858; 48-993; 65-200; 67-200; 96-193; 97-282,590; 99-501; 20-988; 21-987; 24-987,989; 41-988; 42-988;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744 DFT= 30µm per coat	2	--	--	--	--	Red oxide	60
10 PS6	**Hand rails and posts, ladders / rungs & stairs** (Spec. Cl. No. 17,2 –v) sheet 2 of 21, chapter 17, Vol.VI) 34-820,850; 35-821,822,823,851; 36-820,851,852,853; 38-820,850; 39-820,850; **Floor Grills, guard plates** (Spec. Sheet 8 of 15, chapter 7, Vol. II) 34-810; 35 – 811,812; 36-811,812,813,814; 38 – 810; 39 – 810;	Acid pickling to SSPC-SP8	Hot dip Galvanizing to a coating weight of 610 g/m^2 (minimum) and coating thickness of 80 microns (min). Immediately after galvanizing, post treatment chromating shall be applied. Refer Notes given below **							

Notes **: The Guard plates, Hood Ladders, Stringer channels, angles and plates shall be painted as per painting scheme prescribed in Sl. No: 03.

PAINTING SCHEME FOR VALVES

Sl.No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
11 @PS 9/10	**Cast carbon steel valves (Conventional)** **Cast alloy steel valves (Conventional)** **All API valves, QCNRV, SV & SRV Silencers,** **21-800,825, 24-885;** **Safety valves & ERV** **21-850; 24-880,881;**	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. II/I DFT=20 µm per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr. II/I DFT=20 µm per coat	1	Aluminum	40
	Forged valves	Chemical cleaning	Phosphating to a coating weight of 1500 mg per Sq.ft.	--	--	--	--	--	--	--
1AS	**Soot Blower housing components, temperature <95 deg.C** **20-051,054,201,204,794,962;**	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744 DFT= 30µm per coat	2	--	--	Syn. Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20µm per coat	2	Verdigris Green Shade No. 280 of IS5	100
	HP / LP system	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr.I	2	--	--	--	--	--	40

@ Heat resistant aluminum paint to IS 13183 Gr.II shall be applied for temperature up to 400 deg.C, Gr. I shall be applied for temperature >400 deg.C and < 600 deg.C

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
12 PS15	**For CLH & VLH*** PGs 07,08,12,17,19,21,24,45,47,48 & 80 07-402,403,405,505;12-517,528; 17-904,906 19-506,507,904,905, 906,907; 24-353; 48-206,395;	Blast cleaning to SA2 ½ (Near white metal) with surface profile 35-50 µm	Epoxy zinc rich primer To IS 14589 Gr. II %VS=35, (min) DFT=40 microns per coat	1	--	--	Aliphatic acrylic Poly-urethane paint %VS=40.0 (min) DFT=30.0 microns per coat	1	Phirozi Blue Shade No. 176 of IS5	70
13 PS10B4	**Components > 95°C, un-insulated Fuel pipes** (Spec. Sl. No. 7, sheet 12 of 15, chapter 7, Vol.II) 47-200, 269;	Blast cleaning to SA2 ½ (Near white metal) with surface profile 35-40 µm	Inorganic Ethyl Zinc Silicate Primer DFT=40µm per coat	1	Heat Resistant Aluminium Paint to IS 13183 Gr. III DFT 20 µm per coat	1	Heat Resistant Aluminium Paint to IS 13183 Gr. III DFT 20 µm per coat	1	Aluminum	80
14 PS 1BE	All Columns below '0' level (embedded in concrete) PGs 34,35,36,38 39	SSPC-SP3/ Power Tool Cleaning	Chlorinated Rubber Based Zinc Phosphate primer DFT=50µm per coat	1	--	--	--	--	Grey	50

*- For components other than CLH & VLH, painting scheme shall be as given in Sl. No. 8.

NOTES:

1. **Rust Preventive Coating should be given on HSFG Bolt and nut threads.**

2. Machined surfaces and all retainers are to be applied with a coating of Temporary Rust Preventive oil.

3. All threaded and other surfaces of foundation bolts and its materials, insulation pins, Anchor channels, Sleeves, shall be coated with Temporary Rust Preventive Fluid and during execution of civil works; the dried film of coating shall be removed using organic solvents.

4. Ground shade/ Colour of Finish paints & identification tag/Band for equipments, pipings pipe service, boiler supporting structures and other boiler components shall be followed as per doc. No. Vol-II Chapter 7 Painting.

5. PGMAs under Sub-Vendor items are not indicated. For all bought-out and sub-vendors items including PGMAs mentioned above falling under the scope of BHEL the same scheme as for main equipment as covered in this document shall be followed. For SCR system, vendor's painting scheme to be followed.

6. This painting Schemes is valid for only Customer No: U6/1728, UPRVUNL PANKI TPS - 1X660 MW.

7. No painting is required for Stainless Steel, non-ferrous & galvanized components.

08. Wherever inside surfaces of components under PGMA 48 – XXX & others, need protection till erection, two coats of Red-oxide zinc phosphate primer paint to IS12744 to a DFT of 60 microns shall be applied, after power tool cleaning.

09. The Temporary Rust Preventive coating that already been applied on any components, tubes, pipes etc., shall be visually inspected for good adherence. If the coating is intact, direct coating of alkyd based red oxide paints over the coating is permitted. In case, the coating has peeled off over a large area, then the coating is to be removed by suitable solvents / heating to 350 –400 °C for an hour before primer paint application –but, in this case, it should be ensured that the minimum surface cleanliness required for primer paint application shall be SSPC – SP2 (equivalent – Hand Tool cleaning).

10. In components, wherever plates / sheets of thickness less than or equal to 5 mm and rods of <25mm/tubes/drain pipes are used, power tool / hand tool cleaning to SSPC – SP3 / SP2 shall be followed and the painting shall be done as described in Sl.No.8.

11. For all commissioning components-erection materials (xx-993) two coats of Red oxide Zinc Phosphate Primer shall be applied to meet the temporary protection till erection, after power tool cleaning.

12. Touch-up paintings, making good any damaged shop painting and completing any unfinished portion of the shop coat shall be carried out as per clause applicable painting scheme.

13. All components covered under different PGMA's are to be painted. In case any component is left out, the same shall be deemed to be included under the relevant section based on paint logic approved.

14. For very small components like clamps, bent rods, small plates etc. which don't have feasible dimensions for blast cleaning, Sl.No.8 shall be followed.

15. For very small components with weldable primer at edges, the entire component shall be applied with weldable primer. Structural members having welded connections at site, relevant area can be painted with primer paint instead of Weldable primer.

16. Painting scheme for all temporary structures like 04-196, shall be PS 1AE i.e. 1 coat of Red oxide Zinc Phosphate primer (Alkyd Base) to IS 12744-DFT-30µ and 2 coats of Synthetic Enamel paint (Long Oil Alkyd) to IS 2932-DFT-2X20µ Shade Yellow –Shade No. 356 of IS 5- Total DFT 70µ. These are to be cut & removed at site after erection. (It excludes components covered under Sr. No. 3 & 10 of description table).

17. For internal protection of Pipes, tubes, headers and other pressure parts, Volatile Corrosion Inhibitor (VCI) pellets shall be put (after sponge testing/ draining/ or drying) and subsequently end capped. The dosage of VCI pellets shall be approximately 100 g/ Cu.m. For tubes typically 4 – 5 tablets per end are to be put. For C & I items the dosage of self-indicating Silica Gel (colourless) shall be 250 g/ cu.m. (About 2 to 3 bags weighing approximately 100 grams each). VCI pellets shall not be used for stainless steel components and its composite associates.

18. All threaded components of spring assemblies and turnbuckles shall be galvanized and achromatized to 15 microns minimum thickness.

19. Soot blower components i.e Valve head assembly having high surface temperature (> 200 and <600 deg. C) shall be applied with protective coating as per PS9 (up to 400 deg.C) and PS10 (up to 600 deg.C)

20. Corner plate, sheet channel and fixing pins of PGMA 32-210 shall be painted as per scheme PS3 to total DFT of 60 microns.

21. It is mandatory that for finish coat each layer shall have a permanent DFT and free from any paint defects like sags, wrinkles etc. Total DFT of a component correspond to respective painting scheme has to be ensured and recorded by inspection agency as per QP.

22. For chequered plates having thickness <=5mm, surface preparation can be power tool cleaning to St3 and painting shall be in line with Sl. No. 8.

23. Handrails of PGMA under Sl. No. 3 need to be galvanized in line with scheme for handrails (i.e. Sl. No. 10).

24. Inside surfaces of fabricated structure (e.g. Box type column) shall be painted with two coats of red oxide primer paint during fit up stage.

25. Painting of bunker structures to be in line with painting scheme of supporting structures (Sl. No. 3).

26. Corrosivity environment C3 considered for painting scheme of structural components as per the requirement of technical specification.

Painting Scheme – Details for procurement & application purposes

Sl. No.	Generic nature of paint	Theoretical Covering Capacity Sq.m per Litre.	No. of pack	Volume solids, % (min)	DFT in microns per coat (min.)	Shade	Shade No. to IS5	Mode of appln.	Over coating interval, Hrs.
1	Epoxy Zinc rich primer to IS14589 Gr.II (latest)	8	2	35	40	Grey	--	Spray	24
2	Aliphatic acrylic polyurethane paint to IS 13213 (latest)	13	2	40	30	Phirozi – Blue/ Dark admiralty grey	176/ 632	Spray	24
3	Heat resistant Aluminium paint to IS 13183 Grade I/II (latest)	10	1	-	20	--	--	Brush / Spray	24
4	Red oxide zinc phosphate primer paint to IS 12744 (latest)	10	1	--	30	-	--	Brush / Spray	12
5	Red oxide Zinc Phosphate Dip coat primer paint to PR: CHEM: 09-03	10	1	--	35	--	---	Dip	12
6	Long oil alkyd synthetic enamel finish paint to IS2932 (latest)	17	1	35	20	Reqd. shade	Corrpdg. Shade no.	Brush / Spray	12
7	Temporary Rust preventive fluid to PR: CHE: 09 – 04	10	1	--	25	--	--	--	12
8	General purpose Aluminium paint to IS 2339 (latest)	10	2	--	20	Aluminum	--	Brush	12
9	Epoxy based polyamide cured MIO pigmented intermediate coat.	8	2	60	120	Brown	--	Spray	24
10	Inorganic ethyl zinc silicate primer to IS 14946 (%Zn on dry film= 75min)	8	2	60	80	Grey	--	Spray only	16
11	Chlorinated Rubber Based Zinc Phosphate Primer-Colour Grey	8	1	40	50	Grey	--	Brush / Spray	12

The covering capacity of paints specified is only approximate.
The paints and Rust Preventive fluid shall be procured from BHEL's approved suppliers.

Painting of Damaged Areas

(Areas where the paint has deteriorated badly by erosion and areas where the paint film has lost its adhesion and where the steel has rusted appreciably, should be repainted as follows)

Sl.No.	Components	Surface Prepa-ration	Primer coat		Intermediate coat		Finish coat			Total DFT µm
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
1	Paint damaged components fall under Sl.no: 3	Power tool cleaning to bare metal	Epoxy zinc rich primer to IS 14589 Grade II	2 T.DFT 80µ (min)	As given in scheme	1	As given in scheme	2	As given in scheme	As given in scheme

Annexure - I

Certificate by Chartered Accountant on letter head

This is to Certify that M/S ....., (hereinafter referred to as 'company') having its registered office at ..... is registered under MSMED Act 2006, (Entrepreneur Memorandum No (Part–II) ..... dtd:....., Category: ..... (Micro/Small)). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as per the latest audited financial year ..... as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated October 5, 2006 :
   Rs.....Lacs
2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:
   Rs.....Lacs

(Strike off whichever is not applicable)

The above investment of Rs.....Lacs is within permissible limit of Rs.....Lacs for .....Micro / Small **(Strike off which is not applicable)** Category under MSMED Act 2006.

Or

The company has been graduated from its original category (Micro/ Small) **(Strike off which is not applicable)** and the date of graduation of such enterprise from its original category is ..... (dd/mm/yyyy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S.O. No. 3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:

(Signature)

Name -

Membership number -

Seal of Chartered Accountant

THIRD PARTY NON-DISCLOSURE AGREEMENT

I, _____, on behalf of the _____ (Name of Company), acknowledge that the information received or generated, directly or indirectly, while working with BHEL, Trichy on contract is confidential and that the nature of the business of the BHEL, Trichy is such that the following conditions are reasonable, and therefore:

I warrant and agree as follows:

I, or any other personnel employed or engaged by our company, agree not to disclose, directly or indirectly, any information related to the BHEL, Trichy Without restricting the generality of the foregoing, it is agreed that we will not disclose such information consisting but not necessarily limited to:

- Technical information: Methods, drawings, processes, formulae, compositions, systems, techniques, inventions, computer programs/data/configuration and research projects.

- Business information: Customer lists, project schedules, pricing data, estimates, financial or marketing data,

On conclusion of contract, I, or any other personnel employed or engaged by our company shall return to BHEL, Trichy all documents and property of BHEL, Trichy, including: drawings, blueprints, reports, manuals, computer programs/data/configuration, and all other materials and all copies thereof relating in any way to BHEL, Trichy 's business, or in any way obtained by me during the course of contract. I further agree that I, or any others employed or engaged by our company shall not retain copies, notes or abstracts of the foregoing.

This obligation of confidence shall continue after the conclusion of the contract also.

I acknowledge that the aforesaid restrictions are necessary and fundamental to the business of the BHEL, Trichy and are reasonable given the nature of the business carried on by the BHEL, Trichy I agree that this agreement shall be governed by and construed in accordance with the laws of country.

I enter into this agreement totally voluntarily, with full knowledge of its meaning, and without duress.

Dated at _____, this ____ day of _____, 20__.

Name

Company

Signature