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GeM Tender Enquiry for Lube Oil Transfer Pumps for 1x 660MW SAGARDIGHI Extn Unit-5 Project

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Annexure-I

	ADDITIONAL TERMS & CONDITIONS :- SAME SHALL SUPERSEDE TERMS AND CONDITIONS MENTIONED ELSEWHERE IN BID	
1	**Terms Of Payment**	
	a) Supply (Main supply along with commissioning spares and Mandatory spares)	As per clause no. 12 (i), (ii) of GTC on GeM. Supply items: - Supplier has to provide original 1 copy of Tax E-invoice (if applicable), Packing List, LR/RR, CRAC, Insurance intimation, Guarantee Certificate, Local content certificate, E-way bill (as applicable) for payment. Offline payment mode shall be selected. 100% Payment will be released after CRAC & receipt of complete documents For Supervision of E&C: - 100% payments shall be released after completion of the activities & furnishing site certification/ BHEL Engg. Offline payment mode shall be selected. Payment will be released within 90days for Non-MSME vendors, within 45 days for Micro & Small vendors and 60 days for Medium enterprises (qualified and registered as Micro or Small as per MSMED Act) from CRAC & receipt of complete documents.
2	**Terms Of Delivery**	As per cl. No. 13 of GTC on GeM. (i.e. Free Delivery at site basis including loading/unloading). However, unloading of items (at delivery point) shall be in the scope of buyer. Insurance shall be in seller scope. Bidder to quote prices accordingly.
3	**Delivery**	Delivery schedule shall be as per **"Annexure A: - Standard Delivery Schedule"**. For Delivery and delay analysis purpose, delivery schedule mentioned in **"Annexure A: - Standard Delivery Schedule"** shall be considered. Delivery period chosen as 999 days from PO date shall not be considered for Delivery and Delay analysis purpose as same has been selected for sake of GeM only. For Mandatory Spares: - 04 months from the date of BHEL clearance. Separate manufacturing clearance shall be accorded for mandatory spares. Supervision of E&C:- Vendor to depute its service engineer for demonstration and handing over at site within 15 days from BHEL's intimation (for deputing service engineer).
4	**Guarantee Terms**	As per Cl. No. 10 of GTC on GeM for the bid .However time period shall be as under: **For Main Supply** : Guarantee & Warrantee time period shall be 18 months from the date of last supply in the Main Supply scope. **For Mandatory Spares :** Guarantee & Warrantee time period shall be 18 months from the date of last supply in the Mandatory Spares Supply scope.
5	**Quantity Variation**	Qty Variation is +/- 0%.
6	**Any other special major condition**	1. Material shall be dispatched only after issuance of MDCC by BHEL. 2. Bank Guarantee submission shall be as per cl. No. 7 of GeM GTC with initial validity of 26 Months. Further, extension if any shall be as per GeM Terms. However, proportionate value of BG can be reduced on elapse of 2 months from expiry of Guarantee & Warrantee period of Main Supply Scope/Mandatory Spares Scope (as applicable).

Annexure-I

7	This is a conditional tender enquiry. Reverse Auction of a bidder shall be subjected to the following: i) Approval of vendor by end customer i.e. (M/s WBPDCL) ii) Techno-Commercial evaluation by BHEL. iii) Qualification of Technical PQR. iv) Offered item should mandatorily conform to PP-MII order provisions.
8	This item/package /system falls under the list of items defined in para 3 of ministry of finance guideline dtd. 20.09.16 (Procurement of items related to Public safety, Health, Critical Security operations & Equipment's etc.) & hence criteria of prior experience/Turnover shall be same for all the bidders including start-up/MSME.
9	Data Sheet of the product(s) offered in the bid, are to be uploaded along with the bid documents. Buyers can match and verify the Data Sheet with the product specifications offered. In case of any unexplained mismatch of technical parameters, the bid is liable for rejection.
10	Bidders have to note, "For this procurement, the local content to categorize a supplier as a Class I local supplier as defined in Public Procurement (Preference to Make in India) Order 2017 dated 16.09.2020 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 this NIT." Since this package falls under clause 3 (a) of DPIIT's PP-MII order 2017, Rev dated 16/09/2020 & MHI Order no. 9/45/2017 HE&MT-Part I dated 29.12.2021 issued by MHI, therefore, in line with clause of DPIIT's PP-MII order 2017, Rev dated 16/09/2020, **"Class-I local suppliers" as defined in the order are eligible to bid**. In accordance with para 9 (a) of DPIIT's PP-MII order 2017 revision dated 16/09/2020, Class-I local suppliers at the time of tender, bidding or solicitation shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for the Class-I local supplier". They shall also give details of the location(s) at which the local value addition is made. *Class-II suppliers as per MII order is not eligible to bid for subject tender and it is reserved for Class-I supplier having min. local content **60%.** In case tender is showing for class-II suppliers also due to GeM logic, same may please be ignored/neglected.
11	Bidders to ensure that Third party / customer issued certificates being submitted as proof of PQR qualification should have verifiable details of document / certificate issuing authority such as name & designation of Issuing Authority and its organization contact number and e-mail Id etc. In case the same found not available, Purchaser has right to reject such document from evaluation.
12	Bidders to, • ensure compliance to Ministry of Power (MoP) Order No. 25-11/6/2018-PG dt. 02/07/2020 & Order No. 11/05/2018-Coord. dt. 28/07/2020, if applicable. • ensure compliance of Ministry of Finance (MoF) Order (Public Procurement No. 1 & 2) F. No. 6/18/2019/PPD dt. 23/07/2020. • to submit "Model Certificate for Tenders" as per Annexure-III of Ministry of Finance (MoF) Order (Public Procurement No. 1 & 2) F. No. 6/18/2019/PPD dt. 23/07/2020. Note: Subsequent orders/circulars to be checked and to be complied.
13	Due to COVID-19 pandemic condition prevailing in the country, BHEL/PEM may go for Remote Inspection of Offered items, if required. Vendors are requested to be equipped with the facilities/gadgets as indicated in the guidelines mentioned in "https://pem.bhel.com/Documents/VendorSection/Vendor/Guidelines.pdf" to take up the inspection REMOTELY. Inspection call to be raised by bidder on BHEL CQIR portal (details shall be shared at the of execution of order) and Inspection agency shall attend at the inspection within seven (07) days of the date on which the material is notified as being ready. In case of delay in witnessing of inspection beyond stipulated time (i.e. 7 days from the date on which the material is notified as being ready), by BHEL arising due to

Annexure-I

	reasons not attributable to vendor, BHEL will extend the delivery period for such delay in carrying out inspection. If BHEL is not able to witness inspection up to 15 days then in addition to delay beyond stipulated period, extension in delivery time of 07 days for arranging fresh inspection will be given. When the tests have been satisfactorily completed at Seller/ Contractor's works, the Inspection Agency shall issue an inspection report that effect within seven (07) days after completion of the tests, but if the tests were not witnessed by the Inspection Agency or his representative, the material acceptance report would be issued within seven (07) days after receipt of the test certificates by the Purchaser. Purchaser will issue MDCC to the Seller/ Contractor within 7 days based on inspection report/ test certificates/Certificate of Conformance as applicable. In case of delay in issuance of MDCC beyond 7 days stipulated time (i.e. from the date of successful inspection report), by BHEL arising due to reasons not attributable to vendor, BHEL will extend the delivery period for such delay in issuing MDCC. If BHEL is not able to issue MDCC up to 15 days then in addition to delay beyond stipulated period, 7 days' additional time shall be given to vendor to facilitate the vendor for arranging logistics arrangements.
14	The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case, the bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/guideline.
15	Bidders to inform freight /GST percentage for all the items as part of un-priced bid to be submitted along with their Techno-Commercial offer. However, negotiation/RA shall be on Total Evaluation (FOR as per GeM) price only as per GeM logics. Detailed Price Break shall be reverse calculated based on freight/GST percentage furnished by bidder for Order Placement.
16	Bidder has to provide the details as per TECHNICAL PQR (at pg. no. 1 - 3 of 19 of technical specification document) in its offer and has to note that bids of only those bidders shall be evaluated who meet the Technical Pre-Qualifying requirements. Above terms for PQR shall prevail in conflict (if any).
17	**For bidders (who are not registered with BHEL-PEM) -** For registration in BHEL PEM- Online registration portal is operational, Non-registered Vendors who wish to apply for registration in BHEL-PEM can apply through Online Registration Portal available at www.pem.bhel.com - vendor section - Online Supplier Registration. All credentials and/or documents duly signed and stamped related to registration can be uploaded on the website and submit the application for registration. However, registration of suppliers is not mandatory in case of open tender.
18	**Dispatch Markings: -** Each box shall be marked with Capital Letters in "Red" indicating: Main Supply OR Commissioning spare OR Mandatory Spare for 1X 660 MW SAGARDIGHI TPP EXTENSION UNIT 5, P.O. Manigram, District - Murshidabad, PIN:742237, West Bengal, India Each package/Drum delivered under the Contract shall be marked by Supplier as per details listed below and such marking must be distinct and in English Language (all previous irrelevant markings being carefully obliterated) for purposes of identification. Each and every box(package) shall be marked with following: - 1) Name and address of the consignee. 2) Project Reference. 3) Name of Supplier 4) P.O. reference no. along with package name. 5) Packing No. (1/10, 2/10, 3/10 when there are 10 packages for one consignment) 6) The Gross weight and net weight of the package. Besides above necessary, packing shall bear a special marking "TOP", "BOTTOM", "DO NOT TURN OVER", "DEEP DRY", "HANDLE WITH CARE", etc. **IMPORTANT**

Annexure-I

	Two copies of respective standard manufacturer's erection instruction /operation manual shall be provided for immediate reference by BHEL site. The Copy of complete Packing list for the consignment must be put inside the Box/Boxes. 12 copies of supplier's Erection/ Instruction manuals to be given to the BHEL, PEM, PPEI Noida and 3 copies to BHEL, PSER, Sagardighi site within 30 days of dispatch for handing over to Customer/BHEL site. LOP shall essentially have O&M Manuals and E&C guidelines to be kept inside box duly enclosed. **Commissioning Spares:** - The commissioning spares shall be properly packed separately in separate box and each spare shall be properly tagged giving details i.e. dispatch (to match the description given in the packing slip) to facilitate their proper identification. One Copy of Packing list must be put inside the packing Box. **Mandatory Spares:** - Supplies of spares will be separate from main supply and separate manufacturing clearance shall be given for mandatory spares. The Mandatory spares shall be properly packed separately in separate boxes & boxes should be painted in red indicating Mandatory Spares in bold letters and each spare shall be properly tagged giving details i.e. item number of the equipment in line with the WBPDCL approved BBU for Mandatory spares & Number per item (to match the description given in the packing slip) to facilitate their proper identification by ultimate customer M/s WBPDCL. One Copy of Packing List must be put inside the BOX along with Manufacturing drawing no. reference, Catalogue reference etc. Note: - MDCC for mandatory Spares shall be issued only after receipt of detailed list of mandatory spares & photographs before final packing clearly showing mandatory spares with due tagging as per packing list (to be sent over mail/CD). Separate dispatch clearance will be issued for the mandatory spares in line with availability of customer's stores at site.
19	**Liquidated Damages**: - a) **Main Supply & Commissioning Spares** :- Purchaser reserves the right to recover from the Seller/ Contractor, as agreed liquidated damages and not by way of penalty, a sum equivalent to half (½) percent and applicable GST thereon, of the total main supply & commissioning spares contract price excluding GST per week or part thereof, subject to a maximum of ten(10) percent of the total main supply & commissioning Spares contract price excluding GST, if the Seller/ Contractor fails to deliver any part of the ordered goods/stores within the period stipulated in the Order/ Contract. b) **LD on Mandatory spares portion:** - Purchaser reserves the right to recover from the Seller/ Contractor, as agreed liquidated damages and not by way of penalty, a sum equivalent to half (½) percent and applicable GST thereon, of the total Mandatory Spares contract price excluding GST per week or part thereof, subject to a maximum of ten (10) percent of the total Mandatory Spares contract price excluding GST, if the Seller/ Contractor fails to deliver any part of the ordered Mandatory Spares goods/stores within the period stipulated in the Order/ Contract. c) **LD on Supervision E&C:** - For delay in deputing service engineer, LD on supervision activities shall be applicable @ ½% of the total Supervision E&C portion contract value (excluding element of taxes) per week or part thereof, with applicable GST. However, total LD shall be limited to 10% of cumulative total contract (if applicable) value excluding taxes. **NOTE:** i. LR/RR date for indigenous supplies (Bill of Lading/AWB for Foreign supplies) shall be treated as the date of dispatch for levying LD. However, if receipted LR date for indigenous supply is beyond 30 days for FTL/ 45 days for PTL from the date of LR (PTL to be clearly mentioned in LR), such excess period shall be considered for LD purpose irrespective of dispatch date. Import General Manifest (IGM)/Bill of entry date (whichever is earlier), for foreign supplies, is beyond 90 days from the date of Bill of Lading/AWB, such excess period shall be considered for LD purpose irrespective of dispatch date.

Annexure-I

	ii. In case of any amendment/ revision, LD shall be linked to the amended/ revised contract value and delivery date(s). iii. If Order/ Contract involves two or more Units/ Sets/ Lots/ Stages, then Liquidated Damages shall be levied on order/ contract value excluding GST of the delayed Unit/ Set/ Lot/ Stage, provided delivery stipulated in the Order/ Contract is Unit/ Set/ Lot/Stage wise, however total LD amount shall be limited to 10% of total order/ amended order value excluding GST of delayed Unit/ Set/ Lot/Stage. Any subsequent lot released (not envisaged in original contract) due to increase in quantity within permissible quantity variation shall be treated as separate lot for the purpose of LD. iv. The sum specified above is not a penalty but a genuine pre-estimate of the loss/ damage which will be suffered by purchaser on account of delay on the part of the Contractor/Seller and the said amount will be deductible without proof of actual loss or damage caused by such delay.
20	**Risk & Cost Purchase** - As per **Annexure-V** (Risk & Cost purchase)
21	The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines.
22	In course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective bidders. In case more than one bidder happens to occupy L-1 status even after soliciting discounts, the L1 bidder shall be decided by a toss / draw of lots, in the presence of respective bidder(s) or their representative(s). Ranking will be done accordingly. BHEL's decision in such situation shall be final and binding .
23	GeM has the functionality to quote Single Unit Price (FOR) for each item. Bidders to furnish applicable Freight & GST % w.r.t. Ex Works included in Single quoted (FOR) price.
24	Successful bidder to submit detailed 'BOM' at the time of drawing/document submission after placement of PO along with undertaking as per **annexure-II.** Breakup prices of commissioning spares (if applicable) item wise and mandatory spares shall also be sought.
25	For recognition of dispatch, vendor to submit following documents to BHEL by e-mail/ fax immediately on dispatch: - GST compliant invoice, LR for Indian Vendors (indicating Invoice No., no. of boxes, PTL (if applicable) etc.) / Bill of Lading or AWB for foreign vendor, Packing List (Must be indicating No. of boxes, Packing size, Gross weight and net weight of each package, Contents of the package with cross reference to BoM item code no. or item serial no. and Quantity of each item separately), Insurance Intimation to underwriter through email/fax, Dispatch Clearance.
26	i. Bidder's offer is liable to be rejected if they don't upload any of the certificates / documents sought in the Bid document, ATC and Corrigendum if any. ii. ii. Bidders are advised to check applicable GST on their own before quoting. Buyer will not take any responsibility in this regards. GST reimbursement will be as per actuals or as per applicable rates (whichever is lower), subject to the maximum of quoted GST %. iii. iii. Data Sheet of the product(s) offered in the bid, are to be uploaded along with the bid documents. Buyers can match and verify the Data Sheet with the product specifications offered. In case of any unexplained mismatch of technical parameters, the bid is liable for rejection. iv. iv. The bidder is required to upload, along with the bid, all relevant certificates such as BIS licence, type test certificate, approval certificates and other certificates as prescribed in the Product Specification given in the bid document. v. v. While generating invoice in GeM portal, the seller must upload scanned copy of GST invoice and the screenshot of GST portal confirming payment of GST.
27	100% MSE preference will be given as per MSEs ACT & GeM Logic.

Annexure-A

Standard Delivery Schedule of PEM BOIs

Sl. No.	Package Code	Package name	BHEL Drawing No	Drawing Title	Primary/ Secondary	Drg Sch for Vendors	Standard Delivery Terms for Supply Portion
1	567A	LUBE OIL TRANSFER PUMP	PE-V0-445-567-A001	Data sheet & GA of LOP	Primary	R-0 within 21 days from PO & subsequent revisions within 10 days of comments received from BHEL.	Within Four (04) months from date of CAT-1 approval of Primary drawing/documents or BHEL manufacturing clearance whichever is later, subjected to drawing/document submission/re-submission schedule as stipulated, in case of any delay in submission/re-submission of Primary drawing/documents, then same shall be reduced from the given delivery period.
			PE-V0-445-567-A002	Data sheet & GA of Strainer	Primary		
			PE-V0-445-567-A003	Data sheet & GA of lube oil pump motor	Primary		
			PE-V0-445-567-A004	QAP of Lube oil pump and strainer	Primary		
			PE-V0-445-567-A005	O & M Manual of lube oil pumps	Secondary	within 30 days of issuance of MDCC	

a. The end period specified is for completion of the deliveries. Deliveries to start progressively so as to meet the completion schedule.
b. The delivery conditions specified are for contractual LD purposes, however BHEL may ask for early deliveries without any compensation thereof.
c. Non-applicable drawings shall be decided during bid evaluation.
d. Wherever schedule of drawings/documents submission / re-submission is stipulated in the Technical Specifications, same shall be superseded by delivery specified in NIT

1 X 660 MW WBPDCL SAGARDIGHI EXTN UNIT V

GeM BID NO. -……..., Dt:-

ANNEXURE -II (INSTRUCTIONS TO PACKING LIST)

For faster verification of bills, successful bidder to submit detailed Bill of Material (BOM) at the time of drawings/ documents submission after placement of PO. Each item of the BOM to be uniquely identified with item code no. or item Sl. No. Supplier to ensure that all items which will find separate mention in the packing list are covered in this detailed BOM.

Supplier to also give the following undertaking in the BOM:
"The BOM provided herewith completes the scope (in content and intent) of material supply under PO No. ……. Dated …… Any additional material which may become necessary for the intended application of the supplied items/package will be supplied free of cost in most reasonable time.

Packing List must indicate:

a) Packing size
b) Gross weight and net weight of each package
c) Contents of the package with cross reference to BOM item code no. / Sl. No.
d) Quantity of each items separately.

The packing list must cover all the BOM items.

Supplier to give following undertaking in the packing list:

The Packing list provided herewith is as per BOM approved under PO No. -----

BIDDER's LETTER HEAD

Annexure-III

UNDERTAKING

PROJECT NAME: 1 X 660 MW WBPDCL SAGARDIGHI EXTN UNIT V
PACKAGE NAME: LUBE OIL TRANSFER PUMPS
TENDER ENQUIRY REF:

"I (M/s ……) have read the clause (GOI- MOF F.No. 6/18/2019-PPD dated 23/07/2020 and clarification dated 24.07.2020) regarding restrictions on procurement from a bidder of a country which shares a land border with India; I hereby certify that M/s … … (bidder name) is not from a such country and eligible to be considered".

For ……(Bidder Company Name)

(Authorized Signatory)

Note :- Bidder is requested to furnish the above undertaking on company letterhead from the highest competent authority at your end (i.e Owner, partner, CMD, Director, company secretariat etc.).

Bidder's company letter head

Annexure-IV

TO WHOM IT MAY CONCERN

PROJECT NAME: 1 X 660 MW WBPDCL SAGARDIGHI EXTN UNIT V
PACKAGE NAME: LUBE OIL TRANSFER PUMP
GeM Bid No.:

As per Make in India orders issued by Govt. of India, we hereby confirm that minimum local content

for GeM tender no. ……. will be ……..…%.

We further confirm that address for local value addition will be our registered works is at

……

Your's faithfully

Authorised Signatory & stamp

Note :- Bidder is requested to furnish the above undertaking on company letterhead from the highest competent authority at your end (i.e Owner, partner, CMD, Director, company secretariat etc.).

ANNEXURE-V

(RISK AND COST CLAUSE)

1. BHEL reserves the right to terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor *after due notice of a period of 14 days' by BHEL* in any of the following cases:

   i) If the Seller/Contractor fails to deliver the goods or materials or any instalment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/ services vis-a-vis delivery/execution timeline as stipulated in the Contract, backlog attributable to seller including unexecuted portion of supply does not appear to be executable within balance available period;
   ii) Delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications;
   iii) Withdrawal from or repudiation/ abandonment of the supply/ services by Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the Order/Contract either in whole or in part or otherwise fails to perform the Order/Contract;
   iv) Non-supply by the Seller within scheduled completion/delivery period as per Contract or as extended from time to time, for the reasons attributable to the Seller;
   v) Termination of Contract on account of any other reason (s) attributable to Seller.
   vi) Assignment, transfer, subletting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
   vii) If the Seller be an individual or a sole proprietorship Firm, in the event of the death or insanity of the Seller;
   viii) If the Seller/Contractor being an individual or if a firm on a partnership thereof, shall at any time, be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the Order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
   ix) If the Seller/Contractor being a company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances shall have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager;
   x) Non-compliance to any contractual condition or any other default attributable to Seller.

1.1 **Risk & Cost Amount against Balance Work:**

Risk & Cost amount against balance work shall be calculated as follows:

Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,
A= Value of Balance scope of Work (*) as per rates of new contract
B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.
H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

1.2 *** Balance scope of work (in case of termination of contract):**

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount.

Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.

Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose.

Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: In case portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

1.3 **LD against delay in executed work in case of Termination of Contract:**

LD against delay in executed work shall be calculated in line with LD clause no. 16 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of LD against delay in executed work in case of termination of contract" is given below.

i. Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
ii. Let the value of executed work till the time of termination of contract = X
iii. Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
iv. Delay in executed work attributable to contractor i.e. T2 = [1-(X/Y)] x T1
v. LD shall be calculated in line with LD clause (clause 16) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2. Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor

Without prejudice to the other means of recovery of such dues from the Seller recoveries from the Seller on whom risk & cost has been invoked shall be made from the following:

a) Dues available in the form of Bills payable to seller, SD, BGs against the same contract.
b) Dues payable to seller against other contracts in the same Region/Unit/ Division of BHEL.
c) Dues payable to seller against other contracts in the different Region/Unit/ division of BHEL.

In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

RISK & COST PURCHASE.

DEFAULT/ BREACH OF CONTRACT, INSOLVENCY AND RISK PURCHASE

In case of delays (beyond the maximum late delivery period as per LD clause) in supplies, or if there be defective supplies or non-fulfilment of any other terms and conditions of the Contract as enumerated subsequently in this clause, then, without prejudice to its right to recover any expenses, losses or damages to which the Buyer may be put to incur or sustain by reason of the Seller/Contractor's default or breach of Order/Contract or to suspend business dealings with the Seller/Contractor in terms of the Buyers' Guidelines for Suspension of Business Dealings as applicable from time to time, the Buyer shall also be entitled to cancel the Order/ Contract either in whole or portion thereof without compensation to Seller. On the occurrence of any of the acts/omissions mentioned below, the Buyer may if it so desires, procure upon such terms and in such manner as deemed appropriate, plant/ equipment/ stores not so delivered or others of similar description where plant/ equipment/ stores exactly complying with particulars are not, in the opinion of the Buyer (which shall be final), readily procurable, at the risk and cost of the Seller.

The Seller shall be liable to the Buyer for any excess costs incurred thereof and the Seller shall continue the performance of the Order/Contract to the extent not cancelled under the provisions of this clause. The Seller shall on no account be entitled to any gain on such repurchases. If the Bidder does not agree to this Risk Purchase clause, BHEL reserves the right to reject the bid/offer of the Bidder.

The order/contract may be cancelled in whole or part thereof and Risk & Cost Clause in line with terms and conditions of PO/Contract may be invoked by the Buyer in any of the following cases:

i. If the Seller/Contractor fails to deliver the goods or materials or any installment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/services vis-à-vis delivery/execution timeline as stipulated in the contract, backlog attributable to the Seller including unexecuted portion of supply does not appear to be executable within balance period available;
ii. delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications/execution methodology;
iii. withdrawal from or repudiation/abandonment of the supply/services by the Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the order/Contract either in whole or in part or otherwise fails to perform the Order/Contract.

iv. Non supply by the Seller within scheduled completion/delivery period as per contract or as extended from time to time for reasons attributable to the Seller;

v. Termination of Contract on account of any other reason(s) attributable to the Seller.

vi. Assignment, transfer, sub-letting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.

vii. If the Seller be an individual or a Sole Proprietorship, in the event of death or insanity of the Seller.

viii. If the Seller/Contractor being an individual or if a partnership firm thereof, shall at any time be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;

ix. If the Seller/Contractor being a Company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager

x. Non- Compliance to any contractual condition or any other default attributable to the Seller.

Such defaulting vendor/Seller shall not be eligible to participate in re-tendering conducted on account of risk purchase made due to fault of such vendor/Seller.

BHEL's right to go for Risk and Cost, Calculation of Risk and Cost amount & LD, recovery options to BHEL are given in detail in Annexure-V hereto.

Bill of Quantity (BOQ)

	PROJECT:-	**1X660 MW,SAGARDIGHI THERMAL POWER EXTENSION PROJECT ,UNIT 5,PHASE III**
	PACKAGE:-	**LUBE OIL TRANSFER PUMP**
	DETAILS OF ITEM - BOQ	**TECHNICAL SPECIFICATION NO. PE-TS-445-567-A001**

SI. NO.	DESCRIPTION OF EQUIPMENT / ITEM FOR DEBRIS FILTER		HSN/ SAC code	QTY	UNIT
1	**Main Supply-**Total lump sum firm price inclusive of all prevailing taxes, duties and other levies for **Supply part** comprising of design (i.e.preparation and submission of drawing /documents including "As Built" drawings and O&M manuals), engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants & consumables, supervision of E&C, alongwith spares for erection, startup and commissioning as required, forwarding, proper packing, shipment and delivery at site complete with all accessories for the total scope defined as per BHEL NIT & tender technical specification as specified above, amendment & agreements till placement of order.				
1.1	Pump & motor set duly coupled and unitised on a common base frame with coupling guard, foundation bolts, flanges, companion flanges with nuts bolts and gaskets, drip pan with plugged draining arrangement with one set of commissioning spares comprising of one no. mechanical seal and one no. gasket compound tube/one set gasket for pump. Rated Capacity **6600 LPH** and rated discharge pressure as 2 kg/cm2 (g), inlet/outlet size as **80NB/80NB**		8413 60 10	Nos.	2
1.2	Strainer complete with flanges,companion flanges with nuts bolts and gaskets, foundation bolts (if applicable) with nuts and washers, 15 NB vent and drain connections provided with CS ball valves, 15 NB vent & drain pipe each 5 ft long with one set of commissioning spares comprising of one set gasket for strainer. Duplex Strainer - Rated Capacity **6600 LPH,** inlet/outlet size as **80NB/80NB**		8413 60 10	Nos.	2
2	**Supervision of E&C**				
2.1	Supervision of E&C including Supervision of assembly, erection and commissioning, including visit charges (should include travel expenses to/ fro site, visa/ insurance (if applicable)), boarding, lodging & other related exepenses for the total scope defined as per BHEL NIT & tender technical specification, amendment & agreements till placement of order	Charges per visit	998871	No.	1
2.2		Charges per man-day		No.	7
3	Total lumpsum firm price inclusive of all prevailing taxes, duties and other levies for **Mandatory spares** comprising of manufacture, fabrication, assembly, inspection / testing (as applicable) at vendor's & sub-vendor's works, painting, forwarding, proper packing, shipment, delivery at site & guarantee as per tender technical specification above, amendment & agreements till placement of order.				
3.1	Motor of each type and rating		8413 91 90	Nos.	1
3.2	End Shield cover driving & non driving end			Set	1
3.3	Heaters			Set	2
3.4	Bearing (DE & NDE) for each type and rating of motor			Set	2
3.5	Cooling Fan			set	1
3.6	Dust seals and gaskets seal for each type of motor			set	1
3.7	Motor Terminal block			Nos.	1
3.8	Complete Set of Coupling			set	1

Note: 1) Mandatory spares listed above is bare minimum requirement. In case any additional mandatory spares requirement is covered elsewhere in the tender specification apart from specified above, same shall be deemed to have been covered in bidders scope of supply.

2) The requirement for visit &/or supervision at site as indicated at sl no. 2.1 & 2.2 shall vary as per requirement of site. Any variation shall be adjusted as per Unit rate mentioned in PO.

SECTION -IC

DATA SHEET

SECTION -IC

DATA SHEET-A

BHEL PEM	DATA SHEET FOR LUBE OIL PUMPS		DOC. NO. PE-DC-445-100-N137
			SHEET NO. 01 OF 01
	PROJECT TITLE : 1X660 MW SAGARDIGHI UNIT 5		
1.0	SERVICE IDENTIFICATION	**CLEAN OIL PUMP**	**DIRTY OIL PUMP**
2.0	DRAWING NO.	PE-DG-445-100-N108	PE-DG-445-100-N108
3.0	SYSTEM	CENTRAL LUBE OIL SYSTEM	CENTRAL LUBE OIL SYSTEM
4.0	TYPE	ROTARY POSITIVE DISPLACEMENT	ROTARY POSITIVE DISPLACEMENT
5.0	NUMBER REQUIRED	ONE (01) NO.	ONE (01) NO.
6.0	FLOW RATE (MAX.)	6600 LPH	6600 LPH
7.0	DISCHARGE PRESSURE	2.0 KG/CM^2 (g)	2.0 KG/CM^2 (g)
8.0	SUCTION CONDITION	FLOODED (MAX -4 MLC TO BE CONSIDERED)	FLOODED (MAX -4 MLC TO BE CONSIDERED)
9.0	LOCATION OF INSTALLATION	INDOOR	INDOOR
10.0	LIQUID PUMPED	TURBINE LUBE OIL (TURBINOL-46-HPC / SERVOPRIME 46-IOC)	TURBINE LUBE OIL (TURBINOL-46-HPC / SERVOPRIME 46-IOC)
11.0	PROPERTIES OF FLUID	DENSITY- 0.9 GM/CC AT 15°C FLASH POINT - 210 °C VISCOSITY -28 CST AT 50 °C / 48 CST AT 37.8°C / 140 CST AT 20°C	DENSITY- 0.9 GM/CC AT 15°C FLASH POINT - 210 °C VISCOSITY -28 CST AT 50 °C / 48 CST AT 37.8°C / 140 CST AT 20°C
12.0	TEMPERATURE NORMAL / MAX	AMBIENT / 70 ^{0} C	AMBIENT / 70 ^{0} C
13.0	SUCTION / DISCHARGE PIPING CONNECTION	OD 88.9 X 5.49 / OD 88.9 X 5.49	OD 88.9 X 5.49 / OD 88.9 X 5.49
14.0	RELIEF VALVE	BUILT-IN ON EACH PUMP	BUILT-IN ON EACH PUMP
15.0	SUCTION STRAINER	DUPLEX TYPE STRAINER WITH CHANGE-OVER VALVE, SS ELEMENT MESH SIZE 20 & BLOW DOWN VALVE	DUPLEX TYPE STRAINER WITH CHANGE-OVER VALVE, SS ELEMENT MESH SIZE 20 & BLOW DOWN VALVE
16.0	MATERIALS OF CONSTRUCTION CASING GEARS SHAFT	 CAST IRON - IS 210 - FG260 EN-8/9 EN-8/9	 CAST IRON - IS 210 - FG260 EN-8/9 EN-8/9
17.0	APPLICABLE CODES / STATUTORY REGULATIONS	AS APPLICABLE IS, BS, API STANDARDS	AS APPLICABLE IS, BS, API STANDARDS
18.0	DRIVE TYPE	INDUCTION MOTOR 415 V, 50 Hz	INDUCTION MOTOR 415 V, 50 Hz
19.0	INSTRUMENTS	NA	NA

NOTE : ALL OTHER GENERAL TECHNICAL REQUIREMENTS / ACCESSORIES & SPARES IN LINE WITH CUSTOMER SPEC.

SECTION -IC

DATA SHEET -C

"*" marked details will be furnished by the bidder for review and approval by customer

1.00	**Project Information**	
1.01	Enquiry No.	*
1.02	Project	*
2.00	**Service Condition**	
2.01	Service	Clean Oil/ Dirty Oil/Drain Oil (*bidder to tick mark the applicable service)
2.02	No. of units	*
2.03	Location	Indoor
2.04	Duty	Intermittent
3.00	**Operating Condition**	
3.01	Liquid to be pumped	Turbine Lube Oil
3.02	Pumping Temperature	Ambient/70°C
3.03 Viscosity		
	a) Highest	140cSt @20°C
	b) Lowest	28cSt @50°C
	c) Normal	48cSt @37.8°C
3.04	Design Viscosity of oil (cSt)	28cSt for capacity , 140cSt for power consumption
3.05	Specific Gravity	0.9
3.06	Suction Conditions available	Flooded
3.07 i)	Rated capacity (LPM)	*
ii)	Pump Maximum flow (LPM) & corresponding head (kg/cm^2 (g))	*
3.08	Rated head – kg/cm^2 (g)	*
3.09	R..V.Press.Setting	*
4.00	**Pump**	
4.01	Manufacturer	*
4.02	Type	External gear with herringbone gears
4.03	Model No.	*
4.04 (i)	Design & Manufacturing Standard	API 676
4.04 (ii)	Testing Standard	HIS (ANSI/HI-3.6-2000 /

s

VDMA 24284 , Accuracy Class-2, Group-II
(* Bidder to tick the standard adopted)

4.05	Rotation (Viewed from pump shaft end)	*
4.06	Shut off head, if applicable	Not applicable
4.07	Suction flange	Size 80 NB Standard ANSI B 16.5 Rating 150 lb Facing RF Location (as viewed from drive end) -*(Bidder to tick the applicable) Top End Side
4.08	Discharge flange	Size 80 NB Standard ANSI B 16.5 Rating 150 lb Facing RF Location (as viewed from drive end) -*(Bidder to tick the applicable)
4.09	Timing Gear	Not applicable for gear pumps
4.10	Relief Valve	Built-in
	a) Manufacturer	Pump manufacturer (OEM)
	b) Type	*
	c) Size (NB)	*
	d) Capacity, litre/min	110% of the pump max. flow
	e) Valve, setting pressure adjustable & range of adjustability, in case adjustable	Yes/No (* bidder to indicate the applicable) - *
	f) **Material**	
	g) Spring, Material	Spring Steel
	h) Relief valve cover-Material	Same as MOC of pump body
	i) Bonnet-Material	Same as MOC of pump body
4.11	Shaft Sealing	Mechanical seal
4.12	Bearing	
	a) Type	*
	b) Nos. Provided	*
	c) Method of lubrication	*
	d) Temperature rise over oil temperature	*

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4.13	Type of Coupling	*
4.14	Type of Impeller	External gear- Herringbone profile
4.15	BHP consumed at Rated viscosity (at pump shaft)	*
4.16	BHP consumed at Max. viscosity (at pump shaft)	*
4.17	BHP consumed at Min. viscosity (at pump shaft)	*
4.18	BHP consumed at the R.V. Set Pressure (at pump shaft) @ 48 cSt at maximum value of set pressure range	*
4.19	Pump Efficiency at rated condition @ 48 cSt	
	a) Mechanical	*
	b) Volumetric	*
	c) Overall	*
4.20	Recommended motor rating at 50 º C ambient (kw)	*
4.21	Motor RPM	*
4.22	Design pressure of the pump body and end covers - kg/cm^2 (g)- * (Should be at least 6 kg/cm^2 (g))	
5.00	**Material of Construction**	
5.01	Casing and End covers	CAST IRON IS210 FG 260
5.02 VOID		
5.03	Rotor/Gear	EN-8 BS 970 Part-I Hardness- *
5.04	Shaft/Shaft Sleeve	SS 316
5.05	Seal	*
5.06	Gasket	GRAFOIL/ Any other asbestos free material subject to customer acceptance (* bidder to indicate)
5.07	Bearing	*
5.08	Relief Valve Components	*
5.09	Base Plate	MS to IS 2062
6.00	**Spares**	
6.01	Commissioning Spares	1 set of gaskets/1 no. gasket compound tube 1 No. mechanical seal
6.02	Essential Spares for Pump, if applicable	* (Project specific)

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6.03	Essential Spares for Motor, if applicable	* (Project specific)
6.04	Recommended Spares for Pump for 3 Years	*
6.05	Recommended Spare for Motor for 3 Years	*
7.00	**Weight of**	
7.01	Pump	*
7.02	Motor	*
7.03	Base plate	*
7.04	Other Accessories (Please specify)	*
8.00	**Strainer/Filter**	
8.01	**Manufacturer** Bhatia Engineering Company/ Filtration Engineers (I) Pvt.Ltd / Jaypee Industries Pvt. Ltd./Multitex Filtration Engineers/ Otoklin Plants & Equipment Ltd/ OEM subject to condition that strainer of similar type & capacity have been working satisfactorily at least two plants. (Bidder to tick the make considered)	*
8.02	Type & Size	* (Type -Project specific; size –to match pump suction)
8.03	Nos. provided	* (Project specific)
8.04	Size of Screen mesh & wire dia (min)	40 mesh & 34 SWG
8.05	Design Pressure (kg/cm^2) (Should be at least 4 kg/cm^2)	*
8.06	Capacity (LPM)	To match pump flow
8.07	Design Viscosity	140cSt @ 20 °C
8.08	End Connection	Flanged ANSI B 16.5, Class –150 lb

D

8.09	Maximum Pressure drop at design viscosity (kg/cm2)	
	a) Clean	*
	b) Dirty (50% clogged)	*
8.10	Material of construction	
	a) Strainer body	*
	b) Screen	SS316
	c) Gaskets	GRAFOIL/ Any other asbestos free material subject to customer acceptance (* bidder to indicate)
8.10	a) Inlet pipe Area	*
	b) Free straining area	*
	c) Ration of Free straining area to inlet pipe area (should be $\geq$ 6:1)	*

9.00 Accessories to be provided

Common base plate plate	Yes- MS fabricated from IS 2062 Common for pump & motor
Coupling & Coupling Guard	Yes
Foundation bolts & nuts	Yes
Flanges & Companion flanges	Yes, Class 150 lb, RF to ANSI B 16.5
Nuts, bolts & gaskets	Yes
Lifting lugs, Eye bolts etc	Yes
Name plate for all the equipment	Yes

D

PQR

	PRE-QUALIFICATION REQUIREMENT- LUBE OIL TRANSFER PUMPS-1X660 MW SAGARDIGHI, THERMAL POWER EXTENSION UNIT 5 PROJECT	DOC NO.: PE-PQ- 445-567-A001	
		DATE	08.06.2022
		REV NO	0

1.0	The following technical details are required from bidder to comply technical PQR: a) LUBE OIL PUMPS should be of GEAR type. b) Pump should be designed as per API-676. c) Capacity of the pump should be min6600 LPH. Supplier should have capabilities for design/manufacturing and meeting the requirements as mentioned above.
2.0	**A**. The bidder should have the proven design for the pump (meeting the requirements as per sl.no. 1.0) and have supplied these pumps in at least one (1) number of thermal power unit of capacity 600MW or above working satisfactorily for a minimum period of one (1) years as on **01.07.2020** **OR** **B**. The bidder should have the proven design for the pump (meeting the requirements as per sl.no. 1.0) and have supplied these pumps in at least two (2) no. of thermal power units of 500 MW or above, working satisfactorily for a minimum period of two (2) years within last 7 years as on **01.07.2020**
3.0	If the bidder does not possess the credentials mentioned at Clause No. 2.0 above, they may alternatively submit credentials establishing the below mentioned requirement to comply technical PQR: a) LUBE OIL PUMPS should be of GEAR type. b) Pump should be designed as per API-676. Supplier should have capabilities for design/manufacturing and meeting the requirements as mentioned above.
4.0	Bidder has to submit following supporting documents meeting above mentioned pre-qualifying requirement. Copy of performance certificate (In English) from end user along with copy of related Purchase Order (PO) Or Letter of intent (LOI) or Letter of Award (LOA) or Work Order (WO) in support of credentials above.
5.0	Bidder shall submit all necessary data such as type, design, make capacity, duty conditions, date of commissioning/operation etc. to substantiate technical parameters specified in PQR, if the same is not mentioned in performance certificate/purchase order.
6.0	Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
7.0	Minimum one (1) no. PO/LOI/LOA/WO shall be submitted which should not be more than seven (7) years old, for establishing continuity in business. This is over and above the requirement of PO/LOI/LOA/WO mentioned at Sl. No. 5.0 above
8.0	Notwithstanding anything stated above, BHEL/WBPDCL reserve the right to assess the capabilities and capacity of the bidder/ sub vendors to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL/WBPDCL.
9.0	Consideration of offer shall be subject to customer's approval of bidder.

10.0	After satisfactory fulfilment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all other terms of the tender.
11.0	The bidders approved by M/s WBPDCL for the supply of LOTP for 1x660 MW Sagardighi Extension Project need not submit credentials as specified in this document (Clause No. 2). The list of approved suppliers by M/s WBPDCL is annexed as Annexure – 1.
12.0	The bidder shall meet the PQR based on its own credentials. Bid from joint venture (JV) company /consortium bid is not acceptable.

Notes:

1. Please note, PQR indicated at Clause 2.0 is requirement of BHEL's end customer (M/S WBPDCL) with respect to capacity, place of installation (type of industry) & duration and to be considered by M\s WBPDCL while approving the bidder.

2. **BHEL will take up with M/s WBPDCL for rationalisation with respect to the capacity, installation & duration which are indicated at Clause No. 3.0 for their consideration.**

3. Bidders are advised to furnish the PQR documents in line with Clause No. 2.0 which is specific requirement of BHEL 's end customer (M/s WBPDCL). However, in case the bidder feels that they are not meeting the requirement of Clause No. 2.0 ,but can meet the requirement of Clause No. 3.0, they are advised to submit the bid along with PQR documents meeting the clause No. 3.0.**The bids meeting the requirement of Clause No. 3.0 shall be technically recommended by BHEL and shall be forwarded to end customer for acceptance with respect to Clause No,3.0 and shall be subject to approval of the bidder(s) by M/s WBPDCL.**

4. **In case BHEL's end customer (M/s WBPDCL) does not consider any relaxation with respect to Clause No.3.0 the bids and bidder's approval shall be solely governed with respect to Clause No.2.0 of the PQR and bidder shall not have any claim with respect to Clause No.3.0**

Prepared by Reviewed by Approved by

THE WEST BENGAL POWER DEVELOPMENT CORPORATION LIMITED

SAGARDIGHI THERMAL POWER EXTENSION PROJECT
1X660MW UNIT NO. 5, PHASE-III

TECHNICAL SPECIFICATION

FOR

LUBE OIL TRANSFER PUMPS

SPECIFICATION NO.: PE-TS-445-567-A001

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA (INDIA)

SECTION – I

INTENT OF SPECIFICATION

1.0 INTENT OF SPECIFICATION

1.1 The specification covers design (i.e. Preparation and submission of drawing /documents including "As Built" drawings and O&M manuals), engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants & consumables, supervision of E&C, mandatory spares along with spares for erection, start up and commissioning as required, forwarding, proper packing, shipment and delivery at site complete with all accessories for the total scope defined as per BHEL NIT & tender technical specification as specified, amendment & agreements till placement of order, demonstration testing and handing over to BHEL's customer of Lube Oil Transfer Pumps as per details in different sections / volumes of this specification and various pre award agreements for **1X660 MW SAGARDIGHI THERMAL POWER EXTENSION PROJECT.**

1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the contractor of the responsibility of providing such facilities to complete the supply, erection and commissioning, demonstration testing of **Lube Oil Transfer Pumps.**

1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to highest standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgement is not in full accordance herewith.

1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing. Similarly, the extent of supply also includes all items required for completion of the system and not withstanding that they may have been omitted in drawings / specifications or schedules.

1.5 The general term and conditions, instructions to tenderers and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.

1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification within 10 days of receipt of tender documents. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser / Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.

1.8 Deviations, if any, should be very clearly brought out clause by clause along with cost of withdrawal in the enclosed schedule (in Section – III); otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification. If no cost of withdrawal is given against the deviation, it will be presumed that deviation can be withdrawn without any cost to BHEL/its customer.

1.9 In the event of any conflict between the requirements of two clauses of this specification documents or requirements of different codes and standards specified, Section - I shall prevail over section –II, however more stringent requirement as per the interpretation of the owner shall apply.

1.10 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.

1.11 For definition of word like Contractor, bidder, supplier, vendor, Customer/ Purchaser / Employer, consultant, please referred relevant clause(s) of GCC.

Note:

Bidder to note that BHEL reserves the right for drawing/document submission through web based Document Management System. Bidder would be provided access to the DMS for drawing/document approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.

- Internet explorer version – Minimum Internet Explorer 7.
- Internet speed – 2 mbps (Minimum preferred).
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked.
- Vendor's internal proxy setting should not block DMS application's link (http://dmsserver.bhelpem.com/Wrench%20Web%20Access/Login.aspx.).

SECTION -I

PROJECT INFORMATION

SECTION-III

PROJECT SYNOPSIS AND GENERAL INFORMATION

CONTENTS

SECTION-III

PROJECT SYNOPSIS AND GENERAL INFORMATION

1.00.00 INTRODUCTION

The West Bengal Power Development Corporation Limited (WBPDCL) proposes to extend their on-going Phase-II extension project of 2x500 MW at Sagardighi by adding one super critical unit of 660 MW as Phase-III extension unit. Sagardighi TPS is located in the village Manigram in Murshidabad district of West Bengal, India. The West Bengal Power Development Corporation Limited, a Company fully owned by the Government of West Bengal formed in the year 1985, have commissioned 2x300 MW Thermal Power Plant together with all other infrastructure at Sagardighi Thermal Power Project. Presently WBPDCL is also working on their under-construction Phase- II extension project of 2x500 MW at Sagardighi.

The Bidder shall acquaint himself, by visiting the site, with the conditions prevailing at site. The information given here in under is for general guidance only.

2.00.00 APPROACH TO SITE

Sagardighi Super Thermal Power Station site is located at Manigram village, 13 KM north of Sagardighi town by the side of the SMGR (Sagardighi-Manigram-Gankar-Raghunathganj) Road at a distance 20 KM from National Highway 34 in Murshidabad District, West Bengal and around 240 KM from Kolkata, India. The nearest rail station is Manigram adjacent to the site on Bandel - Barhawara branch line and 6.5 KM from Sagardighi Railway Station on Sainthia - Azimgunj line of Eastern Railway. From Sagardighi railway station a railway line will branch off to the site for material unloading and coal marshalling. The equipment will be normally transported by rail only and under exceptional cases by road. The material consignments shall be as per the restrictions of rail and road transportation prevailing in the country.

Nearest Airport – Kolkata.

Nearest Seaport –Haldia.

3.00.00 LAND

The total land available for the Power Station and Plant auxiliaries will be generally as per the Site Location Plan (12A05-DWG-M-002) enclosed and flexibility will remain to make the final equipment layout based on equipment sizes.

All construction material, heavy equipment, over dimensioned consignments (ODC) for the station during construction may be transported through road/rail access. During operation stage, coal would be transported through rail access.

The total land, approximately 706 hectares, has already been acquired for the present and proposed extension. The locations of various facilities and plant auxiliaries for Unit 1 & 2 under Phase-I and Units 3 & 4 in Phase-II and the space provision for extension unit no. 5 (660 MW) will be as per the General Layout enclosed. About 456 acre of land has been kept for disposal of ash. The Bidder shall accommodate equipment offered under this specification generally within the spaces allocated for such equipment in the General Layout. Specific approval from Owner/Consultant shall be taken by the contractor prior to any revision or relocation.

Except where stated otherwise, the plinth levels of all buildings shall be 300 mm above the corresponding developed grade level and the road level shall be 150 mm above the developed grade.

4.00.00 SOURCE OF COAL

The Power plant shall receive coal from ECL mines. Coal is planned to be transported in rake loads through the existing Pakur- Tildanga-Dhulian-Monigram broad gauge line or through Pakur- Nalhati (proposed)–Takipara-Gosaingram-Poradanga-Monigram broad gauge line. The coal would be carried in rake loads of BOBR/BOX-N wagons.

It is considered that coal would be received from the same source as the plant under Phase-I and Phase-II station with similar characteristics and a new mine at Pachwara (north) in Jharkhand being developed by WBPDCL. These sources being connected by B.G. rail track, coal would be transported by rail only. For coal unloading, crushing and storage facility it is proposed that a new Wagon tippler along with crusher houses, conveyors will be installed in addition to existing coal handling plant of Phase-II station with suitable extension from the end of Transfer Point (TP-19).

5.00.00 SOURCE OF WATER

The source of water for this project is the River Bhagirathi (5 km) through the proposed intake pump house under implementation for Phase-II station. The water from the River Bhagirathi will be transferred and stored in the five (5) nos. Plant Raw Water Reservoirs by augmentation of the Intake water transportation system for phase - II for meeting the requirement of Phase-III Sagardighi TPS.

The Power station will operate on semi open recirculating condenser cooling system using cooling towers. In addition all water conservation and recycling measures will be adopted to minimize requirement of make up water. The proposed project will adopt zero effluent discharge philosophy.

6.00.00 ASH DISPOSAL AREA

Bottom Ash (BA) shall be extraction in wet form and conveyed to the disposal area in lean slurry form. Whereas Fly Ash (FA) shall be extracted in dry form and stored in dry form for onward usage. However, arrangement shall be also

made to dispose fly ash in lean slurry form to ash dump yard located within 1 km from Plant boundary under exigency..

7.00.00 DETAILS OF EXISTING FACILITIES OF PHASE-II

INTRODUCTION

The proposed phase-III, Unit No. 5 is an extension project with many auxiliary systems being common and shared with the Phase-II units (Unit Nos. 3 & 4). It is not the intent to describe all systems in details. Facilities being shared by both Phase-II & Phase-III units and which have a common terminating and control philosophy are outlined below:

MAIN & AUXILIARY COOLING WATER SYSTEMS & ACCESSORIES

Condenser cooling water and auxiliary cooling water system of Phase-III will be independent of Phase-II. Separate pump house and pumping system shall be installed for Phase-III. Only CT make-up system of Phase-II will be shared for Phase-III. However, DMCW system of boiler of Phase-II has excess capacity, which can be utilized for phase-III. The detail of excess cooling water capacity is furnished below:

Provision kept of miscellaneous BOP coolers in DMCW (SG) pump capacity of Phase-II:

i) AHP compressor coolers – 2X300 = 600 m^3/hr (for 2X500 MW units)
ii) MRS compressor coolers - 2X30 = 60 m^3/hr (for 2X500 MW units)
iii) Plant air compressor coolers - 2X175 = 350 m^3/hr (for 2X500 MW units)

Cooling water consumption for miscellaneous BOP coolers (both working and standby) of Phase-II:

i) AHP compressor coolers 158 m^3/hr (for 2X500 MW units)
ii) Fluid Coupling of Ash slurry pumps = 40 m^3/hr (for 2X500 MW units)
iii) BA overflow pumps = 30 m^3/hr (for 2X500 MW units)
iv) MRS compressor coolers - 30 m^3/hr (for 2X500 MW units)
v) Plant air compressor coolers - = 185 m^3/hr (for 2X500 MW units)

The following excess capacity of DMCW(SG) system of Phase-II is available, which can be shared by miscellaneous BOP coolers of Phase-III (except BAOF pump and vacuum pumps), by suitable extension of existing supply and return header of Phase-II :

i) AHP system coolers- 372 m^3/hr
ii) MRS compressor coolers - 30 m^3/hr
iii) Plant air compressor coolers - = 165 m^3/hr

Bidder to check and confirm that excess available capacity of DMCW (SG) system of Phase-II would be adequate for satisfactory operation of the above mentioned BOP systems of Phase-III. With this consideration, the capacity of DMCW (SG) can be optimized for Phase-III.

Condensate Storage Tanks & Transfer System:

In addition to two (2) nos. installed Condensate storage tanks of Phase-II, One (1) no. similar capacity Condensate storage tank (CST) of capacity 750 m^3 shall be installed for Phase-III.

Inside CST pumps, the following horizontal centrifugal pumps are installed for Phase-II:

a) Three (3) nos. (2W+1S) cycle make-up (DMSW)pumps of capacity 120 m^3/hr and TDH 50.0 MWC at rated capacity

b) Two (2) nos. (1W+1S) boiler fill(SG Fill) pumps of capacity 190 m^3/hr and TDH 140.0 MWC at rated capacity

c) Two (2) nos. (1W+1S) CPU Regeneration pumps

In addition to these, installed pumps, the CST pump house have the provision for the following pumps of Phase-III:

a) One (1) no cycle make-up pump

b) One (1) no boiler fill pump (though no additional pump is considered for Phase-II, as the capacity of boiler fill pumps of Phase-II is envisaged to be sufficient for requirement of Phase-III).

c) Two (2) nos. (1W+1S) CPU Regeneration pumps

The proposed pumps of Phase-III shall be selected and interconnected such that the aggregate pumping capacity of Phase-II & III can be shared by all the units of both Phase-II & III.

WATER & WASTEWATER TREATMENT SYSTEMS

Pre-Treatment System-.

A Pre-Treatment Plant for Phase-II (Unit Nos. 3 & 4) have been envisaged which shall cater the requirement for Phase-III (Unit 5). As per the WBD developed for 3,4 & 5 the total clarified water requirement works out as 4789 m^3/hr. therefore the requirement of construction of additional PT Plant is not called for. However the detail of the Pre-Treatment System is given below.

Raw water will be taken through a flow control station to Aerator where raw water will be aerated and then led to Stilling Chamber where its turbulence will be broken.

To inhibit incidental growth of organic matters in raw water, pre chlorination of raw water in Stilling Chamber shall be carried out by use of gaseous chlorine.

Water will then flow to three (3) nos. Distribution Chambers through three (3) nos. Parshall Flumes. From Distribution Chambers, water would be directed to three (3) nos. proposed High Rate Solids Contact Clarifiers. Chemicals such as Ferric Chloride, Lime solution & Polyelectrolyte will be added at the inlet of each of the High Rate Solids Contact Clarifiers.

Clarified water from Clarifiers will flow through channel and be stored in a Clarified Water Reservoir for further use.

The sludge generated from Clarifiers as addressed above will be collected in a common Sludge Sump. Sludge will be pumped from Sludge Sump by means of three (3) nos. Sludge transfer Pumps to the Effluent Treatment Plant. An arrangement for sludge recirculation to Clarifiers shall be provided to aid flocculation in case of low turbidity in raw water.

All chemicals required for the entire plant will be stored in the ground floor of a two-storied Chemical House. Chemicals will be unloaded from the trucks and thereafter be stacked in the respective storage space at ground floor by means of an Electrically Operated Monorail Hoist. However, preparation of chemical solution of Ferric Chloride, lime and polyelectrolyte for injection to raw water shall be carried out in the first floor of the Chemical House. Chemicals will be lifted from ground floor to first floor by means of another Electrically Operated Monorail Hoist. The water required for preparation of solutions is supplied from Overhead Clarified Water Tank to be located above Chemical House or directly from the Service Water Line.

The Chlorination System will be complete with Electrically Operated Monorail Hoist, Chlorine Ton Containers, Booster Pumps, Strainers, Pipe Works and Diffuser Systems up to points of injection, Emergency Chlorine Leak Absorption System and all other necessary accessories and auxiliaries.

The Chlorinators will be connected with Chlorine Ton Containers. The water to the Booster Pumps will be supplied from Overhead Clarified Water Tank located above Chemical House. All the necessary equipment (Chlorinators, Chlorine Ton Containers, etc.) will be located indoor at ground floor of the Chemical House as addressed above.

The water to the booster pumps will be supplied from Overhead Clarified Water Tank.

De-mineralization System

A De-mineralization Plant for Phase-II (Unit Nos. 3 & 4) have been envisaged which shall cater the requirement for Phase-III (Unit 5), considering 500 MW sub-critical unit. In view that Unit #5 is now rated to 660 MW super-critical technology, the requirement of DM water has been reduced as evident from attached WBD. Therefore the requirement of construction of additional DM Plant is not called for. However the detail of the De-mineralization System is given below.

Clarified Water will be pumped from Clarified Water Reservoir (located in Raw Water Treatment Plant area) by three (3) nos. DMF Feed Pumps to UF-RO-MB Exchanger Plant.

Clarified Water will enter the Dual Media Filters and suspended solids present in it will be removed.

From the Dual Media Filters, water shall flow to UF Modules through Pre-Filter. The UF Modules shall be backwashed automatically as per the requirement. Permeate from UF Modules shall be stored in 'UF Permeate Water Storage Tank' for further treatment by Reverse Osmosis. Reject from UF Modules shall be collected to Backwash Collection Pit and feed to the Waste Water Treatment System.

Ultrafiltered water from UF Permeate Storage Tank shall be pumped to Cartridge Filter for further filtration, prior to RO Modules.

Required quantity of antiscalant shall be dosed before Cartridge Filters in order to reduce scale formation tendency of feed water on the surface of the RO Membranes. Sodium Bi Sulphite shall be dosed to de-chlorinate the water and acid shall be dosed to maintain the pH.

After Dosing, filtered Water from Cartridge Filter shall be passed through RO High Pressure Pump to deliver water at desired pressure to the inlet on RO Modules.

The entire RO System shall be designed to achieve minimum 85% recovery. Permeate shall be passed through Degasser Tower to reduce the dissolved CO2 content in the water. Water from Degasser Towers shall be collected to the Degassed Water Storage Tank.

Degassified RO Permeate, finally be pumped to MB Exchanger for further reduction of TDS, to get desired quality of Water.

For chemical cleaning of UF System, One (1) no..UF Cleaning Solution tank, two (2) nos. UF Cleaning Chemical Pumps and one (1) no. 5 micron cartridge filter along with necessary piping and instrumentation as addressed in the P&I Diagram shall be provided.

A full-fledged chemical cleaning system comprising One (1) no. chemical cleaning tank, one (1) no. chemical solution circulating pumps and one (1) no. 5 micron cartridge filter along with necessary piping and instrumentation as addressed in the P&I Diagram shall be provided for RO Skid.

The entire UF-RO-MB Exchanger System along with Chemical Dosing / Cleaning Systems shall be located indoor within DM Plant Building.

EFFLUENT TREATMENT SYSTEM

An Effluent Treatment Plant is already under construction for the Treatment of liquid waste to be generated from Unit# 3, 4 & 5. The wastewater streams from different sources of the Power Plant will be collected, treated and then reused to the maximum extent possible within the Plant. Various waste waters are to be handled and treated for reuse.

However few items have been envisaged for Phase-III (Unit 5) which is described below.

One (1) no. Retention pit and two (2) nos. transfer pumps for service oily waste from Power House Area which will pump the effluent from Power House Area to the existing Waste water Treatment Plant.

One (1) no. Retention pit and two (2) nos. transfer pumps oily effluent from Transformer Yard area which will pump the effluent from Transformer Yard area to the existing Waste water Treatment Plant.

COAL HANDLING SYSTEM

The Existing Coal Handling Plant has been designed to cater the requirement for Phase-II & III stations together. One (1) track hopper for Phase-I, one (1) additional track hopper (Capacity: 5100T) and one (1) wagon tippler (Rated capacity 20 Tips/Hour and Design capacity 25 tips/Hour) along with one (1) side arm charger (Rated / Design capacity 29 Loaded wagons of 140 T) in Phase-II are provided. These are adequate for Phase-III extension unit#5 also. Further two (2) nos. of stacker-cum-reclaimers having 2000 / 2200 TPH rated / design capacity for Phase-II station are adequate for both Phase- II & III units. In the existing crushers, coal would be sized to (-) 20 mm. Crushed coal would thereafter be led either to the boiler bunkers or to the stack yard. In the main route, coal will be directly taken to the powerhouse via TP # 19. Existing four (4) nos. in-line magnetic separators, two (2) nos. metal detectors, two (2) nos. suspended magnets, four (4) nos. belt weighers, two (2) nos. coal sampling units will be commonly used for phase-II & phase-III units.

New set of 2000 / 2200 TPH rated / designed capacity twin stream conveyors as per the same for existing CHP would be installed under Phase-III beyond Transfer Point 19 of unit #4 upto unit #5 bunkers.

New set of 1650 / 1500 TPH, 1200 / 1320 TPH (rated / designed) capacity twin stream conveyors considered from New Wagon Tippler to TP-20. This conveyor stream will also feed to conveyor 22A & 22B for Stacking on the Existing Stock Pile.

Existing system facilities to be commonly used for Phase-II & III and new dedicated system facilities for Phase-III

The major equipment for the coal handling plant installed for Phase-II & shall serve Phase III also is listed below :-

1.	a) Track Hopper	: 5100T with paddle feeders to twin stream conveyors
	b) Wagon Tippler	: One (1) no (Rated capacity 20 Tips/ Hr and Design capacity 25 ips / hr.).
	c) Side Arm Charger	: One (1) no
2.	Conveyors	: Twin stream conveyor line of 2000 / 2200 TPH rated / design capacity.
3.	Crushers	: **Type:** Ring granulator. **Number:** Four (4) (2 working + 2 standby) **Capacity:** 1200 TPH (Rated) / 1320 TPH (Design) **Input coal size:** (-) 300 mm **Output coal size:** (-) 20 mm
4.	Vibrating Screen	: **Type:** Roller screen type. **Number:** Four (4) (2 working + 2 standby) **Capacity:** 1200 TPH (Rated) / 1320 TPH (Design)
5.	Paddle Feeder	: Capacity 1200 TPH rated / 1320 TPH design x 2 in each stream of conveyors.
6.	Stacker-cum-reclaimer	: **Type:** Hydraulic motor-driven rail-mounted unidirectional having slewing and adequate lifting arrangement. **Stacking Capacity:** 2000 TPH (Rated) / 2200 TPH (Design) **Reclaiming Capacity:** 2000 TPH (Avg.) / 2200 TPH (Peak)

Quantity: Two (2)

Coal size: (-) 20 mm

7. Apron feeder : 2000 / 2200 TPH rated / design capacity

ASH HANDLING SYSTEM

BAHP Water System

Six (6) nos. (4W+2S) BAHP water pumps (Make- Flowmore& Model - 5822 (HS) / 350 X 300) with drive, each of capacity 1000 CMH and discharge pressure of 70 MWC, are already installed in existing ash water sump & pump house (common for Phase-II & III). Space for two (2) nos. BAHP water pumps (one shall cater the HP water requirement of bottom ash system and the other for wet fly ash system) with drive for Unit#5, had been kept in the existing ash water sump & pump house.

For details and disposition of existing equipments of Phase-II and space provision for proposed equipment of phase-III, please refer layout of ash water sump & pump house (Dwg. No I-5034-M-GA-002).

BALP Water System

Three (3) nos. (2W+1S) BALP water pumps (Make – Flowmore & Model - 5821A / 300 X 250) with drive, each of capacity 757 CMH and discharge pressure of 25 MWC, are already installed in existing ash water sump & pump house. Space for one (1) no BALP water pump with drive for Unit#5, had been kept in the existing ash water sump & pump house.

For details and disposition of existing equipments of Phase-II and space provision for proposed equipment of phase-III, please refer layout of ash water sump & pump house (Dwg No I-5034-M-GA-002).

Eco Water System

Three (3) nos. (2W+1S) Eco water pumps (Make – Flowmore & Model - F5824A / 100 X 75) with drive, each of capacity 48 CMH and discharge pressure of 45 MWC, are already installed in existing Boiler area for Phase-II i.e. Unit #3 & #4. Space for one (1) no eco water pump for Unit # 5, had been kept in the existing Boiler area (Phase-II).

Ash Conditioning Water System

Two (2) nos. (1W+1S) ash conditioning water pumps (Make – Flowmore & Model - F5824 / 100 X 75) with drive, each of capacity 106 CMH and discharge pressure of 50 MWC, are already installed in existing silo utility building. Space for one (1) no ash conditioning water pump for the proposed silo of Unit#5, had been kept in the existing silo utility building.

For details and disposition of existing equipment of Phase-II and space provision for proposed equipment of phase-III, please refer layout of silo utility building (Dwg No I-5034-M-BE-016).

Seal Water System

Two (2) nos. (1W+1S) seal water pumps (Make – Flowmore & Model - M5972 / 150 X 100) with drive, are already installed in existing ash slurry pump house for Phase-II i.e. Unit #3 & #4. Space for Two (2) nos. (1W+1S) seal water pumps for Unit # 5, had been kept in the existing ash slurry pump house.

Civil foundations for the proposed pumps have already been constructed in the existing slurry pump house. The base plate of the proposed pumps shall be matched with the foundation.

For details and disposition of existing equipment of Phase-II and space provision for proposed equipment of phase-III, please refer layout of ash slurry sump & pump house (Dwg No I-5034-M-GA-001).

Ash Slurry Disposal System

Four (4) nos. (2W+2S) ash slurry pump (Make – Indure & Model - A-918-401) chain (each slurry pump chain consists of 2 nos. pumps in series and there is space provision for future series pump also) with drive, each of capacity 1270 CMH, are already installed in existing ash slurry sump & pump house for Phase-II i.e. Unit #3 & #4. Space for one (1) no ash slurry pump chain for Unit # 5, had been kept in the existing ash slurry sump & pump house.

Civil foundations for the proposed pumps have already been constructed in the existing slurry pump house. The base plate of the proposed pumps shall be matched with the foundation.

For details and disposition of existing equipments of Phase-II and space provision for proposed equipment of phase-III, please refer layout of ash slurry sump & pump house (Dwg No I-5034-M-GA-001).

Silo

Three (3) nos silos, each of capacity 2400 Tons, are already installed in existing silo area for Phase-II i.e. Unit #3 & #4. Space for one (1) no silo for Unit # 5, had been kept in the existing silo area.

For details and disposition of existing silos of Phase-II and space provision for proposed silo of phase-III, please refer layout of ash compressor house (Dwg No I-5034-M-GA-015).

Silo Fluidizing Air System

Five (5) nos. (3W+2S) water cooled silo aeration blowers (Make - Swam & Model - RH-250 WC) with drive and heater, each of capacity 1860 CMH and discharge pressure of 10 MWC, are already installed in existing silo utility building for Phase-II i.e. Unit #3 & #4. Space for one (1) no silo aeration blower and heater for Unit # 5, had been kept in the existing silo utility building.

For details and disposition of existing equipment of Phase-II and space provision for proposed equipment of phase-III, please refer layout of silo utility building (Dwg No I-5034-M-BE-016).

Instrument Air System

Four (4) nos. (2W+2S) oil free, water cooled screw compressor (Make - Atlas Copco & Model ZR 110) with drive and heat of compression (HOC) dryer (Make - Atlas Copco), each of capacity 900 CMH (FAD) and discharge pressure of 8 Kg/cm2 (g), are already installed in existing ash compressor house for Phase-II i.e. Unit #3 & #4. Space for one (1) no instrument air compressor & HOC dryer for Unit # 5, had been kept in the existing ash compressor building.

For details and disposition of existing equipment of Phase-II and space provision for proposed equipment of phase-III, please refer layout of ash compressor house (Dwg No I-5034-M-GA-018).

Recycle Water System

Space for two (2) nos. (1W+1S) recycle water pump with drive for phase-III, had been kept in the existing ash clarifier area.

Space for one (1) no ash slurry disposal pipe (450 NB x 9.52 MM Thk.) for Unit # 5, had been kept in the existing slurry piping corridor of Phase-II. Please refer Dwg No I-5034-M-BE-015 & I-5034-M-BE-025 for layout of existing ash slurry disposal piping & ash dyke.

MILL REJECT SYSTEM (COMPRESSED AIR SYSTEM)

Two (2) nos. (1W+1S) oil free, water cooled screw compressor (Make - ELGI and Model No. - EG110 - 5.5 WC) with drive, each of capacity 20 m3/min (FAD) and discharge pressure of 5.0 Bar (g), are already installed in existing Plant Compressor House (Common for Phase-II & III) for Phase-II i.e. Unit #3 & #4. Space for one (1) no conveying air compressor for Unit # 5, had been kept in the existing plant compressor building.

Civil foundation for the proposed MRS Compressor has already been constructed in the existing plant compressor house. The base plate of the proposed compressor shall be matched with the foundation.

For details and disposition of existing equipments of Phase-II and space provision for proposed equipment of phase-III, please refer layout compressor house (Dwg. No.PE-V0-373-160-505).

Cooling water requirements for conveying air compressor shall be met from existing DMCCW system. The supply and return lines shall be connected at the tie in points from the existing DMCCW system.

PLANT COMPRESSED AIR SYSTEM

Plant air compressor house will be common for Phase-II & III. Instrument air and service air compressors, dryer, receivers and interconnecting piping system for phase-II are installed in the compressor house. Provision of one (1) no. Instrument air Compressor and one (1) no. Service air Compressor, with dryer, receivers and interconnecting piping system are kept in the compressor house for Phase-III. The brief details of existing facilities of Phase-II are indicated below:

a) Instrument Air Compressors- Three (3) nos. (2W+1S) Motor driven oil free screw compressors with air dryer, each of capacity 36 Nm^3/min (FAD-46.53 m^3/min) and discharge pressure of 8.0 kg/cm^2(g)at after cooler outlet at rated capacity.

b) Service Air Compressors- Two (2) nos. (2W+0S) Motor driven oil free screw compressors with air dryer, each of capacity 36 Nm^3/min (FAD-46.53 m^3/min) and discharge pressure of 8.0 kg/cm^2(g)at after cooler outlet at rated capacity.

c) Air Receivers- Five (5) nos., each of capacity 10m^3.

For details and disposition of existing equipment of Phase-II and space provision for proposed equipment of phase-III, please refer P&ID & layout Compressor house of Phase-II (Dwg. no. PE-V0-373-555-A002 & PE-V0-373-555-A001 respectively).

The proposed compressors of Phase-III shall be selected and interconnected such that the aggregate compressed air capacity of Phase-II & III can be shared by all the units of both Phase-II & III.

FIRE PROTECTION SYSTEM

Two (02) nos. inter-connections with isolation valves for hydrant system and Two (02) nos. inter-connections with isolation valves for spray system shall be considered at site for proposed integration with the hydrant and spray network of Phase-III with Phase – II. Please refer Composite piping layout of hydrant and spray network of Phase-II (Dwg. no. PE-V0-373-522-A0013) for locations of inter connection points.

LP PIPING (PIPE RACK)

Existing pipe rack of Phase-II shall be utilized to carry pipe lines from new pumps/ compressors of Phase-III to be installed in existing pump/compressors

houses of Phase-II. Suitable augmentation/ modification/strengthening of existing pipe racks of Phase-II shall carried out by the bidder.

FUEL OIL HANDLING SYSTEM

No further extension of unloading and storage capacity is envisaged for installed fuel oil handling system, which is sufficient for requirement of Phase-I, II& III units.

Pressurizing pumps will supply oil from the HFO/LDO storage tanks to the burner. Three (3) nos.HFO (2 W+ 1S) & two (2) nos. LDO (1W +1S) pressurizing pumps (each having capacity equivalent of 2X500 MW units) are installed under Phase-II system.

There is provision for one additional HFO pressuring pump along with HFO Heater to be installed in pressurizing pump house to cater the requirement of Phase-III. Installed LDO forwarding pumps of Phase-II can also cater requirement of Phase-III. HFO & LDO Pressurizing pump discharge lines, which has been extended up to Unit #4 of Phase-II, shall be further extended by bidder to feed Phase-III.

HFO supply and return lines to and from boiler of phase-III to be extended from existing HFO supply and return header respectively (terminated with isolation valve) of Phase-II. Similarly, LDO supply line to boiler of phase-III to be extended from existing LDO supply header (terminated with isolation valve) of phase-II.

The proposed HFO pressurizing pump with heater of Phase-III shall be of identical capacity with the existing equipment to utilize existing equipment foundations at site.

ELECTRICAL EQUIPMENT & ACCESSORIES

Necessary power supply for Phase-III Fuel oil pump will be arranged from existing FO Switchboard. Accordingly existing FO switchboard shall be modified as specified elsewhere.

If the new equipment of Phase-III 400kV air insulated switchyard can be accommodated in the existing switchyard control building, same needs to be modified if required.

For further details regarding the existing facilities of Phase – II, please refer Volume – II F1 and F2: Technical Specifications for Electrical Equipment and accessories.

CONTROL & INSTRUMENTATION

The following are the existing Stage-II facilities which shall be used for Unit #5 C&I works.

	System	Existing Facilities to be used
a)	Fuel Oil Pressurizing & Heating System	Existing spare I/O cards and spare I/O slots of Unit #3 & Unit #4 DCS [Stage-II] shall be used for augmentation of the new Fuel Oil Pressurizing & Heating System of Unit#5 of Stage-III. Relevant control shall be implemented in the existing DCS processors.
b)	Compressed Air System	New Instrument Air Compressor and Service Air Compressor shall share the existing serial network of Compressors of Unit#3 & Unit#4 DCS [Stage-II] for DCS soft communication. The new Instrument Air Compressor shall also be interfaced with the existing electronic sequencer module (ES-6) provided for the existing Instrument Air compressors of Unit#3 & Unit#4 DCS [Stage-II] for group interlocks.
c)	Mill Reject Handling System	The control shall be implemented in the existing MRHS PLC of Unit#3 & Unit#4 [Stage-II], located in the existing CPU regeneration Area control room. The new MRH System shall use the existing processor of the PLC. New IO panel for additional IO cards for the new system shall be installed in the assigned location of the existing control room for Future IO Panel. The UPS for the new MRH system PLC IO Panel shall be derived from the existing UPS ACDB located in the existing CPU Regeneration Building Control Room (Stage-II).
d)	Ash Handling System	The operation and control of new Unit#5 AHP facilities shall be through the existing PLC of Stage-II (located in the Compressor House Control room). Existing PLC processor (PLC-1), shall cater to the control of the common systems including Ash Water & Ash Slurry System, Fly Ash Unloading System, Instrument Air System & various sump draining systems. Additional IO panels shall be installed in the locations assigned for future IO panels in the Compressor House Control Room, Ash Water Pump House RIO Room and Silo Utility Building RIO Room of Stage-II units.

		One new redundant processor shall be installed in the existing Processor Panel located in the Compressor House Control room to cater the new Unit#5 Bottom Ash & Fly Ash Evacuation System. Extended RIO of the new processor shall be procured for the Unit#5 systems. For new PLC CPU/ IO at existing (Stage-II) Compressor House Control Room, existing UPS system in the Existing [Stage-II] Compressor House Control Room shall be considered. New Energy Meter, Numerical Relays, Air Compressor etc. shall share the existing serial network for interface with existing PLC for Unit#3 & Unit#4 [Stage-II].
e)	Coal Handling System	Spare IOs cards at Remote IO Unit of existing Stage-II CHP PLC near TP-17 of Stage-II shall be used for the augmentation of new CHP system of Unit#5 (Stage-III). The control shall be implemented in the existing PLC processor. However, for Wagon Tippler & Crusher separate new PLC based system with connectivity with existing PLC at HMI network level shall be envisaged. Existing “3D Level Mapping Software” loaded in the CHP PLC for Unit#3 & #4 of Stage-II shall be used for the new Unit#5 Bunker Level indication System. The existing Fiber Optic network for CHP PLC interface with Bunker Level indication System of Stage-II shall also be used by the new Bunker Level indication System for CHP PLC interface.
f)	GPS Master Clock System	All the microprocessor based control systems like DCS, PLC based systems, CCTV, TSI & Rotating machine condition monitoring system etc of unit#5 shall be time synchronized with the Existing GPS Master clock of Phase-II.
g)	Fire Alarm System	Existing Fire Alarm Panel at Fire Station of phase II shall be used to display parameters / Alarms of new Fire Alarm System of unit#5. Main FAP of unit#5 shall be connected to the phase II FAP located at existing fire station.

CIVIL, STRUCTURAL AND ARCHITECTURAL WORK (BUILDINGS CONSTRUCTED WITH SPACE FOR PHASE III)

Necessary Walkway connection between operating floors of Power House of Phase – II (Existing) and Phase – III shall be considered by Bidder.

Few civil foundations have already been constructed for future equipment. Such existing foundation details including bolts, inserts etc. to be studied in detail before procurement of specific equipment for respective purposes so that the same can safely be placed over the existing foundations complying all technical compatibility. In case this is not at all possible, new foundations need to be constructed after complete demolition of existing foundations.

For further details regarding the existing facilities of Phase – II, please refer Volume – II G1, G2 and G2: Technical Specifications for Civil, Structural and Architectural..

8.00.00 SALIENT DESIGN DATA

8.01.00 For implementation of the project, the Bidder shall consider the following Site and Meteorological data:-

a)	Location	:	Manigram village, Sagardighi, Raghunathganj sub-division, Murshidabad District, West Bengal.
b)	Latitude and Longitude	:	24^0 22’ 13.7” N, 88^0 6’ 15.8” E (Topo sheet No.78/D/3)
c)	Nearest Towns	:	Ajimganj, Jangipur, Raghunathganj.
d)	District Head Quarters	:	Berhampore - 40 km.
e)	Approach Road	:	20 km from National Highway (NH-34)
f)	Nearest Railhead	:	Manigram railway station on Bandel-Barhawara branch line 1 km from site.
g)	Source of Water	:	Bhagirathi River - 5 km
h)	Source of Coal	:	Pachwara (North) mine block in Jharkhand.
i)	Fuel Transportation	:	By rail in rake loads of BOBR/BOX-N wagons.
j)	Surrounding Habitations	:	Villages - Manigram, Chhamugram, Karaia, Thakurpara on the south; Bhumhar, Khasittor, Ekrakhi on the west;

Dhalo, Bagpara, Santoshpur on the north and Harirampur, Chandparam, Dogachhi on the east.

k) Level : Within 34.5 m contour. Land is above HFL (highest flood level) of the area.

l) Soil : Less fertile alluvial soil.

m) Land Use : Within existing plant boundary of WBPDCL.

Meteorological data of site is given below:

a) Design ambient dry bulb temperature : 50 ºC maximum
5 ºC minimum

b) Highest wet bulb temp : 26.9 ºC

c) Maximum relative humidity : 84%

d) Average relative humidity : 73%

e) Average annual Rainfall : 1389 mm

f) Wind load : In accordance with IS-875 for a basic wind speed of 47 m/sec, up to a height of 10 metres above mean ground level.

g) Seismic Zone : Zone III as per IS: 1893 latest edition.

h) Altitude : 34M above MSL

SECTION -IA

SECTION -IA

SPECIFIC TECHNICAL REQUIREMENT

(MECHANICAL)

1.0 SCOPE OF WORK

1.1 Design, engineering, manufacturing, inspection and testing at manufacturer's works, painting, supply/delivery duly packed at project site for pump & motor set duly coupled and unitised on a common base frame with coupling guard, foundation bolts, flanges, companion flanges with nuts bolts and gaskets, drip pan with plugged draining arrangement, strainer with flanges, companion flanges, nuts, bolts & gaskets, foundation bolts etc. along with commissioning spares and all accessories as indicated in the **pump Datasheet-C under SECTION -IC.**

The scope of equipment (Quantity, Capacity, Head and the type of strainer) to be supplied shall be as per Data sheet-A (PE-DC-445-100-N137) given under SECTION- IC.

1.2 Mandatory spares: Applicable (refer section-IA)

1.3 Supervision of Erection & Commissioning: Applicable (refer point no.9.0)

2.0 TERMINAL POINT

a) Suction strainer nozzle counter flange (suction side)
b) Pump discharge nozzle's counter flange.

2.1 For electrical system, bidder's scope shall terminate at motor terminal box complete with cable glands/ lugs for power cabling. Also refer electrical scope between BHEL & Vendor given under **Electrical portion** of specification under section-IB.

3.0 EXCLUSIONS

3.1 Power Cable

3.2 Motor starter in MCC

3.3 Local Push Button Station

3.4 Feeder for motor

3.5 Earthing of Pumps. However, earthing conductor is to be provided by the bidder.

3.6 Foundation & associated civil works.

4.0 CORROSION PROTECTION/ PAINTING SCHEDULE

	External
Surface preparation	Surface shall be degreased and prepared by brush/mechanical tool/ blasting as per manufacturing guidelines.
Primer Coat	One coat of epoxy-based zinc rich primer of minimum DFT 50 micron.
Intermediate coat	One coat of epoxy based TiO2 pigmented polyamide cured paint of DFT 50 microns.
Finish	Two coats, each of DFT 50 microns per coat of aliphatic acrylic 2 pack polyurethane finish paint. Thus, a total DFT of 200 microns shall be achieved. Paint shade shall be IS-631-LIGHT GREY).

Note:

I. Any change in painting specification at later date needs to be complied by bidder without any Commercial implication. Bidder to refer **section IA** for detailed painting specification.

II. Make of paints shall be as Asian Paints, Berger paints or Good lass Nerolac.

5.0 QUALITY REQUIREMENTS

a) Bidder should maintain excellent quality of works, all supply items shall meet the relevant quality Standards.

b) The successful bidder shall furnish Quality Plans/ Inspection Check Lists for various item for the Package in line with minimum requirement indicated in specification during detail engineering for Customer's approval.

c) For other items for which any specific inspection requirement is not indicated in the specification but the same included in scope of work, vendor specific QPs/ CLs shall be furnished by the successful bidder for Customer/Consultant's review and approval. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

6.0 DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH THE BID

The drawings and documents to be submitted with the bid shall be as per list given under SECTION-IIIA.

7.0 DRAWINGS AND DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

List of drawings / documents required during detail engineering along with submission Schedule is given under SECTION-IA**.**
Further, bidder to prepare the drawings & docs in line with general Mech. & Elect. guidelines given under Section-I.

8.0 SUB-VENDOR ITEMS

The maker of sub-vendor items indicated under section -IA of specification are subject to acceptance By customer without any additional commercial implication to BHEL.

9.0 SUPERVISION OF ERECTION & COMMISSIONING:

The erection of Lube oil transfer pumps and its accessories will be done by owner as per Erection Manual and check List to be provided by the bidder during detail engineering. However, the bidder shall make visit as per enquiry/PO for the supervision of erection, pre-commissioning & post-commissioning check-up, start-up, testing and trial runs of all the items covered under the scope of supply & Services.

The Scope of Supervision for Erection & commissioning: Tentatively following visits shall be planned by site team which shall be as follows: -

- Two visits (for all pumps with motor and strainer) of 7 days each for supervision for erection, pre-commissioning & post- commissioning check-up, start-up, testing and trial runs of all the items covered under the scope of supply & Services.

- The total lump sum price of visit & man days shall include travel expenses to & fro site, insurance (if applicable), boarding & lodging etc. at site including the supervision charges for erection, commissioning, performance testing or any other services at site. The no. of man days shall be decided from the day of actual commencement of supervision at site/availability of site for supervision activity excluding travel to & from site.

Note: Bidder shall be informed at least 10 days in advance for the requirement of visit at site. Visiting team shall consist of one or two experts as deemed necessary by the bidder.

SECTION -IA

GENERAL TECHNICAL REQUIREMENT

SECTION-V

GENERAL TECHNICAL REQUIREMENTS

CONTENTS

SECTION-V

GENERAL TECHNICAL REQUIREMENTS

1.00.00 CODES AND STANDARDS

1.01.00 Except where otherwise specified, the Plant shall comply with the appropriate Indian Standard or an agreed internationally accepted Standard Specification as listed in the annexure to this Section and mentioned in detailed specifications, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the Bidder shall give all particulars and details as necessary; to enable the Owner to identify all of the Plant in the same detail as would be possible had there been a Standard Specification.

1.02.00 Where the Bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each Standard Specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.

1.03.00 Wherever specified or required the Plant shall conform to various statutory regulations such as Indian Boiler Regulations, Indian Electricity Rules, Indian Explosives Act, Factories Act etc. Wherever required, approval for the plant supplied under the specification from statutory authorities shall be the responsibility of the Successful Bidder.

1.04.00 In the event of any conflict between the codes and standards referred above, and the requirements of this specification, the requirements, which are more stringent, shall govern.

1.05.00 In case of any change of code, standards and regulations between the date of purchase order and the date the Successful Bidder proceeds with manufacturing the Owner shall have the option to incorporate the changed requirements. It shall be the responsibility of the Successful Bidder to advise Owner of the resulting effect.

2.00.00 RESPONSIBILITY FOR DESIGN

2.01.00 The Bidder shall assume full responsibility for the design of the whole and every portion of the Plant, whether or not the design work was undertaken specifically in relation to the Contract and whether or not the Successful Bidder was directly involved in the design work.

2.02.00 Notwithstanding the Owner's wish to receive the benefits of new, advanced and improved technologies, a prime requirement is that all the systems and components proposed shall have been already adequately developed and shall have demonstrated good reliability under similar, or more arduous conditions elsewhere, at least for continuous 2 years in two different power station.

2.03.00 The Bidder shall carry out optimization studies for selection of pipe size and equipment wherever required. The result of such studies shall be included as part of bid proposal.

The successful Bidder shall have to carry out surge analysis and other transient condition studies as may be necessary and as required by the Owner as per proven engineering practice.

2.04.00 The Bid shall include a detailed discussion on the development status of and the reasons for any changes made in proposed systems or components for the Plant, as compared with similar items previously supplied in other installations cited by the bidder as reference plants.

2.05.00 The Bidder may also make alternate offers, provided such offers are superior in his opinion in which case adequate technical information, operating feedback, etc. are to be enclosed with the offer, to enable the Owner to assess the superiority and reliability of the alternatives offered. In case of each alternative offer, its implications on the performance, guaranteed efficiency, auxiliary power consumptions, etc. shall be clearly brought out to the Owner to make an overall assessment. In any case, the base offer shall necessarily be in line with the specifications i.e. Base offer shall be as per the technical specifications and the same will be considered for techno-commercial evaluation.

3.00.00 NAME PLATES (RATING PLATES)

3.01.00 Instruction plates, nameplates or labels shall be permanently attached to each main and auxiliary item of plant in a conspicuous position. These plates shall be engraved with the identifying name, type and manufacturers serial number, together with the loading conditions under which the item of plant has been designed to operate.

3.02.00 Items such as valves, etc. which are subject to hand operation, shall be provided with nameplates so constructed as to remain clearly legible throughout the life of the plant giving due consideration to the difficult climatic conditions to be encountered. Nameplates shall be securely mounted where they will not be obscured in service by insulation, cladding, actuators or other equipment. Direction of flow is also to be engraved.

3.03.00 All trade nameplates and labels shall be in English language. All measurements shall be in M.K.S. Units.

3.04.00 The size and location of nameplates shall be subject to Approval of the Owner/Owner's Engineer.

4.00.00 SAFETY AND SECURITY

4.01.00 The design shall incorporate every reasonable precaution and provision for the safety of all personnel and for the safety and security of all persons and property. The design shall comply with all appropriate statutory regulations relating to safety. All structures and equipment shall be designed and constructed to withstand every foreseeable static and dynamic loading condition, including loading under earthquake conditions, with an adequate margin of safety.

4.02.00 Ready and safe access with clear headroom shall be provided to all parts of the plant for operation, inspection, cleaning and maintenance.

4.03.00 Escape routes and clear ways shall be provided to allow speedy evacuation of the plant in the event of fire or explosion, and the plant layout shall allow for ease of access to all parts of the Works by rescue and fire fighting teams. The Plant layout shall be designed to localize and minimise the effects of any fire or explosion. The recommendations of NFPA, OSHA, and TAC etc. as necessary shall be followed in all respects.

4.04.00 The use of corrosive, explosive, toxic or otherwise hazardous materials shall be kept to a minimum during construction and the design of the plant shall minimise the requirement for such materials during operation and maintenance. Where such materials must be used, all necessary precautions shall be taken in the design, manufacture and layout of equipment to minimise the resulting hazard, and all equipment necessary for the protection and first-aid treatment of personnel in the event of accidents shall be provided. Particular attention is drawn to avoid the use of materials containing asbestos in any form.

5.00.00 **GUARDS**

5.01.00 Effective guards and fences must be provided to prevent injury to operators through accident or malpractice.

5.02.00 Mesh guards which allow visual inspection of equipment with the guard in place are generally preferable. The guards shall be constructed of mesh attached to a rigid framework of mild steel rod, tube, or angle and the whole galvanised to prevent loss of strength by rusting or corrosion. The guards shall be designed to facilitate removal and replacement during maintenance.

5.03.00 All drive belts, couplings, gears, sharp metallic edges and chains must be safely guarded. Any lubricating nipple requiring attention during normal running must be positioned where they can be reached without moving the guards.

5.04.00 Guards for couplings and rotating shafts shall be in accordance with BS 5304-1975 or similar approved standard. All rotating shafts and parts of shafts must be covered.

5.05.00 Suitable fencing shall be provided to enclose all openings or doorways used for the hoisting and lowering of machinery etc. This fencing must be securely fixed but quickly detachable when required. A secure handhold must be provided on each side of the opening or doorway.

6.00.00 **LOCATION AND LAYOUT REQUIREMENTS**

The majority of plant and equipment shall all be of indoor installation. A broad list of buildings housing such equipment is given In Vol-II-G2 Section I. Layout shall facilitate access for operation-maintenance and inspection of any one or more equipment/components at a time without disturbing the operation or installation of rest of the plant. Further, Bidder should comply with the criteria given under the various equipment and system specifications as well as those stipulated in Annexure-II attached to this section.

Enclosed General Layout and other tender layout drawings enclosed in Vol-II-L show the location of major installations and auxiliary buildings. The Bidder

shall try to retain these locations as far as practicable. The layout of equipment within the power house as shown in the tender drawings is indicative. The Bidder may, subject to Owner's acceptance alter the same to suit the space requirement of the equipment offered.

While developing the layout of buildings the following criteria shall be given effect:

a) The minimum width of clear access corridors around equipment shall be 1.2 meters.

b) Each building shall have an identified vacant space for equipment unloading and maintenance and preferably a separate bay altogether in buildings housing heavy equipment. Provision for handling equipment by monorail hoist and/or overhead crane shall be made as required.

c) The plinth level with respect to the existing grade level shall be as indicated elsewhere in Vol-II-A Section-V/Annexure-II.

d) The minimum clear height available between two consecutive floor slabs shall not be less than five (5) meters. A clear head room of 2.2 meters shall be maintained between the floor and any overhead piping/cables or other obstruction. Adequate provision for natural ventilation and illumination shall be made as per good engineering practices.

e) There shall be at least two (2) nos. main access doors, one on either side of each building, of which one shall be minimum 3 meters wide with rolling shutters for equipment entry. For multistoried buildings, at least two (2) nos. regular staircases diagonally opposite to each other shall be provided connecting all the floors and roof. These minimum requirements shall be augmented as required depending on the floor area, statutory requirements and TAC recommendations.

f) All buildings shall have provision for toilet and associated effluent discharge system together with facility for drinking water. The criteria for ventilation, fire protection and illumination of building spaces shall be as specified in Vol-II-A Section-V/Annexure-II.

g) All rail/road crossings for pipe/cable racks shall be constructed with minimum 8 meters headroom from top of rail/road to bottom of rack. Similarly top cover over underground pipes/cables shall be minimum one (1) meter. For other detail refer to Annexure-II of this section.

h) Cubicle for operating personnel shall be located at safe place near the equipment.

i) Pipe rack, cable rack and Pipe cum Cable rack shall have hand railings (not less than 1200 mm high) in walkways (min. 800 mm wide) on both sides at appropriate heights.

7.00.00 **OPERATION AND MAINTENANCE CONSIDERATIONS**

7.01.00 Space for ease of operation and maintenance including equipment removal, tube bundle/cartridge/rotor pulling etc. shall be provided. All valves, gates, dampers and other devices shall be located and oriented in such a way that they are accessible from operating floor levels. Where this cannot be adhered to, platforms and walkways with access ladders shall be provided to facilitate operation and maintenance.

7.02.00 Lifting devices i.e. hoists, chain pulleys, jacks, etc. shall be provided for handling of any equipment and/or part having weight in excess of 100 Kg during erection and maintenance activities. Suitable beams, hooks etc. for this purpose shall be provided in the buildings and clear space provided below to a platform or floor which will allow normal risk free transport means to be used.

Lifting tackles, slings, etc. to be connected to hook of the hoist/crane shall also be provided by the Bidder for lifting the various equipments and accessories covered under this specification.

7.03.00 All similar parts of the equipment shall be made to gauge and shall be interchangeable with and shall be made of same material and workmanship as the corresponding parts of the equipment. Where feasible common components shall be employed in different pieces of equipment in order to optimize the spares inventory and utilization.

8.00.00 **MATERIALS**

8.01.00 In selecting materials of construction of equipment, the Bidder shall pay particular attention to the atmospheric conditions existing at the Site and the nature of material/fluid handled.

All materials shall be new and shall be of the quality most suited to the proposed application.

8.02.00 Materials used for various components shall be those which have already proven operating experience in similar type of applications.

8.03.00 All parts which could deteriorate or corrode under the influence of the atmospheric, meteorological or soil conditions at the Site, or under the influence of the working conditions shall be suitably and effectively protected so that such deterioration or corrosion is a minimum over the life of the plant.

8.04.00 **Prohibited Materials**

The use of the following materials is prohibited:

a) High alumina cement in structural elements

b) Wood wool slabs in permanent framework to concrete

c) Calcium chloride in mixtures for use in concrete works

d) Naturally occurring aggregate for use in reinforced concrete that does not comply with the applicable codes and standards.

e) Cast iron for any oil service

f) Carcinogenic material and suspected carcinogenic materials by World Health Organization.

g) Asbestos or any other fibrous form of hydrated magnesium silicate

h) Any other material generally known to be deleterious if used or incorporated in such project like the facility.

9.00.00 **LUBRICATION**

9.01.00 Provision shall be made for suitable efficient lubrication where necessary to ensure smooth operation free from undue wear.

9.02.00 Non ferrous capillary tubing shall be used throughout.

9.03.00 Gear boxes and oil baths shall be provided with filling and drain plugs, both of adequate size. An approved means of oil indication including level switches and temperature indication shall be provided.

9.04.00 All high speed gears shall be oil bath lubricated. Low speed gears shall be lubricated by means of soft grease. Removable and accessible drip pans shall be provided to collect lubricant, which may drop, from operating parts.

9.05.00 All lubrication points shall be conveniently situated for maintenance purposes. It must be possible to carry out lubrication from a gangway or landing and without the removal of guarding or having to insert the hand into it. Where accessibility to a bearing for oiling purposes would be difficult a method of remote lubrication shall be fitted.

9.06.00 The Bidder shall supply grease gun equipment suitable to service each type of nipple fitted.

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10.00.00 **LUBRICANTS, SERVO FLUIDS AND CHEMICALS**

10.01.00 The Bidder shall provide a detailed and comprehensive specification for all lubricating oils, greases and control fluids required for the entire plant. A sufficient supply of these shall be provided by the Successful Bidder for initial commissioning, first fill and till completion of facilities and handing over of respective units.

10.02.00 The Bidder shall supply a detailed schedule giving the lubricant testing, cleaning and replacement procedures. All equipment and facilities necessary for the testing, cleaning and changing of lubricants and control fluids shall be provided. The Successful Bidder shall endeavor to reduce the verities and grades of required lubricants and control fluids to a minimum, matching them where possible to those already in use in the generating station in order to simplify procurement and minimise storage requirements. All lubricants and control fluids shall be of internationally recognized standards and shall be easily

obtainable from a large number of Indian suppliers. Bidder shall also indicate the equivalent Indian Standard for the above for easy procurement in future.

10.03.00 No lubricant or control fluid shall have toxic or other harmful effects on personnel or on the environment.

11.00.00 PLANT LIFE AND MODE OF OPERATION

The complete plant including all the equipment and systems individually and collectively shall be designed for continuous operation for an economic service life of thirty (30) years under the prevailing site conditions and for the type of duty as specified in relevant sections of the specification.

The critical components of the Steam Generator, Turbine-Generator and Auxiliary equipment, the life of which is limited by time and temperature dependent mechanisms such as thermal stress, creep and low cycle fatigue, are to be designed considering expected (hot, warm and cold) start-up, shut-down and cyclic load variations. (Details are specified in the Volume IIB – Specification of Steam Generator and Auxiliaries and Volume IIC – Specification of Steam Turbine and Auxiliaries and)

The units would be operated on base load with cyclic load variation. The load variation is expected to be as per schedule depending on power demand.

12.00.00 PACKAGING & MARKING

All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing the materials, the limitations from the point of view of availability of railway wagon sizes in India should be taken account of. The details of various wagons normally available with Indian Railways for transportation of heavy equipment shall be considered by the Bidder. The Bidder shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.

Bidder shall conduct his own route survey and transportation logistics for transportation of the equipments to project site by road/rail/sea and indicate the same in his proposal.

Each package shall have identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Bidder shall include in the marking gross and net weight, outer dimension and cubic measurement. Each package shall be accompanied by a packing note (in weather proof paper) quoting specifically the name of the Bidder, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

13.00.00 PROTECTION

Equipment having antifriction or sleeve bearings shall be protected by weather-tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces that are damaged shall be repainted.

Electrical equipment, controls and insulations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound as specified above and protected with suitable wood, metal or other suitable covering to ensure their full protection. All exposed threaded parts shall be greased and protected with metallic or other suitable protectors.

All piping, tubing and conduit connections on equipment and other equipment openings shall be closed with rough usage covers or plugs shall be sealed and taped. Male threaded openings shall be closed with rough usage covers or plugs shall be sealed and taped. Female threaded openings shall be closed with forged steel plugs.

Returnable containers and special shipping devices shall be returned by the Bidder.

14.00.00 PAINTING

14.01.00 General

All exposed metallic and wooden surfaces subject to corrosion shall be protected by shop application of suitable coatings. Surfaces not easily accessible after shop assembly shall be treated before-hand and protected for life of the equipment. Surfaces to be finish painted after installation shall be shop painted with at least two (2) coats of primer. Steel surfaces, which are not to be painted, shall be coated with suitable rust preventive compound subject to the acceptance of the Owner.

All paints shall be used in accordance with the manufacturer's instructions. No thinners or other substance shall be added to the coating material without the prior notification and specific acceptance of the Owner. The quality and vendor of the paints shall require acceptance of the Owner.

Procedure for painting of any item, if not indicated in the relevant specification, shall be developed by the Bidder. This procedure and quality of paint shall be subject to Owner’s acceptance

All paints shall be applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.

All primers shall be properly applied on to the surface and the first priming coat shall be applied as soon as possible after cleaning, within four hours maximum. The paint shall be applied by brush, roller or airless spray, according to the manufacturer's instructions. Spray painting shall be carried out by operators trained and thoroughly experienced in the use of the spray painting equipment.

If the drying interval between successive coats of paint or primer exceeds the manufacturer’s recommendations, the paint already applied shall be completely and uniformly abraded with fine abrasive paper before putting on the next coat.

Paint spraying on large surfaces shall not be done indoors, without the prior notification and specific acceptance of the Owner. Spray guns shall not be used outdoors in windy weather nor near unprotected surfaces of a contrasting colour and under no circumstances shall spray guns be used where spray may be carried into or onto exposed electrical equipment or unprotected humans.

The Bidder shall provide suitable protection for adjacent plants from air borne materials during cleaning and spraying to the satisfaction of Owner

Paint containers shall not be opened until required and the paint shall be mechanically mixed thoroughly before use, and agitated occasionally during use.

Electrical equipment shall be shop finished with one or more coats of primer and two coats of high-grade oil resistant enamel. The interior of all panels' cabinets and enclosures shall be finished with gloss white enamel. For detail please refer relevant electrical sub-section Volume II F1 & F2.

The Bidder shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory surfaces of each item of equipment. The touch-up paint shall be of the same type and colour as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished.

Shop primer for steel and iron surfaces which will have a continuous operating temperature below 35°C shall be selected by the Bidder, in accordance to the relevant standard. Special high temperature primer shall be used on surface exposed to operating temperature above 35°C.

The colour scheme shall be submitted during execution of contract for acceptance by the Owner.

14.02.00 **Surface Preparation**

The grade of surface preparation shall be classified as indicated in Annexure-I of this section.

Sl. No.	Type of Preparation	Reference Standards		
		SSPC	SIS	BS 4232
1.	Solvent cleaning	SP1	-	-
2.	Hand Tool Cleaning	SP2	St-2	-
3.	Power Tool Cleaning	SP3	St-3	-
4.	Flame cleaning of new steel	SP4	-	-
5.	White metal blast cleaning	SP5	Sa-3	First Quality
6.	Commercial blast cleaning	SP6	Sa-2	Third Quality
7.	Brush-off blast cleaning	SP7	Sa-1	-
8.	Pickling	SP8	-	-

9.	Weathering followed by blast cleaning	SP9	-	-
10.	Near white blast cleaning	SP10	Sa-2.5	Second Quality

Oil and grease shall be removed from the surface by washing with a suitable detergent, rinsing with clean water, and drying.

The abrasive to be used shall be metal grit.

The surface preparation of all steel surfaces to be coated shall be free from all mill scales, rust corrosion products, oxides, paints, oil or other foreign matter.

All welded areas and appurtenances shall be given special attention for removal of welding flux in crevices. Welding splatter, slivers, laminations and underlying mill scale exposed during shot blasting shall be removed or repaired.

No acid/solvents/other cleaning solutions shall be used on surfaces after they have been blasted.

14.03.00 **Application of Primer and Paint**

Primer shall be applied immediately after surface preparation has been completed.

Brushing, spraying, roller coating or other suitable method shall be adopted for application of primer and paint and the work shall be carried out strictly as per the recommendation given by the paint manufacturer.

Primarized surfaces shall be faultless and shall not have mudcracking, dripping over thickness and dry sprays.

Before application of paint/primer, the following shall be particularly checked for conformance to this specification and recommendation of the paint manufacturer:

a) Surface preparation profile.

b) Catalysis ratio for two component paints.

c) Pot life.

d) Minimum and maximum top coating times.

e) Type and quantity of thinners (if required)

f) Viscosity

g) Soundness of previous coating.

h) Ambient conditions (temperature, humidity, etc)

Depending on the degree of contamination by foreign matters, the surfaces primed at shop shall be washed as follows to the satisfaction of the Owner:

a) With clean water under a pressure of a least 7 Kg/cm2 (g) using suitable nozzles. During washing broom of corn brushes shall be used.

b) With suitable solvents, (such as Carbon Tetrachloride, Trichloroethylene etc.) if necessary, to remove traces of grease, oil etc.

Coated parts shall be carefully handled using hemp ropes, cloth belts, pendulum conveyors or suitable means as instructed by the Owner.

Surfaces which cannot be painted after fabrication shall be primed and provided with suitable rust preventive oil before boxing up.

Paints shall be stored in well-ventilated rooms, far away from heat sources, open flames, sparks and protected from sun. Outdoor storage is not permitted. Storage life shall be clearly indicated on the container. Paints, which have thickened or gelled or contained in non-original containers or in unsealed containers shall not be used. Owner's decision in this regard shall be final and binding.

The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as per Table I & II of this section.

For detail painting on building & structural steel elements refer Section-IIG/1 & IIG/2 of this specification.

14.04.00 **Damaged Paintwork**

Any damaged paintwork shall be made good as follows:

a) The damaged area, together with an area extending 25mm around its boundary, shall be cleaned down to bare metal.

b) A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50mm around the perimeter of the original damage.

c) The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming.

14.05.00 Surface preparation and painting work shall not be carried out under the following weather conditions:

a) When the surface is wet or expected to become wet before the paint/primer has dried up due to impending rain, fog or mist.

b) High winds.

c) Ambient temperature below 5deg.C or surface temperature less than 3 deg.C above dew point.

d) Relative Humidity is more than 85%.

14.06.00 **Inspection and Testing of Painting**

The following inspection and testing shall be performed during and on completion of paint systems.

- Shot blasting profile shall be checked using a suitable profile-meter. Acceptable profile shall be 25-30 microns.

- Check of time of top coating and drying, in accordance with the recommendation of paint manufacturer.

- Check of Dry Film thickness by suitable Non Destructive Equipment. The painting shall be rejected if any of the spot measurement shows thickness to be less than 80% of the specified thickness.

- Check of adhesion of Paint Material by "Chequering" or another suitable method.

- Check of porosity of coating for internals, by the use of a suitable instrument.

- Visual inspection of appearance and uniformity of the surfaces painted.

If during above inspection, painting defects are observed, the Bidder shall carry out rectification to bring the faulty surface to the acceptable degree.

The areas where defective or damaged coatings have been repaired or replaced shall be re-inspected to the original requirements.

Surface temperature and humidity readings shall be taken prior to application of each coat. The work shall not proceed if the ambient temperature parameters are outside the requirements of this specification. If more stringent, the coating manufacturer's requirement shall dictate.

The dry film thickness shall be tested with a micro test film gauge or an accepted equivalent. The testing method shall be in accordance with SSPC – PA 2.

15.00.00 **COLOUR CO-ORDINATION & FINISH**

15.01.00 Exterior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and with the surrounding landscape.

15.02.00 Interior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and which will be conducive to; the comfort, well-being and high productivity of the operators. Operating plant and services provided shall be colour coded for ease of identification.

15.03.00 All finishes shall be durable and as far as possible maintenance free. Finishes shall be easily cleaned.

15.04.00 Final colours and finishes shall be to the acceptance of the Owner.

16.00.00 **ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT**

16.01.00 **Environment Protection**

The plant shall be designed for installation and operation in harmony with the surrounding environment and all measures of pollution control shall be ensured by the Bidder to restrict pollution from the liquid effluent and stack emission within the limits as given below with due consideration of Environment (Protection) Rules 1986 as amended till date.

The Plant shall be designed meeting the latest environmental requirement issued by MoEF, GOI. In the event of Ministry of Environment & Forest stipulate any other conditions not specified hereunder, the Bidder shall comply with those requirements.

16.01.01 **Liquid Effluent Discharge**

a) Provision laid down in schedule-I for Thermal Power Plants and also in Schedule-VI. General Standards for discharge of Environmental pollutants Part-A: Effects of Environmental (protection) Rules 1986, as amended till date.

b) Any specific requirement of State Pollution Authorities over and above the above stipulation.

16.01.02 **Air Quality Emissions**

a) Suspended Particulate Matter at chimney outlet - Maximum 30 mg/Nm^3

b) Oxides of Nitrogen (NO_x) - 100 mg/Nm^3 .

c) Sulphur di-Oxide(SO_2) - 100 mg/Nm^3

d) Mercury (Hg) - 0.03 mg/Nm^3

e) The Efflux velocity from boiler stack(s) shall not be less than 25 m/sec.

g) Outlet dust emission level of bag filter installed in AHP and CHP shall be restricted to 30 mg/NM^3.

h) For The Coal Handling Plant, areas covered under Dry Fog Dust Suppression (DFDS) shall be designed to control the dust emission level in the working area measured at distance of 2m from the dust generation sources, over and above the atmosphere background dust level to shall be within 5 mg/NM3

The Bidder shall include in his scope all necessary equipment and measuring instruments to comply with above requirements. Location and accessibility of the instruments shall be properly coordinated.

16.02.00 **Noise Level Requirement**

The plant shall be designed, constructed and provided with suitable acoustic measures to ensure the noise level criteria as per the following stipulations.

a) Maximum noise level shall not exceed 85 dB (A) when measured at 1.0M away from the noise emission source.

b) Maximum noise level from its source within the premises shall not exceed 70 dB (A) as per Environment (Protection) Rules 1986, Schedule-III, `Ambient Air Quality Standards' in respect of noise.

c) Any statutory changes in stipulations regarding noise limitation that may occur in future according to State Pollution Control Board or Central pollution Control Board or Ministry of Environment & Forest regulation during tenure of the contract, the Successful Bidder shall comply with the requirement.

17.00.00 **INSPECTION AND TESTING**

17.01.00 Inspection and Tests during Manufacture

17.01.01 The method and techniques to be used by the Successful Bidder for the control of quality during manufacture of all plant and equipment shall be agreed with the Owner prior to the Award of Contract.

17.01.02 The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this specification.

17.01.03 Before any item of plant or equipment leaves its place of manufacture the Owner shall be given the option of witnessing inspections and tests for compliance with the specification and related standards.

17.01.04 Advance notice shall be given to the Owner as agreed in the Contract, prior to the stage of manufacture being reached, and the piece of plant must be held at this stage until the Owner has inspected the piece, or has advised in writing that inspection is waived. If having consulted the Owner and given reasonable notice in writing of the date on which the piece of plant will be available for inspection, the Owner does not attend the Successful Bidder may proceed with manufacture having forwarded to the Owner duly certified copies of his own inspection and test results.

The Successful Bidder shall forthwith forward to the Owner's Engineer duly certified copies of the Test Certificates in Three (3) copies for approval.

17.01.05 Under no circumstances any repair or welding of castings be carried out without the consent of the Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer.

17.01.06 All the individual and assembled rotating parts shall be statically and dynamically balanced in the works.

Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Successful Bidder shall allow for trial assembly prior to dispatch from place of manufacture.

17.01.07 All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the Purchaser. The certificates shall include tests for mechanical properties and chemical analysis of representative material.

17.01.08 All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than one hour.

17.01.09 All necessary non-destructive examinations shall be performed to meet the applicable code requirements.

17.01.10 All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination magnuflux and ultrasonic testing shall be employed wherever necessary/ recommended by the applicable code. At least 10% of all major butt welding joints shall be radiographed. Statutory payments in respect of IBR approvals including inspection shall be made by the Successful Bidder. Successful Bidder's scope and responsibility shall also include preparation of all necessary documents in the specific formats stipulated by the statutory bodies, coordination and follow up for above approvals.

17.02.00 **Performance Tests at Site**

17.02.01 The full requirements for testing the system shall be agreed between the Owner and the Bidder prior to Award of Contract. The completely erected System shall be tested by the Successful Bidder on site under normal operating conditions. The Successful Bidder shall also ensure the correct performance of the System under abnormal conditions, i.e. the correct working of the various emergency and safety devices, interlocks, etc.

17.02.02 The Bidder shall provide complete details of his normal procedures for testing, for the quality of erection and for the performance of the erected plant. These tests shall include site pressure test on all erected pipe work to demonstrate the quality of the piping and the adequacy of joints made at site.

17.02.03 The Successful Bidder shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection, pre-commissioning to tests on completion and commissioning of the complete system/equipment.

17.03.00 For details of specific tests required on individual equipment refers to respective section of this specification.

18.00.00 TRAINING OF OWNER'S PERSONNEL

The Successful Bidder shall extend all possible assistance and co-operation to the Purchaser regarding the transfer of technology and developing expertise in the area of engineering operation and maintenance of the Plant.

Number of man-days of training as mentioned below shall be included in his Tender.

18.01.00 Training at Successful Bidder's Premises

The Successful Bidder shall conduct training of Sixty Five (65) engineers of the Purchaser on engineering, operation and maintenance of the Plant at the Successful Bidder's or Associates or Sub Vendor's premises where adequate training facilities are available during the design and manufacturing stage of the successful Bidder.

The total man-months for training of engineers shall be maximum sixty (60), having following indicative break-up:

Discipline	No. of Engineers	No. of Man-month
Operation	25 heads	25
Maintenance Boiler, Turbine,	25 heads	25
Electrical Maintenance	5 heads	5
Control & Instrumentation	10 heads	5
	65 heads	60

However, the details of the training programme will be discussed and finalised with the successful Bidder.

The training may also be arranged by the Successful Bidder in any Plant where the equipment manufactured by the Successful Bidder or his Associates is under installation, operation or testing to enable the trainees to become familiar with the equipment being furnished by the Successful Bidder. All expenses inherently related to the training shall be borne by the Successful Bidder and shall include but not limited to travel expenses in case of off-shore training (international and inland fares), lodging and per diem charges as well as medical insurance, instructors fee, programme and miscellaneous cost to be incurred during the training.

The training programme shall be adequate for the trainees to acquire the necessary expertise and competence in the area of engineering, operation and maintenance and as trainers for in-house technology transfer programme of the Purchaser.

The Successful Bidder shall be responsible for the development of the Training Module and Programme Schedule, which shall be submitted to the Purchaser for approval.

The components of the training modules shall include but not be limited to the training procedures/methodology, instructional materials such as audio visual materials, CDs and slides and manuals for each trainee.

Three (3) sets of the materials included in the training modules shall be handed over to the Purchaser upon completion of the training. An evaluation shall be jointly undertaken by the Successful Bidder and the Purchaser's representative on the adequacy, appropriateness and relevance of the training and the programme effectiveness after the training. The training material shall be in English language only.

The content of the training programme shall include but not be limited to :

1. Coal fired thermal plant principles in management and practice for operators, technicians and maintenance personnel.

2. Plant operation and systems training for operators including simulator training as applicable.

3. Maintenance training programme covering electrical, mechanical and instrumentation and control.

Said training programme shall be submitted to the Purchaser for approval.

The timing of the training should be such that the participants will be conversant with sufficient know-how to participate in the pre-commissioning and commissioning tests of the Plant.

The Successful Bidder shall provide qualified English speaking instructors and training coordinator(s) during the tenure of the training programme.

18.02.00 **Operation and Maintenance Training at Site**

The Successful Bidder shall provide a comprehensive training programme related to design application, plant management, operation and maintenance, including trouble shooting, of the Successful Bidder's supplied system and equipment at the Site starting from Start of Commissioning and thereafter up to the Final hand over of the Unit..

The following instructors shall be at the Site continuously during the training :

a) One (1) for Steam Generator and Auxiliaries

b) One (1) for Turbine Generator and Auxiliaries

c) One (1) for Electrical Works

d) One (1) for Instrumentation and Control (Boiler and Auxiliaries)

e) One (1) for Instrumentation and Control (Turbine and Auxiliaries)

18.03.00 **On-the-Job Training**

During the period of pre-commissioning, commissioning and trial operation, the Purchaser shall provide operation and maintenance personnel to assist the Successful Bidder in the operation and maintenance of his supply and work under the direction of the Successful Bidder for the purpose of on-the-job training.

The Purchaser shall have the right to send to the Site his employees later intended to operate and maintain the equipment supplied under this Contract. The successful Bidder shall, without additional cost, use his site staff to instruct these employees on the operation and maintenance of the equipment. All instructions shall be in the English language.

ANNEXURE-I

LIST OF STANDARDS FOR REFERENCE

a) International Standards Organisation (ISO).

b) International Electro-technical Commission (IEC).

c) American Society of Mechanical Engineers (ASME).

d) American National Standards Institute (ANSI).

e) American Society for Testing and Materials (ASTM).

f) American Institute of Steel Construction (AISC).

g) American Welding Society (AWS).

h) Architecture Institute of Japan (AIJ).

i) National Fire Protection Association (NFPA).

j) National Electrical Manufacturer's Association (NEMA).

k) Japanese Electro-technical Committee (JEC).

l) Institute of Electrical and Electronics Engineers (IEEE).

m) Federal Occupational Safety and Health Regulations (OSHA).

n) Instrument Society of America (ISA).

o) National Electric Code (NEC).

p) Heat Exchanger Institute (HEI).

q) Tubular Exchanger Manufacturer's Association (TEMA).

r) Hydraulic Institute (HIS).

s) International Electro-Technical Commission Publications.

t) Performance Test Code (PTC).

u) Applicable German Standards (DIN).

v) Applicable British Standards (BS).

w) Applicable Japanese Standards (JIS).

x) Electric Power Research Institute (EPRI).

y) Standards of Manufacturer's Standardization Society (MSS).

z) Bureau of Indian Standards Institution (BIS).

aa) Indian Electricity Rules.

bb) Indian Boiler Regulations (IBR).

cc) Indian Explosives Act.

dd) Indian Factories Act.

ee) Tariff Advisory Committee (TAC) rules.

ff) Emission regulation of Central Pollution Control Board (CPCB).

gg) Pollution Control regulations of Ministry of Environment & Forests, Govt. of India.

hh) Central Board of Irrigation and Power (CBIP) Publications.

ii) National Building Code (NBC).

jj) Indian Road Congress (IRC).

kk) Latest guidelines of Railway Authority.

ANNEXURE-II

CRITERIA FOR LAYOUT

PLOT PLAN LAYOUT REQUIREMENTS

The guidelines shall be applied in general, unless otherwise stated in other technical Volumes. In addition to these guidelines, Bidder shall refer the attached Plot Plan, drawing no. **12A05-DWG-M-003A,** for tentative arrangement of the various facilities under this package.

	ITEM	SPECIFICATION REQUIREMENT
A.	**Site conditions to be considered**	
1.	Prevalent wind direction during summer (for deciding Cooling Tower orientation)	Refer wind-rose in plot plan.
2.	Prevalent wind direction(s) during dry seasons (for deciding the location of coal stock pile and ash dump/ unloading areas, minimising the pollution effect due to dust)	Refer wind-rose in plot plan .
3.	**Location of:**	
a)	Water intake point.	Towards South.
b)	Water discharge point.	-.
c)	Plant drainage outfall point(s).	Towards East.
d)	Railway entries & exits.	Towards South.
e)	Road entries & exits.	Towards North & North-East.
f)	Electrical power transmission grid system.	Towards East.
g)	selected ash dump area.	Towards North.
h)	Nearest residential area.	Towards South.

ITEM		SPECIFICATION REQUIREMENT
B.	**Layout Requirements**	
1.	**Maximum permissible slope in**	
a)	Rail track	1 in 400
b)	Road	1 in 30
c)	Sides of unpaved embankment	1 in 2
2.	**Required road width**	
a)	Main roads	8.0 Metres with 2.5m wide shoulders on either side.
b)	Auxiliary interconnections	4.0 Metres with 1.0m wide shoulders on either side.
c)	Road to the power house unloading bay :	
	• Only for entry to the unloading bay • To pass through the unloading bay	Yes. No.
3.	**Required minimum horizontal distance between the nearest points of**	
a)	Plant boundary and the boundary of residential area	(Local municipality/factory rule)
b)	Electrical transformer and any other building/facility	As per the Tariff Advisory Committee Rules.
c)	Fire water supply installation and any building/facility subject to fire risk.	As per the Tariff Advisory Committee Rules.
d)	Inflammable liquid (fuel oil, etc.) storage & handling installation and their fencing and other buildings/facilities.	Rules of the Indian Explosive (Indian Explosives Act) and Indian Petroleum Code.
4.	**Required minimum vertical clearance**	
a)	Under pipes/cable racks at road crossings	8.0 Metres.
b)	Soil coverage over underground pipes	1.0 Metre (minimum).
c)	Pipe/Cable trench	No Trench. Pipe/Cable Racks shall be used exclusively.

	ITEM	SPECIFICATION REQUIREMENT
5.	Railway Wagon clearance	As per the rules of the Indian Railways.
6.	Minimum Clearance between any road edge and building/structure/ any fixed installation.	3 Metres.
7.	**Required level, above the local developed grade level, of**	
a)	top of all roads	150 mm.
b)	all outdoor paved areas	150 mm.
c)	Temporary storage areas, workshops, offices, residence etc. required at the time of erection work.	Yes.

BUILDING/ EQUIPMENT LAYOUT REQUIREMENTS

	ITEM	SPECIFICATION REQUIREMENT
A.	**Minimum clear space required at all working and walking areas for operating & maintenance personnel**	
1.	**Horizontal, in all directions**	
a)	Adjacent to any electrical equipment, electrical cables, running (rotating/reciprocating) equipment, safety valve or vent/drain pipe outlet, pipe/ equipment of surface temperature exceeding 60°C.	1200 mm.
b)	Adjacent to any other plant facilities (including walls/structures)	1000 mm.
2.	**Vertical (head-room clearance)**	
a)	Under any pipe/equipment surface of temperature exceeding 60°C and any electrical cables or other electrical items.	2.2 Meters.
b)	Under any other plant facilities (including structures, pipes etc.)	2.2 Meters.
3.	**For all areas** where any equipment (including trucks, trolleys and other material handling equipment) will move or maneuver.	Minimum 500 mm clear in all direction from the outer edges of the equipment.
4.	**Minimum clear hand space required for**	
a)	The application of thermal insulation	100 mm
b)	Welding work	150 mm
c)	Bolt tightening	150 mm

B. **Floors, platforms, staircase, ladders, walls, doors & windows**

1.	**Statutory Requirement**	As per the regulations of OSHA, Tariff Advisory Committee, Indian National Building Code, Indian Factories Act, Local Municipal Rules, etc.
2.	**Operation & Maintenance Requirement**	
a)	Adequate floor space shall be kept to permit dismantling, temporary storing and in-situ maintenance of plant & equipment parts, satisfying the clear space requirements stated above. A separate unloading bay for such purpose is required.	Yes
b)	Floors or fixed/portable platforms with stairs/ ladders shall be provided for easy approach to any plant item, including valves, instruments, etc. to be operated, observed and/or to be frequently (more than once a month) maintained.	Yes
3.	**Plinth level** of all buildings, above the Finished Ground Level (FGL)	300 mm. However, 500 mm for power house building.
4.	**Minimum access** opening required (with rolling shutter)	3.5 m wide x 4 m high or, more wherever entry of loaded truck is envisaged, depending upon the equipment size to be handled.

C. **Other Maintenance Requirement**

C. Other Maintenance Requirement

1.	Generator stator handling In case the Generator stator cannot be handled by the turbine house crane, all provisions for its overhauling, including the arrangement to slide the stator on the turbine house floor, the foundation work for stator jacking /lowering assembly, dismantling of building end walls/structures etc. shall be kept.	Yes

2.	Maintenance of the internals/impellers of all important equipment, like boiler feed pumps, feed water heaters, Surface Condenser, fans of the boiler draft plant, Intake and circulating water pumps, cooling water pumps, coal mills, air compressors, blowers, heat exchangers, fuel oil pumps, filters etc.	Shall be possible without disconnecting or dismantling any piping/ducting.
3.	Overhauling and handling of the casings for the above items	Shall be possible without disturbing/dismantling any piping/ducting not directly connected to them.
4.	Crane Approach	
	Wherever required the unobstructed approach of the crane hook/other hoisting equipment hook to various plant & equipment shall be possible.	Yes
D.	Central Control Room	
	All electronic equipment other than those directly associated with control, operation or presentation of displays shall be mounted external to the control room in air conditioned control equipment room.	Yes
	The bidder shall describe in his bid the proposed layout philosophy of the Central Control Room and Control Equipment Room and the arrangement of equipment best suited for the system offered by him and as per good ergonomically consideration.	
	However, as a guide line, following features are given :	
a)	False ceiling and false flooring shall be provided.	
b)	Uniform height, colouring schemes for cabinets etc. shall be available.	
c)	The total area of floor space covered by Control Consoles/Panels in the Control Room shall not exceed 15% of floor area.	
d)	No opening shall be provided from Boiler side.	
e)	Two double leaf doors, suitably located for entering the Control room shall be provided with opening towards the turbine floor.	

f) Cable entry for the panels/consoles shall be from bottom and suitable openings shall be provided.

g) The Control Room lighting shall be designed to provide a glare free uniform illumination. The level of illumination shall be minimum 400 LUX.

h) Necessary Air Conditioning shall be provided for Central Control room, Control Equipment Room and SWAS room etc.

i) Basic amenities like toilet, Tiffin rooms, wash basins, rest rooms etc. shall be provided near the Control Room.

D. **Toilet and drinking water facility**

Required in all buildings and on all floors wherever operating personnel are to be deployed.

SECTION -IA

QUALITY ASSURANCE PLAN

	MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO: PE-TS-XXX-567-A001	DATE:XXXX
		CUSTOMER:		QP NO.: PE-QAP-XXX-567-A001	DATE: 5.5.2020
		PROJECT:		PO NO.: LATER	DATE: XXXX
		ITEM: LUBE OIL PUMP	SYSTEM:	SECTION:	SHEET 1 OF 4

SL NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			10
1.0	RAW MATERIAL & BOUGHT OUT ITEMS													
1.1	PUMP CASING	PHYSICAL AND CHEMCIAL PROPERTIES	MA	LAB TEST	100%		APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V	-	
1.2	END COVER	PHYSICAL AND CHEMCIAL PROPERTIES	MA	LAB TEST	100%		APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V	-	
1.3	SHAFT	PHYSICAL AND CHEMCIAL PROPERTIES	MA	LAB TEST	100%		APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V	-	
		INTERNAL DEFECTS	MA	UT	100%		ASTM-E 388 100% BACK WELL ECHO	FALL IN BACK ECHO 20% ,MAX DEFECT ECHO M20% MAX B.W.E	UT REPORT	√	P	V	-	
		HARDNESS	MA	HARDNESS	100%		APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V	-	
1.4	GEARS (DRIVING AND DRIVEN)	PHYSICAL AND CHEMCIAL PROPERTIES	MA	LAB TEST	100%		APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V	-	
		HEAT TREATMENT	MA	HEAT TREATMENT	100%		APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	HT CHART	√	P	V	-	
		INTERNAL DEFECTS	MA	UT	100%		ASTM-E 388 100% BACK WELL ECHO	FALL IN BACK ECHO 20% ,MAX DEFECT ECHO M20% MAX B.W.E	UT REPORT	√	P	V	-	
		HARDNESS	MA	HARDNESS	100%		APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V	-	
1.5	RELIEF VALVE BODY	PHYSICAL AND CHEMCIAL PROPERTIES	MA	LAB TEST	100%		APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V	-	
1.6	FLANGES(COMPANION)	PHYSICAL AND CHEMCIAL PROPERTIES	MA	LAB TEST	100%		APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V	-	
1.7	BEARINGS, OIL SEALS, MEACHANICAL	MAKE, SIZE , BEARING NUMBER,FINISH,FITMENT	MA	VISUAL,FITMENT	100%		MANUFACTURING DRAWING	MANUFACTURING DRAWING	COC	√	P	V	-	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	S.K. Yadav		Checked by:		Ashish Panigrahi
Reviewed by:	Sayan Roy		Reviewed by:		R K Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	STANDARD QUALITY PLAN	SPEC. NO: PE-TS-XXX-567-A001	DATE:XXXX
	CUSTOMER:	QP NO.: PE-QAP-XXX-567-A001	DATE: 5.5.2020
	PROJECT:	PO NO.: LATER	DATE: XXXX
	ITEM: LUBE OIL PUMP	SYSTEM:	SECTION: SHEET 2 OF 4

SL NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			10
	SEALS													
1.8	ELECTRIC MOTOR	REVIEW OF ROUTNE TEST CERTIFICATE	MA	REVIEW	100%	100%	IS 325 /IEC -34 FOR EXPORT MOTOR	APPROVED DRAWING/DATA SHEET	ROUTINE TEST REPORT	√	P	V	-	
2.0	**IN PROCESS INSPECTION**													
2.1	**ALL COMPONENT**	WORKMANSHIP & FINISH	MA	VISUAL/MEASUREMENT	100%		MANUFACTURING DRAWING	MANUFACTURING DRAWING	IR	√	P	V	-	
		DIMENSIONS	MA	VISUAL/MEASUREMENT	100%		MANUFACTURING DRAWING	MANUFACTURING DRAWING	IR	√	P	V	-	
2.2	**PUMP CASING, COVERS,RELIEF VALVES HOUSING & CURING OF PUMP CASING GASKETS**	LEAK TIGHTNESS	CR	HYDRO TEST AT 2X MAXIMUM ALLOWABLE WORKING PRESSURE FOR 30 MINUTES	100%	100%	APPROVED DRAWING/DATA SHEET	NO LEAKAGE	IR	√	P	W	-	
2.3	**GEARS/SCREW & SHAFT**	INTERNAL DEFECTS	MA	DPT	100%		ASTM E 165	NO DEFECTS	IR	√	P	V	-	
2.4	**GEARS/SCREW - INDUCTION HARDENING**	HARDNESS	MA	HARDNESS MEASUREMENT	100%		APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V	-	
3.0	**SUB-ASSEMBLY /ASSEMBLY CONTROL/FINAL INSPECTION AND TESTING**													
3.1	**ROTOR ASSEMBLY**	STATIC RESIDUAL DYNAMIC BALANCING	CR	STATIC RESIDUAL DYNAMIC BALANCING	100%		ISO -1940 GR 6.3	ISO -1940 GR 6.3	IR	√	P	V	-	
3.2	**PUMP ASSEMBLY**	COMPLETENESS	MA	VISUAL,MEASUREMENT	100%		APPROVED GA DRAWING	MANUFACTURING DRAWING	IR	√	P	V	-	
3.3	**COMPLETE PUMP WITH JOB MOTOR**	1. PERFORMANCE H V/S Q, H V/S p, PH VS PUMP EFFICIENCY	CR	PERFORMANCE TEST	100%	100%	HYDRAULIC INSTITUTE STANDARD OF USA	HYDRAULIC INSTITUTE STANDARD OF USA	TEST REPORT	√	P	W	-	PUMP TO BE TESTED WITH OIL OF VISCOSITY CLOSEST TO THE LUBE OIL

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	S.K. Yadav		Checked by:		Ashish Panigrahi
Reviewed by:	Sayan Roy		Reviewed by:		R K Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	STANDARD QUALITY PLAN													SPEC. NO: PE-TS-XXX-567-A001	DATE:XXXX
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		PROJECT:													PO NO.: LATER	DATE: XXXX
		ITEM: LUBE OIL PUMP					SYSTEM:							SECTION:	SHEET 3 OF 4	

SL NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			10
					M	C/N				D	M	C	N	
	AND STRAINER													@RATES VISCOSITY FOR PRESSURE @LOWEST VISCOSITY FOR CAPACITY @ HEIGHESTVISCOSITY FOR POWER
		VIBRATION/NOISE	MA	MEASUREMENT	100%	100%	APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	TEST REPORT	√	P	W	-	
		RELIEF VALVE SET PRESSURE	MA		100%	100%	APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	TEST REPORT	√	P	W	-	
		LEAKAGE	MA	LEAK TEST	100%	100%	APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	TEST REPORT	√	P	W	-	
		TEMPERATURE	MA	MEASUREMENT	100%	100%	APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	TEST REPORT	√	P	W	-	
		OVERALL DIMENTIONS	MA	MEASUREMENT	100%	100%	APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	TEST REPORT	√	P	W	-	
		ORENTATION	MA	MEASUREMENT	100%	100%	APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	TEST REPORT	√	P	W	-	
		STRIP TEST	CR	VISUAL	100%	100%	NO VISIBLE DAMAGE	NO VISIBLE DAMAGE	TEST REPORT	√	P	W	-	
3.4	CLEANING , PROTECTION , PAINTING & PACKING	ACTVITY COMPLIANCE	MI	VISUAL	100%		TECHNICAL /MFG SPEC FOR PACKING,APPROVED DRAWING FOR CLEANING PROTECTION AND PAINTING	TECHNICAL /MFG SPEC FOR PACKING,APPROVED DRAWING FOR CLEANING PROTECTION AND PAINTING	IR	√	P	V	-	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	S.K. Yadav		Checked by:		Ashish Panigrahi
Reviewed by:	Sayan Roy		Reviewed by:		R K Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Approved by:			

	MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	STANDARD QUALITY PLAN								SPEC. NO: PE-TS-XXX-567-A001		DATE:XXXX
		CUSTOMER:								QP NO.: PE-QAP-XXX-567-A001		DATE: 5.5.2020
		PROJECT:								PO NO.: LATER		DATE: XXXX
		ITEM: LUBE OIL PUMP			SYSTEM:					SECTION:	SHEET 4 OF 4	

SL NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			10
					M	C/N				D	M	C	N	

NOTES:

1. In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed/verified by supplier's TPI.
2. Following to be noted for packing:
   a. Material shall be packed suitably in order to avoid damage of paint and valve during transit and also during storage at site in tropical climate conditions for a period of 15-18 months.
   b. Photographs of the packing just before dispatch for information of PEM.
3. The latest revisions/year of issue of all the standard indicated in the QP shall be referred.
4. Project specific QP will be prepared based on customer requirement.
5. BHEL reserves the right for conducting repeat test, if required.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N**: CUSTOMER,
P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE, **D**: DOCUMENTATION
MA: MAJOR, **MI**: MINOR**, CR:** CRITICAL, **MTC:** Mill Test Certificate, **RT:** Radiographic Test, **PT**: Penetrant Test

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	S.K. Yadav		Checked by:		Ashish Panigrahi
Reviewed by:	Sayan Roy		Reviewed by:		R K Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-XXX-567-A001	DATE:xx.xx.xxxx
	CUSTOMER :		QP NO.: PE-QAP-XXX-567-A001(S)	DATE: 5.5.2020
	PROJECT:		PO NO.:LATER	DATE: xx.xx.xxxx
	ITEM: BASKET DUPLEX STRAINER	SYSTEM: LUBE OIL PUMPS	SECTION:	SHEET 1 OF 3

SL NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/ N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			
1.0	RAW MATERIAL & BOUGHT OUT ITEMS													
1.1	STRAINER BODY , FLANGE BOTTOM PLATE, TOP COVER	PHYSICAL AND CHEMCIAL PROPERTIES	MA	LAB TEST	100%	--	APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V		
1.2	3 WAY VALVE HOUSING CASTING, BACKING PLATE	PHYSICAL AND CHEMCIAL PROPERTIES	MA	LAB TEST	100%	--	APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V		
1.3	SCREEN	CHEMCIAL PROPERTIES	MA	LAB TEST	100%	--	APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	LAB REPORT	√	P	V		
2.0	IN PROCESS CONTROL													
2.1	WELDING PROCEDURE	CORRECTNESS /WELDING PARAMETERS	MA	REVIEW	100%	--	ASME SEC IX	ASME SEC IX	QW 482	√	P	V		
2.2	PQR & WELDERS QUALIFICATION	WELD SOUNDNESS	MA	PHYSICAL TEST/RT	100%	---	APPRVED WPS/APPROVED DWG	APPROVED WPS	QW 482	√	P	V		
2.3	WELD FIT UPS	DIMENSIONS & ALIGNMENT ORIENION	MA	MEASUREMENT VISUAL	100%	--	APPROVED DRAWINGS	APPROVED DRAWINGS	IR	√	P	V		
2.4	WELDMENTS -ROOT & FINAL RUN(AS APPLICABLE)	WELD DEFECTS	MA	PANETRATION TEST	100%	--	ASME E 165	NO DEFECT	IR	√	P	V		
2.5	ASSEMBLY OF INTERNAL BASKET	DIMENSION & FITTING OF INTERNAL	MA	VISUAL & PROPERFITMENT	100%	--	APPROVED DRAWING/DATA SHEET	APPROVED DRAWING/DATA SHEET	IR	√	P	V		
3.0	FINAL INSPECTION AND TESTING													
3.1		COMPLETENESS,	MA	VISUAL &	100%	--	APPROVED	APPROVED	IR	√	P	V		

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		S K Yadav	Checked by:		Ashish Panigrahi
Reviewed by:		Sayan Roy	Reviewed by:		R K Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-XXX-567-A001	DATE:xx.xx.xxxx
	CUSTOMER :		QP NO.: PE-QAP-XXX-567-A001(S)	DATE: 5.5.2020
	PROJECT:		PO NO.:LATER	DATE: xx.xx.xxxx
	ITEM: BASKET DUPLEX STRAINER	SYSTEM: LUBE OIL PUMPS	SECTION:	SHEET 2 OF 3

SL NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY **			REMARKS
					M	C/ N				D	M	C	N	
1	2	3	4	5	6		7	8	9					
		CLEALINESS, DIMENSION OF SCRFEN & OTHER PARTS		MEASUREMENT			DRAWING/DATA SHEET	DRAWING/DATA SHEET						
		LEAK TIGHTNESS	MA	HYDRO TEST AT 1.5 TIMES THE DESIGN PRESSURE ; HOLDING TIME 30 MINUTES	100%	--	APPROVED DRAWING/DATA SHEET	NO LEAKAE	IR	√	P	V		
		FLOW V/S PRESSURE DROP TEST	MA	MEASUREMENT VISUAL	ONE/TYPE/ SET		APPROVED DRAWING/DATA SHEET	NO LEAKAE	IR	√	P	V		
3.2	CLEANING , PROTECTION , PAINTING & PACKING	ACTVITY COMPLIANCE	MI	VISUAL	100%	--	TECHNICAL /MFG SPEC FOR PACKING,APPR DRAWING FOR CLEANING PROTECTION AND PAINTING	TECHNICAL /MFG SPEC FOR PACKING,APPR DRAWING FOR CLEANING PROTECTION AND PAINTING	IR	√	P	V		

NOTES:

1. In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed/verified by supplier's TPI.
2. Following to be noted for packing:
   a. Material shall be packed suitably in order to avoid damage of paint and valve during transit and also during storage at site in tropical climate conditions for a period of 15-18 months.
   b. Photographs of the packing just before dispatch for information of PEM.
   c. The latest revisions/year of issue of all the standard indicated in the QP shall be referred.

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		S K Yadav	Checked by:		Ashish Panigrahi
Reviewed by:		Sayan Roy	Reviewed by:		R K Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-XXX-567-A001	DATE:xx.xx.xxxx
	CUSTOMER :		QP NO.: PE-QAP-XXX-567-A001(S)	DATE: 5.5.2020
	PROJECT:		PO NO.:LATER	DATE: xx.xx.xxxx
	ITEM: BASKET DUPLEX STRAINER	SYSTEM: LUBE OIL PUMPS	SECTION:	SHEET 3 OF 3

SL NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	

3. Project specific QP will be prepared based on customer requirement.
4. BHEL reserves the right for conducting repeat test, if required

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,

** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N**: CUSTOMER,

P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE

MA: MAJOR, **MI**: MINOR**, CR:** CRITICAL

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		S K Yadav	Checked by:		Ashish Panigrahi
Reviewed by:		Sayan Roy	Reviewed by:		R K Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

SECTION -IA

MASTER DRAWING LIST

DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

The successful bidder shall submit the following drawings / documents during detail engineering for approval / information / reference (as the case may be): -

Sl. No.	BHEL Drawing / Document No.	Title	Schedule Date	Resubmission after incorporating comments
1	PE-V0-445-567-A001	Data sheet & GA of LOP	4 weeks from LOI	Within 1 week
2	PE-V0-445-567-A002	Data sheet & GA of Strainer	4 weeks from LOI	Within 1 week
3	PE-V0-445-567-A003	Data sheet & GA of lube oil pump motor	4 weeks from LOI	Within 1 week
4	PE-V0-445-567-A004	QAP of Lube oil pump and strainer	4 weeks from LOI	Within 1 week
5	PE-V0-445-567-A005	O & M Manual of lube oil pumps	8 weeks from LOI	Within 1 week

NOTE: Drg. / Document shall be uploaded by the successful bidder on WRENCH /DMS. Procedure for the same will be informed after award of contract.

COMPANY SEAL

SIGNATURE: _____

NAME : _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

SECTION -IA

LIST OF MAKES OF SUB-VENDOR ITEMS

	TECHNICAL SPECIFICATION FOR LUBE OIL TRANSFER PUMPS SUB-VENDOR LIST	SPECIFICATION NO. PE-TS-445-567-A001	
			SECTION IA
		REVISION 00	DATE: 07.03.2022
		LIST OF MAKES OF SUB-VENDOR ITEMS	

SUB-VENDORS - LUBE OIL TRANSFER PUMPS					
S. NO	**CATEGORY OF INSPECTION**	**ITEM**	**SUB-VENDORS**	**PLACE**	**REMARKS**
1	II	LUBE OIL TRANSFER PUMPS	UT PUMPS & SYSTEMS LTD.	FARIDABAD	
	II		MATZ PUMPS PVT. LTD.	AHMEDABAD	
	II		DELTA PD PUMPS PVT LTD	MUMBAI	
	II		TUSHACO PUMPS PVT.LTD.	NEW DELHI	
2	II	SIMPLEX STRAINERS	JAYPEE INDUSTRIES PVT. LTD.	NEW DELHI	
	II		MULTITEX FILTRATION ENGINEERS LIMITED,	NEW DELHI	
	II		OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI	
	II		BHATIA ENGINEERING CO.	NEW DELHI	
	II		FILTERATION ENGINEERS (I) PVT. LTD.	MUMBAI	
	II		SUNGOV ENGINEERING PVT. LTD.	CHENNAI	
	II		GRAND PRIX	FARIDABAD	
	II		SAROJINI ENTERPRISE	HOWRA	
	II		TUSHACO PUMPS PVT LIMITED	NEW DELHI	SELF MAKE- SUPPLIED IN DADRI
	II		RELIABLE ENGINEERS		SUBSIDIARY OF MATZ PUMP: SUPPLY STRAINER IN ALL PROJECT. ONLY FOR LOP
2	II	DUPLEX STRAINERS	JAYPEE INDUSTRIES PVT. LTD.	NEW DELHI	
	II		MULTITEX FILTRATION ENGINEERS LIMITED,	NEW DELHI	
	II		OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI	
	II		SUNGOV ENGINEERING PVT. LTD.	CHENNAI	
	II		GRAND PRIX	FARIDABAD	
	II		TUSHACO PUMPS PVT LIMITED	NEW DELHI	SELF MAKE- SUPPLIED IN DADRI
	II		RELIABLE ENGINEERS		SUBSIDIARY OF MATZ PUMP: SUPPLY STRAINER IN ALL PROJECT. ONLY FOR LOP
3	III	MOTORS	CROMPTON GREAVES LIMITED	AHMEDNAGAR	
	III		KIRLOSKAR ELECTRIC COMPANY	BANGALORE / HUBLI	
	III		SIEMENS	MUMBAI	
	III		ABB	BANGALORE / FARADABAD	
	III		BHARAT BIJLEE	MUMBAI	
	III		JYOTI	VADODARA	
	III		MARATHON	KOLKATA	
	III		Bharat Electric (BHEL)		

	III		LHP	SOLAPUR	
4	III	PAINT	ASIAN PAINT		
	III		BERGER		
	III		KANSAI NEROLAC		
	III		JOTUN		
	III		SHALIMAR		
	III		JENSON & NICHOLSON (I) LTD		
	III		CDC CARBOLINE (I) LTD.		
	III		ADDISON PAINTS LTD		
	III		GRAND POLYCOAT		
	III		BOMBAY PAINTS		
	III		HEMPLE PAINTS (SINGAPORE)		
	III		AKZONOBEL COATINGS		

	NOTES	INSPECTION CATEGORIZATION
	1	CAT I :INSPECTION BY OWNER, BHEL/BHEL NOMINATED TPIA & VENDOR .MDCC WILL BE ISSUED BASED ON INSPECTION REPORT IN LINE ITH APPROVED QAP.
	2	CAT II: INSPECTION BY BHEL/BHEL NOMINATED TPIA & VENDOR. MDCC WILL BE ISSUED BASED ON INSPECTION REPORT IN LINE ITH APPROVED QAP.
	3	CAT III: MDCC WILL BE ISSUSED BASED COC & MTC ISSUSD BY VENDOR AND VERIFICATION BY BHEL/OWNER IN LINE WITH APPROVED QAP/CHECK LIST

The make of Sub-vendor items shall be generally as indicated above which is subject to customer / BHEL approval during detail engineering.

Make of any unlisted items shall be subject to customer / BHEL approval during detail engineering. For such items, bidder to furnish list of sub-vendors during detail engineering stage for Customer / BHEL's review and approval. Bidder shall furnish following supporting documentation within 1 month of placement of LOI. Thereafter no request for additional sub-vendor shall be entertained.

a) Documentation to show that the equipment /system has been supplied for a plant of similar or higher capacity.

b) Documentation in the form of certificate that the equipment/system has been operating satisfactorily for two years as on the scheduled date of bid opening.

The successful bidder will get the makes of all items approved from Customer/ Consultant during detail engineering within two months of placement of LOI. The complete list will be necessarily be submitted within one month of placement of LOI to ensure timely placement of order for BOIs

Bidder to assess the capability of their proposed sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them.

Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structural, flanges; counter flanges etc. from approved sub vendor only.

SUB-VENDOR LIST FOR ELECTRICAL ITEMS

ITEM DESCRIPTION	SL NO.	VENDOR NAME
CABLE GLANDS	1	ALLIED TRADERS & EXPORTERS
	2	ARUP ENGG & FOUNDARY WORKS
	3	BALIGA LIGHTING EQPT.PVT.LTD.
	4	COMMET BRASS PRODUCTS
	5	DOWELLS
	6	ELECTROMAC INDUSTRIES
	7	INCAB
CABLE LUGS	1	DOWELLS
	2	UNIVERSAL MACHINES LTD.
LV MOTORS (NON FLAME PROOF)	1	ABB
	2	BHARAT BIJLEE LTD.
	3	CROMPTON GREAVES
	4	GE-POWER
	5	KIRLOSKAR ELECTRIC CO LTD.
	6	LAXMI HYDRAULICS PVT. LTD
	7	MARATHON
	8	NGEF
	9	RAJINDRA ELECT INDUSTRIES
	10	SIEMENS

SECTION -IA

LIST OF MANDATORY SPARES

Sl. No.	Equipment/Package Name	Quantity to be supplied for the Package	Bidder Remarks	Final Resolution
(i)	Motor of each type and rating (Note : motors covered in mechanical spare items need not to be included here again) 10% of the installed quantity or minimum 1 number whichever be higher	10% of the installed quantity or minimum 1 number whichever be higher		Bidder to comply specification requirement.
(ii)	End Shield Cover Driving & Non-Driving End	1 set for each type and rating of Motor		
(iii)	Heaters	2 sets for each type and rating of motor		Bidder to comply specification requirement
(iv)	Bearings (DE and NDE) for each type and rating of motor	2 sets		
(v)	Cooling Fan for all type and rating of LT motors	One (1) set		
(vi)	Dust seals and gaskets for each type of motors	1 Set		
(vii)	Motor Terminal Block	1 no. for each type and rating of Motor		
(viii)	Complete Set of Coupling	1 set for each type and rating		
7.21.04	DC Motor			Bidder to comply specification requirement
(i)	Motor of each type and rating (Note : motors covered in mechanical spare items need not to be included here again)	10% of the installed quantity or minimum 1 number whichever be higher		Bidder to comply specification requirement
(ii)	Carbon brushes	2 sets for each type and rating of Motor		

SECTION -IA

PAINTING SPECIFICATION

SECTION-XI

PROTECTIVE COATING AND PAINTING

CONTENTS

SECTION-XI

PROTECTIVE COATING AND PAINTING

1.00.00 INTENT OF SPECIFICATION

1.01.00 This specification addresses the requirements of all labour, material, and appliances necessary with reference to preparations for lining / painting, application as well as finishing of all lining / painting for all mechanical and electrical equipment, piping and valves, structures etc. included under the scope of this Package.

1.02.00 The Bidder shall furnish and apply all lining, primers including wash primers if required, under-coats, finish coats and colour bands as described hereinafter or necessary to complete the work in all respects.

2.00.00 CODES & STANDARDS

2.01.00 The Bidder shall follow relevant Indian and International Standards wherever applicable in cleaning of surface, selection of lining material / paints and their application. The entire work shall conform to the following standards / specifications (latest revision or as specified).

a)	SSPC SP 10 / NACE 2 / Sa2½	:	Near White Blast Cleaning
b)	SSPC PA 2	:	Measurement of dry film coating thickness with magnetic gauges.
c)	ASTM D 45	:	Method for pull off strength using portable Adhesion Tester.
d)	NACE RP 0274 – 2004	:	High-Voltage Electrical Inspection of Pipeline Coatings.
e)	NACE SP 0188 – 2006	:	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
f)	NACE RP 0169 – 2002	:	Control of External Corrosion of Underground or Submerged Metallic Piping Systems.
g)	AWWA C 210 – 2007	:	Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
h)	IS 3589:2001 Annexure-B	:	Steel Pipes for Water and Sewage Specification.
i)	AWWA C222-2000	:	Polyurethane Coating for the Interior and Exterior of Steel Water Pipe and Fittings.

j)	IS 13213 : 2000	:	Polyurethane Full Gloss Enamel (Two pack)
k)	ISC HD 20 (11902)	:	Polyurethane coating for Interior and Exterior of steel pipe and fittings.
l)	ISC HD 20 (11055)	:	Solvent less Liquid epoxy system by application of Interior and Exterior surface of steel pipeline.

3.00.00 **GENERAL REQUIREMENTS**

3.01.00 The steel surface preparation prior to actual commencement of coating shall conform to SSPC SP 10 / NACE 2 / Sa2½ (near white metal) with sand blasting.

3.02.00 The contractor shall submit a detailed written description in the form of a manual covering coating equipment, procedures, materials inspection test, and repair etc. to Owner/Consultant for approval.

3.03.00 The contractor shall also provide copies of test reports from NABL approved laboratory (like National Test House, Kolkata) in support of the paint/primer materials to be used shall conform to the specification requirement.

3.04.00 The contractor shall also provide certificates from paint/primer manufacturer mentioning the batch numbers, date of manufacture and shelf life etc. of the materials to be used. In addition to that Manufacturing Quality Plan (MQP) and Field Quality Plan (FQP) shall also be submitted prior to commencement of supply of material and field application.

3.05.00 Paint/coating application work at site shall be done either by paint manufacturer or by their authorized applicator. The authorized applicator shall have proper training & certification from manufacturer. Applicator shall possess all the necessary specialized equipment and manpower experienced in similar job.

3.06.00 Applied coating shall be tested for dry film thickness, holiday (electrical inspection for continuity) and adhesion as per relevant standard such as SSPC PA 2, NACE RP 0274 and ASTM D 4541.

3.07.00 If necessary, the material may be heated and applied by airless spray / plural component spray system.

3.08.00 Manufacturer's specific recommendation, if any, shall be followed during application of lining / paints.

3.09.00 In areas where there is danger of spotting automobiles or other finally finished equipment or building by wind borne particles from paint spraying, a Purchaser approved method shall be adopted.

3.10.00 The colour scheme of the entire Plant, covered under this specification shall be approved by the Purchaser in advance before application.

3.11.00 All indoor and outdoor piping, insulated as well as uninsulated will have approved colour bands painted on the pipes at conspicuous places throughout the system, as approved by Purchaser.

3.12.00 Inside surfaces of vessels / tanks shall be protected by anticorrosive paints or rubber lining as required / specified elsewhere in the specification. External surfaces of all vessels / tanks shall be protected by anti-corrosive painting.

3.13.00 For vessels / tanks requiring lining and epoxy painting all inside surface shall be blast cleaned using non-siliceous abrasive after usual wire brushing.

3.14.00 Natural rubber lining shall be provided on the inside of vessels / tanks as required / specified elsewhere in the specification, in three layers resulting in a total thickness not less than 4.5 mm.

3.15.00 Surface hardness of rubber lining shall be 65 +/- 5 deg. A (shore).

3.16.00 After the lining is completed, the vessels / tanks shall not be subjected to any prolonged exposure to direct sunlight in course of its transportation, erection etc. They shall not be stored in direct sunlight. No further lining or burning shall be carried out on the vessel, after application of the lining.

3.17.00 All lining projecting outside of the vessel shall be protected adequately from mechanical damages during shipment, handling storage etc.

3.18.00 Suitable warnings, indicating the special care that must be taken with respect to these lined vessels shall be stenciled on their outside surface with the letters at least 12 mm high.

3.19.00 All insulated piping shall have aluminium sheet jacketing.

4.00.00 EQUIPMENT, MATERIAL AND SERVICES TO BE FURNISHED BY THE BIDDER

4.01.00 After erection at site, the outside surfaces of all equipment having a shop coat shall be given further priming coat and finished coats of paint as detailed in following clauses. However, if the painting system is such that the shop coat and primer coat to be applied at site are not compatible, then shop coat has to be removed from the surface of equipment before application of primer coat with prior blasting.

All factory finished paints shall be touched up at site as required.

All uninsulated piping shall be finished with final paintings after use of proper wash primer and primer. Aluminium sheet jacketed piping need not be painted. Colour bands of Purchaser's approved shade shall however be

applied on jacketed piping near walls or partitions, at all junctions, near valves and all other places as instructed by the Purchaser. All structures shall be painted with approved paint.

4.02.00 **Surface Preparation**

4.02.01 Unless mentioned otherwise, all rust and mill scale shall be removed by blasting up to SSPC SP10/NACE2/Sa2½ level to get "near white metal" surface before applying the primer.

4.02.02 Special care shall be taken to remove grease and oil by means of suitable solvents like Trichloroethylene or Carbon Tetrachloride.

4.03.00 **Painting**

4.03.01 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves shall be as follows :

a) Surface preparation shall be done by means of sand blasting, which shall conform to SSPC SP10/NACE 2/Sa2½ Standard.

b) Primer Coat shall consist of one coat (minimum DFT of 100 microns) of epoxy resin based zinc phosphate primer.

c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 100 microns) epoxy resin based paint pigmented with Titanium Dioxide.

d) Top Coat shall consist of one coat (minimum DFT of 75 microns) of epoxy paint of approved shade and colour with glossy finish. Additional one coat (minimum DFT of 25 microns) of Finish Coat of polyurethane shall be provided.

e) Total DFT of paint system shall not be less than 300 microns.

4.03.02 Specification for application of paints for external surfaces protection of steel pipes and fittings which are buried underground / laid inside a Hume Pipe & or submerged Under Water and laid under Pipe Trenches (in road/rail/pipe or trench crossings) shall be as follows :

a) Surface preparation by means of sand blasting and shall conforms to SSPC SP10/NACE2/ Sa2½.

b) External surface of the pipe, fittings, specialties etc. handling raw water/ clarified water/filter water shall be painted with one coat of two part chemically cured polyurethane primer of min 50 micron dry film thickness followed by three or maximum four coats of two part solvent less polyurethane to build up coating of dry film thickness of 1500 micron including primer coat.

4.03.03 Specification for application of paints for internal surface protection of large diameter pipes, if any, shall be as follows :

a) Surface preparation by means of sand blasting which shall conforms to SSPC SP10/NACE2/Sa2½ standard.

b) All Internal surfaces of steel pipes, fittings, specialties etc. buried underground or located within pipe trenches shall be given epoxy coating to protect them from (except for drinking water service, where the compatible painting shall be so selected to meet relevant quality standards) corrosion.

c) Internal surface of the pipe should be coated with one coat of two part epoxy primer with not less than 50 micron DFT (dry film thickness) followed by two part polyamide cured solvent less epoxy.

d) The minimum dry film thickness (DFT) of internal lining shall be 500 micron.

4.03.04 Specification for application of paints for protection of internal surfaces of DM Water Storage Tank(s) shall be as follows :

a) Primer - One coat of epoxy primer containing high level of Zinc Phosphate anticorrosive pigment. Total Dry Film Thickness (DFT) of primer shall not be less than 125 microns.

b) Finish Paint - Three (3) coats Polyamine HB Epoxy Paint. Total Dry Film Thickness (DFT) of finish paint shall not be less than 125 microns per coat.

c) Total thickness of primer and paint should not be less than 500 microns.

4.03.05 All motors, local push button stations, cable racks, structures used for supports etc. are to be painted with acid proof paint.

4.03.06 The following surfaces shall not be painted - stainless steel, galvanized steel, aluminum, copper, brass, bronze and other nonferrous materials.

4.03.07 No painting or filler shall be applied until all repairs, hydrostatic tests and final shop inspection are completed.

4.03.08 All machined surfaces shall have two (2) coats of water repellant grease after thorough cleaning.

5.00.00 COATING PROCEDURE AND APPLICATION

5.01.00 Surface preparation :

Pipe shall be blast cleaned by sand. The cleanliness achieved prior to application shall be in accordance with the requirement of SSPC SP 10 /

NACE 2 / Sa2½ of ISO 8501 (near white metal)

a) The blast pattern or profile depth shall be 40 to 100 micron and shall be measured by dial micrometer.

b) Before sand blasting is started or during blasting or coating, temperature of the pipe surface should be more than 3°C above dew point temperature. Blast cleaned surface should be primed within 4 hours and shall be protected from rainfall or surface moisture and shall not be allowed to flash rust. If the rust occurs, the surface again to be prepared by sand blasting or wire brushing.

5.02.00 **Application of Epoxy Coating**

a) Coating shall be applied when

i) When the pipe surface temperature shall be at least 3°C above dew point temperature.

ii) The temperature of mixed coating material and the pipe at the time of application shall not be lower than 10°C or greater that
50°C.

b) Material preparation shall be in accordance with manufacturer's recommendations.

c) Application of epoxy coating system :

The epoxy coating system shall be applied as per recommendation of the manufacturer and shall be applied by airless spray / plural component spray machine. For more than one coat, the second shall be applied with the time limits as recommended by the manufacturer.

5.03.00 **Application of PU Coating**

a) PU coating shall be applied when the pipe surface temperature at least 3°C above dew point temperature (when R.H is more than 85%).

b) Material preparation and application shall be done as per manufacturer recommendation.

6.00.00 **TEST REQUIREMENTS**

6.01.00 **Measurement of dry film thickness**

Measurement of dry film thickness of coating: Coating thickness shall be in the range of ±20% and as per SSPC PA 2.

6.01.01 **Apparatus / Instrument**

The instrument used for dry film thickness may be Type 1 pull of gauges or Type 2 electronic gauges.

6.01.02 **Procedures**

a) **Number of measurements**

For 100 square feet (9.29 square meters), five (5) spots per test area (each spot is 3.8 cm) in diameter. Three gauge readings per spot (average becomes the spot measurement).

b) If the structure is less than 300 square feet, each 100 square feet should be measured.

c) If the structure is between 300 and 1000 sq ft, select 3 random 100 square feet test areas and measure.

d) For structure exceeding 1000 square feet, select 3 random 100 square feet testing areas for the first 1000 sq ft and select 1 random 100 square feet testing area for each additional 1000 square feet

e) Coating thickness Tolerance: Individual reading taken to get a representative measurement for the spot are unrestricted (usually low or high readings are discarded). Spot measurements (the average of 3 gauge readings) must be within 80% of the minimum thickness and 120% of the maximum thickness.

Area measurement must be within specified range.

6.02.00 **Electrical Inspection (Holiday) Test**

6.02.01 All the coated / lined pipes shall be tested with an approved high voltage holiday detector preferably equipped with an audio visual signaling device to indicate any faults, holes, breaks or conductive particles in the protective coating.

6.02.02 The applied output voltage of holiday detector shall have a spark discharge of thickness equal to at least twice the thickness of the coating to assure adequate inspection voltage and compensate for any variation in coating thickness. The electrode shall be passed over the coated surface at approximately half the spark discharge distance from the coated surface only one time at the rate of approximately 10 to 20m/min. The edge effect shall be ignored. Excessive voltage shall be avoided as it tends to induce holiday in the coated surface thereby giving erroneous readings.

6.02.03 While selecting test voltages, consideration should be given to the tolerance on coating thickness and voltage should be selected on the basis of maximum coating thickness likely to be encountered during testing of a particular pipe.

The testing voltage shall be calculated by using following formula. (as per NACE 0274 : 2004)

Testing Voltage V = 7900 √T ± 10 percent where T is the average coating thickness in mm.

6.02.04 Any audio visual sound or spark leads to indicate pinhole, break or conductive particle.

6.03.00 **Adhesion Pull off Test**

After holiday the coated surface is subjected to adhesion pull off test as per ASTMD 4541.

6.03.01 Apparatus / Instrument: Adhesion tester consists of three basic components:

A hand wheel, a black column containing a dragging indicator pin and scale in the middle and a base containing three legs and a pulling “Jaw” at the bottom and also dollies.

6.03.02 **Prepare the test surface**

Once test area is selected, test area shall be free of grease, oil, dirt, water. The area should be flat surfaces and large enough to accommodate the specified number of replicate test.

6.03.03 **Prepare Dolly (Test Pull Stub)**

The dolly is a round, two sided aluminium fixture. Both sides of the dolly looks same, however, one side sloped on top surface while flat on bottom surface. As the surface of the dolly is polished aluminium, roughen the same using a coarse sand paper.

6.03.04 **Select an adhesive**

Use araldite, a 100% solid epoxy adhesive. This adhesive requires at least 24 hours at room temperature to cure.

6.03.05 **Attach the dolly to the surface**

a) Using a wooden stick, apply an even layer of adhesive to the entire contact surface area of the dolly.

b) Carefully remove the excessive adhesive by using a cotton swab. Allow the adhesive to fully cure before performing the adhesion test.

c) Attach the dolly to the coated surface and gently push downward to displace any excessive adhesive.

d) Push the dolly inward against the surface, then apply tape across the head of the dolly.

6.03.06 **Adhesion Test Procedure**

a) Attach the adhesion tester to the dolly by rotating the hand wheel counter clockwise to lower the jaw of the device.

b) Slide the jaw completely under the head of the dolly. Position the three legs of the instruments so that they are sitting flat on the coated surface.

c) Slide the dragging indicator pin on the black column to zero by pushing it downward.

d) Firmly hold the base of the instrument in one hand and rotate the hand wheel clockwise to raise the jaw of the device that is attached to the head of the dolly. The dragging indicator pin will move upward on the black column as the force is increased and will hold the reading. Apply the tension using a moderate speed. Continue to increase the tension on the head of the dolly until (a) the minimum PSI/MPa/Kg/cm² required by project specification is exceeded and the test is discontinued, (b) the maximum PSI/MPa/Kg/cm² of adhesion tester has been achieved and dolly is still attached, (c) The force applied by the adhesion tester causes the dolly to dislodge.

e) Read the scale and record the adhesion value.

6.04.00 **Coating Repair**

Defective Coating shall be repaired in accordance with the following subsections.

6.04.01 **Surface Preparation**

Accessible areas of pipe requiring coating repairs shall be cleaned to remove debris and damaged coating using surface grinders or other means. The adjacent coating shall be feathered by sanding, grinding or other method. Accumulated debris shall be removed by blowing with contaminant free air or wiping with clean rags.

6.04.02 Areas not accessible for coating repair such as interior surfaces of small diameter pipe shall be reprocessed and recoated.

6.04.03 **Coating Application**

The coating system shall be applied to the prepared areas in accordance with procedure.

6.04.04 Repair Inspection:

Repaired portion shall be electrically inspected using a holiday detector.

6.05.00 **Welded Field Joints**

6.05.01 **Preparation**

The weld joints shall be cleaned so as to be free from mud, oil, grease, welding flux, weld spatter and other foreign contaminants. The cleaned metal surfaces of the weld joint shall then be blasted or abraded using rotary abrading pads. The adjacent liquid Epoxy / PU coating shall be feathered by abrading the coating surface for a distance of 25 mm.

6.05.02 **Electrical Inspection**

After curing the coating system applied to the welding joints shall be holiday tested. Any holidays indicated by the detector shall be marked with chalk to identify the area of repair.

7.00.00 **INFORMATION/DATA REQUIRED**

The Bidder shall submit complete list of paints and primers proposed, giving detail information, such as, chemical composition, drying time etc. and also unit rates for application of each type of paint along with supply shall be furnished.

SECTION -IA

DRWG/DOC DISTRIBUTION PROCEDURE

	Note: "Action 1*" will not be used for entire 1x660 MW Sagardighi Project. (Referred MOM dtd 28.01.2020)
5.3.10	After obtaining final approval either 'ACTION-1' or 'ACTION-5' in soft form, Vendor shall submit 6 (six) sets of hard Prints of such drawings and documents in the following manner: **WBPDCL corporate office: 2 Prints** **WBPDCL site office : 4 Prints** All such submissions shall be with a transmittal marked to the corresponding WBPDCL Unit coordinator. All the final and WBPDCL/DCPL approved Drawings/Documents shall also be submitted in soft form to WBPDCL Corporate Office by Vendor, post the engineering completion.
5.3.11	Revisions made shall be marked with an identifying Mark along with the Revision No. embossed on that Mark to clearly distinguish the changes made in the subsequent revisions and the reasons for those revisions shall be indicated in the drawing.
5.3.12	In case, BHEL does not agree with any specific comments, BHEL shall furnish the explanation for the same to DCPL /WBPDCL for consideration, acceptance and approval. However, acceptance of any deviation from the specification requirement shall be subjected to the approval of DCPL /WBPDCL as per the contractual provisions and may attract commercial implication as well.
5.3.13	**O&M MANUALS:** Vendor shall submit the O&M Manuals for equipment's to WBPDCL at least Three (03) months before the start of unit commissioning. The manuals shall be submitted as follows: (1 soft copy + 12 Set of Hard Copies) to be submitted to WBPDCL Sagardighi site (1 soft copy + 3 Set of Hard Copies) to be submitted at WBPDCL Corporate Office
5.3.14	**PG TEST PROCEDURE:** PG Test procedure shall be prepared and submitted at least three (03) months before the schedule of PG test to WBPDCL/DCPL for their approval. The approved procedure shall be submitted one copy in the form of CD and 6 (Six) Set in the form of hard copy. (1 soft copy + 4 Set of Hard Copies) to be submitted to WBPDCL Sagardighi site (1 soft copy + 2 Set of Hard Copies) to be submitted at WBPDCL Corporate Office
5.3.15	**SUBMISSION AND CO-ORDINATION OF ERECTION DRAWING / DOCUMENTS:** Vendor shall submit erection drawings/documents covering various equipment, plant and systems to WBPDCL at least three (03) months prior to start for erection activities of particular equipment/system. The drawings/documents shall be submitted as follows (1 soft copy + 4 Set of Hard Copies) to be submitted to WBPDCL Sagardighi site (1 soft copy + 2 Set of Hard Copies) to be submitted at WBPDCL Corporate Office If any discrepancy found on those documents by WBPDCL, further erection or commissioning shall be continued on mutual acceptance and documents shall be revised accordingly.

SECTION -IB

SPECIFIC TECHNICAL REQUIREMENT

(ELECTRICAL)

THE WEST BENGAL POWER DEVELOPMENT CORPORATION LIMITED

SAGARDIGHI THERMAL POWER PROJECT
1 x 660 MW UNIT NO. 5, PHASE – III

LUBE OIL TRANSFER PUMPS
TECHNICAL SPECIFICATION
(ELECTRICAL PORTION)

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT,
NOIDA, U.P., INDIA

CONTENTS

The requirements mentioned in Section-I shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section-II.

SPECIFIC TECHNICAL REQUIREMENT: ELECTRICAL

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

The equipment and services to be provided by bidder under this specification shall be as detailed here below but shall not be limited to the following:

a) Services and Equipment as per "Electrical Scope between BHEL and Vendor".

b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder without any extra charge shall provide the same.

c) Supply of mandatory spares as specified in the specifications of mechanical equipment's.

d) Electrical load requirement for **LUBE OIL TRANSFER PUMPS.**

e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.

f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer / BHEL approval without any commercial and delivery implications to BHEL.

g) Various drawings including GA drg, data sheet as per required format, quality plans, calculations, test reports, test certificates, operation and maintenance manuals, characteristic curves, wiring diagrams/schemes etc. shall be furnished as specified at contract stage. All documents shall be subject to customer / BHEL approval without any commercial implications to BHEL.

h) The sub-vendor list for various electrical items is subject to BHEL/Customer approval without any commercial implications.

i) Motors shall meet minimum requirement of Electric motor specification.

j) All routine tests and type tests reports as per applicable standards shall be furnished at contract stage.

k) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.

l) Cable BOQ worked out based on routing of cable listing provided by the vendor for "both end equipment in vendor's scope" shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer "Electrical Scope between BHEL and Vendor".

3.0 **DOCUMENTS TO BE SUBMITTED ALONG WITH BID**

3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical / quality assurance requirements stipulated in the form of compliance certificate/ NO deviation certificate.

3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

4.0 **LIST OF ENCLOSURES**

4.1 Electrical scope between BHEL & vendor
4.2 Load Data Format. (Annexure –II)
4.3 BHEL Cable listing format (Annexure–III) & Explanatory notes for filling up cable list
4.4 Technical specification – Specification for Electric Motors/Actuators & Cables.
4.5 Datasheets & quality plan for motors & General technical requirements for LV Motors

REV: 0 DATE: 17.03.2015

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGE: LUBE OIL TRANSFER PUMPS

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 1 X 660 MW SAGARDIGHI THERMAL POWER PROJECT UNIT NO. 5, PHASE-III

Sr. No.	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415 V MCC	BHEL	BHEL	415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motors.
3	Power cables, control cables and screened control cables	BHEL	BHEL	Incoming cable from BHEL supplied MCC will be informed by BHEL. Vendor shall provide lugs & glands accordingly.
4	Cable trays, accessories & cable trays supporting system	BHEL	BHEL	
5	Cable glands and lugs for equipments supplied by Vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
6	Conduit and conduit accessories for cabling between equipments supplied by vendor	BHEL	BHEL	
7	Equipment grounding & lightning protection	BHEL	BHEL	
8	Below grade grounding	BHEL	BHEL	
9	LT Motors with base plate and foundation hardware	Vendor	BHEL	Makes shall be subject to BHEL approval at contract stage.
10	Mandatory spares	Vendor	-	Vendor to quote as per specification.
11	Recommended O & M spares	Vendor	-	As per specification
12	Any other equipment/material/service required for completeness of system but not specified above (to ensure trouble free and efficient operation of the system).	Vendor	BHEL	
13	Electrical equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipments/items supplied shall be reputed make & shall be subject to approval of BHEL after award of contract.
2. All QPs shall be subject to approval of BHEL after award of contract without any commercial implication.

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.	VERIFICATION FROM MOTOR DATASHEET (Y/N)	KKS NO
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
ANNEXURE-II																				

NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER

2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V

: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

LOAD DATA (ELECTRICAL)	JOB NO.	445	ORIGINATING AGENCY		PEM (ELECTRICAL)
	PROJECT TITLE	SAGARDIGHI THERMAL POWER PROJECT, 1x 660 MW UNIT NO. 5, PHASE – III	NAME		DATA FILLED UP ON
	SYSTEM	LUBE OIL TRANSFER PUMPS	SIGN.		DATA ENTERED ON
	DEPTT. / SECTION	MAUX	SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE

CABLE SCHEDULE FORMAT

ANNEXURE III **Section-I**

UNITCABLENO	FROM	TO	PURPOSE	CABLE SCOPE (BHEL PEM/ VENDOR)	REMARKS	CABLESIZE	PATHCABLENO	TENTATIVE CABLE LENGTH

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

1. For the purpose of clarity, it may please be noted that the information given in regard to the cables to be routed through WinPath as per the system elaborated below is called "Cable List", while the term "Cable Schedule" applies to the cable list with routing information added after routing has been carried out.
2. The cable list shall be entered as an MS Excel file in the format as per enclosed template EXT_CAB_SCH_FORMAT.XLS. No blank lines, special characters, header, footer, lines, etc. shall be introduced in the file. No changes shall be made in the title line (first line) of the template.
3. The field properties shall be as under:
    a. UNITCABLENO: A/N, up to sixteen (16) characters; each cable shall have its own unique, unduplicated cable number. In case this rule is violated, the cable cannot be taken up for routing.
    b. FROM: A/N, up to sixty (60) characters; the "From" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    c. TO: A/N, up to sixty (60) characters; the "To" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    d. PURPOSE: A/N, up to sixty (60) characters; the purpose (i.e. power cable/ indication/ measurement, etc.) to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    e. REMARKS: A/N, up to forty (40) characters; Any information pertinent to routing to be specified here (e.g., cable number of the cable redundant to the cable number being entered). Information in excess of 40 characters will be truncated after 40 characters.
    f. CABLESIZE: A/N, 7 characters exactly as per the codes indicated below shall be specified here. The program cannot route cables described in any other way/ format.
    g. PATHCABLENO: Field reserved for utilization by the program. User shall not enter any information here.
4. One list shall be prepared for each system/ equipment (i.e., separate and unique cable lists shall be prepared for each system).
5. The cables shall be described as per the scheme listed below:

A	NN	A	NNN
|	|	|	|
Cable Voltage Code (see B below)	No. of cores (e.g. 01,03,3H, 07)	Cable code (See C below)	Cable size (e.g. 035,185,2.5, 0.5)

(A) SYSTEM VOLTAGE CODES:
(ac) A = 11KV, B = 6.6KV, C = 3.3KV, D = 415V, E = 240V, F = 110V
(dc) G = 220V, H = 110V, J = 48V, K = +24V, L = -24V

(B) CABLE VOLTAGE CODES:
A = 11KV (Power cables)

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

B = 6.6KV (Power cables)
C = 3.3KV (Power cables)
D = 1.1KV (LV & DC system power & control cables)
E = 0.6KV (0.5 sq. mm. Control cables)

(C) CABLE CODES

PVC Copper

A = Armoured FRLS	B = Armoured Non-FRLS
C = unarmoured FRLS	D = Unarmoured Non-FRLS

PVC Aluminium

E = Armoured FRLS	F = Armoured Non-FRLS
G = unarmoured FRLS	H = Unarmoured Non-FRLS

XLPE Copper

J = Armoured FRLS	K = Armoured Non-FRLS
L = unarmoured FRLS	M = Unarmoured Non-FRLS

XLPE Aluminium

N = Armoured FRLS	P = Armoured Non-FRLS
Q = unarmoured FRLS	R = Unarmoured Non-FRLS

S = FIRE SURVIVAL CABLES
T = TOUGH RUBBER SHEATH
U = OVERALL SCREENED
V = PAIRED OVERALL SCREENED
W = PAIRED INDIVIDUAL SCREENED
Y = COMPENSATING CABLES
I = PRE-FABRICATED CABLES
Z = JELLY FILLED CABLES

SECTION - II

A.C. & D.C. MOTORS

1.00.00 SCOPE

1.01.00 This specification covers the general requirements of the electric motors for plant auxiliary equipment except for special application like crane, lift, submersible pump etc., motors for which are covered in individual equipment specifications.

1.02.00 Motors shall be furnished in accordance with both this general specification and the accompanying driven equipment specification.

1.03.00 In case of any discrepancy, the driven equipment specification shall govern.

2.00.00 STANDARDS

2.01.00 All motors shall conform to the latest applicable IS, IEC and CBIP Standards/Publications except when otherwise stated herein or in the driven equipment specification.

2.02.00 Equipment and materials conforming to any other standard, which ensures equal or better quality may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

3.00.00 SERVICE CONDITIONS

3.01.00 The motors will be installed in hot, humid and tropical atmosphere, highly polluted area.

3.02.00 Unless otherwise noted, electrical equipment/system design shall be based on the service conditions and auxiliary power supply given in the annexure of this specification.

3.03.00 For motor installed outdoor and exposed to direct sun rays, the effect of solar heat shall be considered in the determination of the design ambient temperature.

4.00.00 TYPE AND RATING

4.01.00 A.C. Motors

4.01.01 Motors shall be general purpose, constant speed, squirrel cage, three/single phase, induction type.

4.01.02 All motors shall be either totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or closed air circuit air cooled (CACA) or closed air water cooled (CACW) type. Temperature rise shall be limited to 70 deg C by resistance method.

4.01.03 All motors shall be rated for continuous duty. They shall also be suitable for long period of inactivity.

4.01.04 All LT motor shall conform to minimum efficiency performance standards (MEPS) of IE2 mentioned in IS: 12615. All HT motors shall have efficiency and power factor higher than 90% and 0.83 respectively.

IE3

4.01.05 The motor name-plate rating at 50°C shall have at least 15% margin for LT system and 10% margin for HT system, over the input power requirement of the driven equipment at rated duty point and also covering the maximum load demand of the driven equipment under entire operating range, including voltage and frequency variations, unless stated otherwise in driven equipment specification or in general electrical specification.

4.01.06 The motor characteristics shall match the requirements of the driven equipment so that adequate starting, accelerating, pull up, break down and full load torques are available for the intended service. The direction of rotation of motor and its cooling fan should be properly matched with the driven equipment.

4.02.00 AC motor for VFD application (If applicable)

4.02.01 Inverter duty motors are designed according to the requirements of IEC/TS-60034 part17 & part 25 or NEMA MG-1, Part-30, Part 31 and have performance characteristics match with the driven equipment and variable speed requirement.

4.02.02 Induction motors to be operated in adjustable-speed drive applications should be de-rated as per NEMA/IEC standard due to the reduction in cooling resulting from any reduction in operating speed and the effect of additional losses introduced by harmonics generated by the control.

4.02.03 Inverter duty motors shall have VPI/improved insulation systems that do not degrade readily due to transient voltage spikes and have an adequate thermal margin.

4.02.04 Inverter duty motors shall be self ventilated without any auxiliary blower. Force ventilation shall be subject to purchaser approval.

4.02.05 Inverter motor shall be suitable for scalar (open loop) control, without any speed feedback signal, where fast response is not required. Vector (closed loop) control will be used with encoder if specified.

4.02.06 The breakdown torque at any frequency within the defined frequency range shall be not less than 150% of the rated torque at that frequency when rated voltage for that frequency is applied.

4.02.07 The motor should be capable of producing a breakaway torque of at least 140% of rated torque requiring not more than 150% rated current when the voltage boost is adjusted to develop rated flux in the motor and when the inverter is able to produce the required minimum fundamental frequencies

4.02.08 The motor shall be provided with insulated bearing on one side.

4.02.09 Normally the maximum safe speed shall be as per IEC/NEMA, however it should be coordinated with VSD requirement.

4.02.10 In case of a conflict, the requirement mentioned under clause no. 4.02.00 for motors for VFD application shall supersede the corresponding requirement for standard motors.

4.03.00 **D. C. Motors**

4.03.01 D.C. motor provided for emergency service shall be shunt wound type. It can also be of compound-wound type with the series field shorted.

4.03.02 Motor shall be sized for operation with fixed resistance starter for maximum reliability. Starter panel complete with all accessories shall be included in the scope of supply.

5.00.00 PERFORMANCE

5.01.00 **Running Requirements**

5.01.01 Motor shall run continuously at rated output over the entire range of voltage and frequency variations as given in the annexure.

5.01.02 The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals.

5.02.00 **Starting Requirements**

5.02.01 Motor shall be designed for direct on line starting at full voltage. Starting current at rated voltage for LT motors shall be 6 times of full load current plus IS tolerance. For 3.3KV and 11KV motor except BFP, starting current shall be maximum 6 times of full load current inclusive IS tolerance. For Boiler feed pump motor, starting current shall be limited to 4.5times of full load current plus IS tolerance.

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

5.02.02 The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage.

5.02.03 Motor shall start with rated load and accelerate to full speed with 80% rated voltage at motor terminals without exceeding acceptable winding temperature.

5.02.04 Motor shall be capable of three equally spread starts per hour, two starts in quick succession from cold condition and one restart from hot condition.

5.02.05 Pump motor subject to reverse rotation shall be designed to withstand the stresses encountered when starting with non-energized shaft rotating at 125% rated speed in reverse direction.

5.03.00 Stress During Bus Transfer

5.03.01 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.

5.03.02 The motor shall be designed to withstand any torsional and/or high current stresses, which may result, without experiencing any deterioration in the normal life and performance characteristics.

5.04.00 Locked Rotor Withstand Time

5.04.01 For motors with starting time upto 20 secs, starting time at minimum permissible voltage should be less than the locked rotor withstand time under hot condition at highest voltage limit by at least 2.5 secs.

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

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

5.04.02 To prevent unwanted tripping of a high inertia load at start-up, there may be need to shunt out the motor's overload trip device. Speed switches mounted on the motor shaft may be provided in such case. Heating experienced during start-up must still be considered when sizing the motor.

5.04.03 Hot thermal withstand curve shall have a margin of at least 10% over the full load current of the motor to permit relay setting utilising motor rated capacity.

5.05.00 Torque Requirements

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

5.05.02 Pull out torque at rated voltage shall not be less than 205% of full load torque.

6.00.00 SPECIFIC REQUIREMENTS

6.01.00 **Enclosure**

6.01.01 Enclosures for the motor and the cable box shall conform to the degree of protection IP-55 unless otherwise specified.

6.01.02 Motors like circulating water pumps of large output ratings, located inside a building and not directly exposed to coal dust or fly ash, could have screen protected drip proof enclosure conforming to IP-23.

6.01.03 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)

Separate Canopy shall be provided for LT motors located in outdoor or semi-outdoor area.

6.02.00 **Cooling**

6.02.01 The motor shall be self ventilated type, either totally enclosed fan cooled (TEFC) or closed air circuit air cooled (CACA).

6.02.02 For large capacity motors, totally enclosed tube ventilated (TETV) may be considered for acceptance. In case of motors rated 3000kW and above, closed air circuit water cooled (CACW) motors may be offered for consideration before proceeding with design and manufacturing.

6.03.00 **Winding and Insulation**

6.03.01 All insulated winding shall be of copper.

6.03.02 HT motors shall have Class F insulation with winding temperature limited to 120ºC. Windings shall be impregnated to make them non-hygroscopic and oil resistant. The lightning impulse and coil inter-turn insulation surge withstand level shall be as per IEC-60034 – Part 15.

6.03.03 LT motors shall have Class F or higher insulation with temperature limited to 120ºC.

6.04.00 **Tropical Protection**

6.04.01 All motors shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

6.04.02 All fittings and hardware shall be corrosion resistant.

6.05.00 **Bearings**

6.05.01 Motor rated above 1000kW shall have insulated bearings to prevent flow of shaft currents.

6.05.02 Vertical shaft motors shall be provided with thrust and guide bearings.

6.06.00 **Noise & Vibration**

6.06.01 Noise level shall not exceed 85 db (A) except for BFP motor for which the maximum limit shall be 90 db (A).

6.06.02 Peak amplitude of vibration shall be limited within the values prescribed in IS:12075 / IEC 60034-14.

6.07.00 **Motor Terminal Box**

6.07.01 Motor terminal box shall be detachable type, made of cast iron or pressed steel and located in accordance with Indian Standards clearing the motor base- plate/ foundation.

6.07.02 Terminal box shall be capable of being turned 360° in steps of 90°, unless otherwise approved.

6.07.03 Terminal box for all LT motors shall be diagonally split type and shall have the same degree of protection as motor.

6.07.04 The terminal box shall have sufficient space inside for termination /connection of suitable sized HT cables. Where the specified main cable size demands, adopter/extension box of suitable size shall be provided as a part integral to the motor, for easy termination of the cable.

6.07.05 Terminals shall be stud or lead wire type, substantially constructed and thoroughly insulated from the frame.

6.07.06 The terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor.

6.07.07 The terminal box shall be capable of withstanding maximum system fault current for a duration of 0.25 sec.

6.07.08 For HT motor, the terminal box shall be phase segregated type. The neutral leads shall be brought out in a separate terminal box (not necessarily phase segregated type) with shorting links for star connection.

6.07.09 Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands to match Owner's cable. All threads shall be ISO metric thread only.

6.07.10 The gland plate for single core cable shall be non-magnetic type.

6.08.00 **Grounding**

6.08.01 The frame of each motor shall be provided with two separate and distinct grounding pads complete with tapped hole, GI bolts and washer.

6.08.02 The grounding connection shall be suitable for accommodation of ground conductors as follows:

Motor above 90 kW	50 x 6 mm GI Flat
Motor above 30 kW upto 90 kW	35 x 6 mm GI Flat
Motor above 5 kW upto 30 kW	25 x 3 mm GI Flat
Motor upto 5 kW	8 SWG GI Wire

The above sizes shall be superseded by different sizes if so indicated in the relevant clause of the General Electrical Specification.

6.08.03 The cable terminal box shall have a separate grounding pad.

6.09.00 **Rating Plate**

In addition to the minimum information required by IS, the following information shall be shown on motor rating plate :

a. Temperature rise in ^{o}C under rated condition and method of measurement.
b. Degree of protection.
c. Bearing identification no. and recommended lubricant.
d. Location of insulated bearings.

7.00.00 ACCESSORIES

7.01.00 General

Accessories shall be furnished, as listed below, or if otherwise required by driven equipment specification or application.

7.02.00 Space Heater

7.02.01 Motor of rating 30 kW and above shall be provided with space heaters, suitably located for easy removal or replacement.

7.02.02 The space heater shall be rated 240 V, 1 phase 50 Hz and sized to maintain the motor internal temperature above dew point when the motor is idle.

7.03.00 Temperature Detectors

7.03.01 All HT motors shall be provided with minimum four (4) numbers simplex or two (2) numbers duplex platinum resistance type winding temperature detectors per phase.

7.03.02 Each bearing of HT shall be provided with minimum one (1) duplex or two (2) simplex type temperature detectors.

7.03.03 The temperature detector mentioned above shall be resistance type, 3 wire, platinum wound, 100 Ohms at 0^{o}C.

7.04.00 Indicator/Switch

7.04.01 Dial type local indicator with alarm contacts shall be provided for the following: -

a) HT motor bearing temperature.

b) Hot and cold air temperature of the closed air circuit for CACA and CACW motor.

7.04.02 Flow switches shall be provided for monitoring cooling water flow of CACW motor and oil flow of forced lubrication bearing, if used.

7.04.03 Alarm switch contact rating shall be minimum 0.5 A at 220V D.C. and 5A at 240V A.C.

7.05.00 Current Transformer for Differential Protection

7.05.01 Motor above 1000 kW shall be provided with three differential current transformers (PS class) mounted over the neutral leads within the enclosure. Matching three (3) numbers PS class CTs shall be mounted on the switchgear end.

7.05.02 The arrangement shall be such as to permit easy access for C.T. testing and replacement. Current transformer characteristics shall match Owner's requirements to be intimated later.

7.06.00 **Accessory Terminal Box**

7.06.01 All accessory equipment such as space heater, temperature detector, current transformers etc., shall be wired to and terminated in terminal boxes, separate from motor (power) terminal box.

7.06.02 Accessory terminal box shall be complete with double compression brass glands and pressure type terminals to suit owner's cable connections.

7.07.00 **Drain Plug**

Motor shall have drain plugs so located that they will drain the water, resulting from the condensation or other causes from all pockets of the motor casing.

7.08.00 **Lifting Provisions**

Motor weighing 25 kg. or more shall be provided with eye bolt or other adequate provision of lifting.

7.09.00 **Dowel Pins**

The motor shall be designed to permit easy access for drilling holes through motor feet or mounting flange for installation of dowel pins after assembling the motor and driven equipment.

7.10.00 **Painting**

Motor including fan shall be painted with corrosion proof paints. The paint shade shall be as specified in the Annexure.

8.00.00 TESTS

8.01.00 Upon completion, each HT & LT motor shall be subject to routine tests as per Schedule-C of Section -I. In addition, any special test called for in the driven equipment specification shall be performed.

8.02.00 Unless and otherwise stated, Six (6) copies of routine test certificates shall be submitted for approval prior to the despatch of the motors from works.

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

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

b) Fault level withstand test for each type of terminal box.

c) Lightning impulse withstand test on the sample coil as per IEC 60034, part-15.

d) Surge withstand test on inter-turn insulation as per clause no. 5.1.2 of IEC 60034, part-15.

8.03.04 The following type tests shall be performed on a representative sample of 11000V and 3300V motor of each type & rating, even if type test certificates of these tests are submitted by the Bidder for Purchaser's approval:

a. Measurement of stator resistance (and rotor resistance on slip ring motors).

b. No load test at rated voltage to determine voltage, current, power input and speeds.

c. Locked rotor reading of voltage, current, power input and values of torque of motor.

d. Full load test to determine efficiency, power factor and slip.

e. Temperature rise test. During heat run test, bearing temperature, Winding temperature, core temperature, coolant flow and its temperature shall be recorded. In case temperature rise test is carried at any load other than rated load, specific approval for test procedure and method has to be obtained.

f. Momentary overload test.

g. Test for noise level of motor.

9.00.00 SPARE

Recommended spares for three (3) years operation shall be quoted along with the bid clearly identifying the part numbers with recommended quantities.

10.00.00 DRAWINGS, DATA & MANUALS

Drawings, data & manuals for the motors shall be submitted as indicated below :

10.01.00 Along with the bid

a) List of the motors
b) Individual motor data sheet as per Annexures
c) Scheme & write up on forced lubrication system, if any.
d) Type test report

10.02.00 After Award of Contract for Information (I)/ Approval (A)

a) Dimensional General Arrangement drawing (I)
b) Foundation Plan & Loading (I)
c) Cable end box details.(I)
d) Space requirement for rotor removal (I)
e) Thermal withstands curves hot & cold (I)
f) Starting and speed torque characteristics at 80%, 100% & 110% voltage (A)
g) Complete motor data sheet (A)
h) Erection & Maintenance Manual (I)

ANNEXURE-A

DESIGN DATA

1.0 AUXILIARY POWER SUPPLY

Supply	Description	Consumer
H.T. Supply	11 kV, 3 Ø/, 3W, 50 Hz Non-effectively earthed Fault level 40 KA symm. for 3 second.	Motors above 1500 kW
H.T. Supply	3.3 kV, 3 Ø/, 3W, 50 Hz Non-effectively earthed Fault level 40 KA symm. for 3 second.	Motors above 160kW upto 1500 kW.
L.T. Supply	415V, 3 Ø/, 3W, 50 Hz Effectively earthed Fault level 50 KA symm. for 1 seconds.	Motors above 200W upto 160 kW
	240V, 1 Ø/, 2W, 50 Hz Effectively earthed	Motors below 200W Lighting, space heating, A.C. control protective devices
D.C. Supply	220V, 2W, unearthed Fault level 25* KA for 1 second (Min.)	D.C. alarm, control protective devices

* However actual value shall be substantiated by the bidder through calculation.

2.0 RANGE OF VARIATION

A.C. Supply

Voltage : ±10%

Frequency : ±5%

Combined Volt & frequency : 10% (absolute sum)

D.C. Supply

Voltage : 190 to 240 Volt

3.0 Paint Shade : RAL 7032

1.0 Design ambient temperature : 50 °C

2.0 Maximum acceptable kW rating of LV motor : Up to & Including 160KW

3.0 Installation (Indoors/ Outdoors) : As required

4.0 Details of supply system

a) Rated voltage (with variation) : 415V ± 10%
b) Rated frequency (with variation) : 50 Hz (Variation: +5% TO –5%)
c) Combined voltage & freq. variation : 10% (sum of absolute values)
d) System fault level at rated voltage : 50 kA for 1 sec
e) Short time rating for terminal boxes
***** Above 90 kW up to & including 160kW (Breaker Controlled): 50 KA for 0.25 sec.
***** Rated up to & including 90 kW (Contactor Controlled): 50 KA protected by MCCB

f) LV System grounding : Solidly

5.0 Class of insulation : Class 'F', with temp rise limited to class B.

6.0 Minimum voltage for starting : 80% of rated voltage

7.0 Power cables data : Shall be given during Detailed engineering.

8.0 Earth Conductor Size & Material : Shall be given during Detailed engineering.

9.0 Space heater supply **(30KW & ABOVE)** : 240 V, 1Φ , 50 Hz

10.0 Rating up to which Single phase motor : Acceptable below 0.20 Kw

11.0 Locked rotor current
a) Limit as percentage of FLC : As per IS 12615

12.0 Makes : BHEL/ Customer approval (Package owner to take care)

13.0 Paint shade : RAL 7032

15.0 Additional tests : As per QP

14.0 Degree of protection for motor/ terminal box: IP 55

***** LT motors of continuous duty shall be energy efficient IE3 class conforming to IS-12615

15.0 TESTING REQUIREMENTS: IN LINE WITH SPECIFICATION

- **Also detailed Customer spec. for Motors is to be referred as enclosed with technical spec.**

SECTION - IV

CABLES

1.00.00 SCOPE OF SUPPLY

1.01.00 Cables shall be furnished in accordance with this specification and the following annexures :-

a. HV. Power Cables : Annexure A

b. LV. Power Cables : Annexure B

c. Control Cables : Annexure C

1.02.00 Other cables including special cables, fire survival cables if any, which are necessary as per proven engineering practice for satisfactory & trouble free operation of the entire cable system of the main plant shall also be within the scope of supply. These shall include all such cables for electrical integral with mechanical equipment systems and sub-systems.

1.03.00 Special tools and tackle.

1.04.00 All relevant drawings, data and instruction manuals.

2.00.00 CODES AND STANDARDS

2.01.00 All cable and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

2.01.01 Cable and material conforming to any other standard which ensures equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

2.01.02 The electrical installation shall meet the requirements of Indian Electricity Rules as amended upto date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

3.00.00 DESIGN CRITERIA

3.01.00 The Cables will be used for connection of power and control circuits of the auxiliary electrical systems.

3.02.00 Cables will be generally laid on ladder type trays or drawn through rigid PVC/GI /HDPE pipe/conduits or directly buried in ground depending on layout requirement.

3.03.00 For continuous operation at specified rating, maximum conductor temperature shall be limited to the permissible value as per relevant standard or this specification which one is more stringent.

3.04.00 The insulation and sheath materials shall be resistant to oil, acid and alkali and shall be tough enough to withstand mechanical stresses during handling.

3.05.00 The outer sheath of power and control cables shall have rodent and termite repulsion treatment.

3.06.00 Core identification for multicore cable shall be provided by colour coding.

3.07.00 For 3.3KV and above rating cables shall be dry cured in pressurized nitrogen atmosphere.

3.08.00 The allowable voltage drop at terminal of the connected equipment shall be maximum 2.5% at full load while choosing the conductor size and calculations shall be submitted for purchaser's approval. In case of squirrel cage induction motors, the cable size shall be so chosen that the motor terminal voltage does not fall below 80% of the rated voltage, at the time of starting.

3.09.00 Cable selection criteria

1> In cable sizing the following are to be taken into consideration.

a. Short circuit current and duration
b. Continuous current.
c. Installation conditions.
d. Voltage drop under normal running and starting condition.
e. Fault contribution of motor and expected time up to which motor contribution persists

2> Apart from above, consideration shall also be given to limit the cable to some standard sizes instead of using too many types.

3> The standard cable sizes, capacities, derating factors, etc. as given in IS will be generally followed.

a) For breaker protected circuits minimum size will be determined by short circuit rating.

b) For motor circuits the selection of size will be made ensuring that the cable shall withstand a short circuit fault directly following a second. For fuse protected circuit, the conductor size will depend on full load current subject to voltage drop not exceeding 2.5%.

4> For practical purposes, the minimum size chosen is as below:
a) Aluminium : 16 Sq. mm.
b) Copper : 2.5 Sq. mm.
All drives of small rating where terminations with 16 Sq. mm. cables are not feasible, shall have copper cable.

5> All control cables shall be 2.5 Sq. mm. copper cable.

4.00.00 SPECIFIC REQUIREMENTS

4.01.00 H.V. Power Cables

The type and quantity shall be furnished as indicated in Annexure -A

4.02.00 L.V. Power Cables

The type and quantity shall be furnished as indicated in Annexure -B

4.03.00 Control Cables

The type and quantity shall be furnished as indicated in Annexure -C

4.04.00 Separate cables for each type of following services / functions as applicable shall be used for each feeder. Same multicore cable using different services and different voltage class/grade shall not be acceptable:

a) Power.
b) Control, interlock and indication.
c) Metering and measuring.
d) Alarm and annunciation.
e) C.T. Cables.
f) V.T. Cables.

4.05.00 Double/ multi run cable termination at motor end shall be avoided.

4.06.00 Drum Length & Tolerance

The cables shall be supplied in non-returnable packing steel drum for HV power cables, wooden drums for LV power and control cables, each containing minimum 500 meters length of larger sizes of cable unless specifically asked for. For smaller sizes of cables, each drum shall contain 1000 meters length of cable. Allowable tolerance on individual drum length is ±5%.

4.07.00 Total Quantity Variation

Total supplied quantity shall not vary by more than ± 2-1/2% of total quantity for ordered length for all types of cables.

4.08.00 Non-Standard Length

Owner shall not accept any non-standard lengths of the total ordered quantity. Cable lengths shall not be less than 500 meters in any case.

4.09.00 Cable identification

Cable identification shall be provided by embossing on every meter on the outer sheath the following:

a) Manufacturer's name or trade mark

b) Voltage grade

c) Year of manufacture

d) Type of insulation, e.g. XLPE/PVC etc.

e) No. of core and size of cables.

f) Type of improved fire performance, e.g. FR/FR-LSH

g) IS number

4.10.00 Packing

4.10.01 Cables shall be supplied in non-returnable drums. The drums shall be of heavy construction. All wooden parts shall be manufactured from seasoned wood. All ferrous parts used shall be treated with suitable rust preventive finish or coating to avoid rusting during transit or storage.

4.10.02 Cable shall be wound and packed on drums in such a manner that it will be properly sealed and firmly secured to the drum. The ends of each length shall be sealed before shipment.

4.10.03 The cable drums should carry the following details in printed form:

a) Manufacturer's name or trade make

b) Type of cable & voltage grade

c) Year of manufacture

d) Type of insulation e.g. XLPE

e) No. of core and size of cables

f) Cable code

g) Length of cable on drum

h) No. of length on drum, if more than one

i) Direction of rotation, by arrow

j) Approx. gross mass.

k) IS number and ISI mark

4.11.00 Joints and Terminations

Materials of construction for a joint/termination shall perfectly match with the dielectric chemical and physical characteristics of the associated cables. The material and design concepts shall incorporate a high degree of operating compatibility between the cable and joints. The protective outer covering (jacket) used on the joints/terminations shall have the same qualities as that of the cable outer sheath in terms of ambient/operating temperature withstand capability and resistance to hazardous environments and corrosive elements.

5.00.00 TESTS

5.01.00 Shop Tests

The Cables shall be subject to shop tests in accordance relevant IS/IEC standards to prove the design and general qualities of the Cables as below: -

5.01.01 Routine tests on each drum of cables.

5.01.02 Acceptance tests on drums chosen at random on each type, size and batch for acceptance of the lot.

5.01.03 Type tests on each type of cable, size and batch inclusive of measurement of armour D.C. resistance of power cables.

5.02.00 Additional Tests

Following additional acceptance tests shall also be performed on each type of cables having outer sheath with improved fire performance (category C1, Type FR/ Category C2, Type FRLSH):

5.02.01 Oxygen index test (for both C1 & C2)

The Oxygen index shall not be less than 29

5.02.02 Temperature Index Test (for both C1 & C2)

The measured value of temperature index shall be 21 at a temperature of 250°C

5.02.03 Flame Retardance test on single cable and on bunched cables (for both C1 & C2)

After the test, there should be no visible damages on the test specimen within 300mm from its upper end.

After burning has ceased, the cables should be wiped clean and the charred or affected portion should not have reached a height exceeding 2.5 meter above the bottom edge of the burner, measured at the front and rear of the cable assembly.

5.02.04 Halogen acid gas evolution test (for category C2).

The level of HCL evolved shall not exceed 20 per cent by weight

5.02.05 Smoke density test (for category C2)

The cables shall meet the requirements of light transmission of minimum 40% after the test.

5.02.06 test for specific optical density of smoke (for category C2)
(to be considered later)

5.02.07 Test for rodent & termite repulsion property

The test shall be carried out to note the presence of rodent and termite repelling chemical in PVC compound. Normal procedure is that a few chippings of the PVC compound are slowly ignited in a porcelain dish or crucible in a muffle furnace at about 600°C. The resulting ignited ash is boiled with a little ammonium acetate solution (10%). A drop of aqueous sodium sulphide solution is placed on a thick filter paper and it is allowed to soak. The spot is touched with a drop of above extract. A black spot indicates the presence of anti-termite & rodent compound.

5.03.00 Test Witness

Tests shall be performed in presence of Owner's representative if so desired by the Owner. The Contractor shall give at least thirty (30) days' advance notice of the date when the tests are to be carried out.

5.04.00 Test Certificates

5.04.01 Certified reports of all the tests carried out at the works shall be furnished in six (6) copies for approval of the Owner.

5.04.02 Test reports shall be completed with all details and shall also contain IS specified limit values, wherever applicable, to facilitate review

5.04.03 The cables shall be dispatched from works only after receipt of Owner's written approval of the test reports.

6.00.00 SPECIAL TOOLS & TACKLE

6.01.00 A set of special tools & tackle which are necessary or convenient for erection, commissioning, maintenance and overhauling of the equipment shall be supplied. These special tools and tackles shall include but not limited to:

a.	Splice-cum-insulation remover for control cable	:	10 Nos
b.	Hand operated compression tools with a set of dies for different cable sizes	:	4 Nos. + 4 Sets of dies for each size of cables
c.	Hydraulically operated Compression tools with a set of dies for different cable sizes	:	4 Nos. + 4 Sets of dies for each size of cables
d.	Wire-wrap gun with accessories for 0.5 Sq. mm. instrumentation cables	:	10 Nos

e. Maxi-terminal connection gun with accessories for 0.5 Sq. mm. instrumentation cables : 10 Nos

6.02.00 The tools shall be shipped in separate containers, clearly marked with the name of the equipment for which they are intended.

7.00.00 DRAWINGS, DATA & MANUALS

7.01.00 Drawings, Data & Manuals shall be submitted with the bid and in quantities and procedures as specified in General Conditions of Contract and/or elsewhere in this specification for approval & subsequent distribution after the issue of Letter of Intent.

7.02.00 To be submitted with the Bid :

a. Manufacturer's catalogues giving cable construction details and characteristics.

b. Cable current ratings for different types of installation, inclusive of derating factors for ambient temperature, grouping etc.

c. Write-up on Manufacturer's recommended method of splicing, jointing, termination etc. of the cables.

d. Type test reports on H.V. power cable.

7.03.00 To be submitted for Information (I) / Approval (A)

7.03.01 Guaranteed Technical Particulars(A)

7.03.02 Quality assurance plan.(A)

7.03.03 Shop Test reports(A)

7.03.04 Instruction manuals(I)

The manual shall clearly indicate method of laying, termination, check-ups and tests to be carried out before commissioning.

7.03.05 Any other relevant drawing or data necessary for satisfactory installation operation and maintenance (I) or as required by purchaser.

7.04.00 The Owner may review the documents marked (I) if thought necessary. The contractor shall note that the approval of drawings & documents by the Owner does not relieve him of his contractual obligation.

7.05.00 The bidder may note that the drawings, data and manuals listed herein are minimum requirement only. The bidder shall ensure that all other necessary write-up, information, etc required to fully describe the cable are to be submitted with the bid.

7.06.00 All drawings shall be prepared by using AutoCAD and documents shall be generated using Electronic version. The paper copy of the drawings &

document shall be submitted for approval & reference. All final drawings and documents shall be submitted in CD in AutoCAD 2000 and MS office format as applicable for Owner's future reference.

Annexure-B

LV POWER CABLE

1.0 1100 V grade, 90º C continuous rating under normal condition and 250°C under short circuit condition rating, XLPE heavy duty, power cable conforming to following requirement and in line with IS 7098. IS 8130 & IS 5831 and IS 3975.

1.1	Conductor	:	Stranded and compacted plain aluminium of grade H2 for cable sizes above 2.5 mm2and class 2 stranded high conductivity annealed plain copper for cable sizes upto 2.5 mm2 conforming to IS:8130.
1.2	Insulation	:	Extruded cross-linked polyethylene (XLPE) conforming to IS:7098(Part-3)
1.3	Core Identification	:	By color coding
1.4	Inner Sheath	:	Extruded PVC compound conforming to type ST2 of IS:5831 for multicore cable. Single core cables shall have no inner sheath.
1.5	Armour	:	Galvanised single round steel wire armour for twin and multicore cables. Non-magnetic hard drawn aluminium single round wire conforming to H4 grade for single core cables.
1.6	Overall Sheath	:	Extruded FRLS PVC compound conforming to type ST2 of IS:5831. having improved fire performance category and type as stated below.

Category	Type
C2	FRLSH (Fire Retardant Low smoke and halogen evolution)

1.7 Drum — Conforming to IS-10418(Wooden Drum)

Annexure-C

CONTROL CABLES

1.0 1100 V grade 70ºC continuous rating under normal condition and 160°C under short circuit condition rating PVC Control cable (YWY) conforming to following requirement and in line with IS:1554, IS:8130, IS:5831 and IS:3975.

1.1	Conductor	:	Stranded non-compacted and circular, high conductivity annealed plain copper, generally conforming to IS:8130.
1.2	Insulation	:	Extruded PVC compound conforming to type A of IS : 5831.
1.3	Core Identification	:	By color coding and numbering at interval of 100mm or less
1.4	Inner Sheath	:	Extruded PVC compound conforming to type ST1 of IS:5831 for multi-core cables. Filler shall be of same material as of inner sheath i.e. ST1. Single core cables shall have no inner sheath.
1.5	Armour:	:	Galvanised single round steel wire for twin and Multi-core cables.
1.6	Overall Sheath	:	Extruded PVC compound conforming to type ST1 of IS 5831 having improved fire performance category and type as stated below.

Category	Type
C2	FRLSH (Fire Retardant Low smoke and halogen evolution)

1.7 Drum : Conforming to IS-10418 (Wooden Drum)

Annexure-D

STANDARD CABLE SIZES

Sl. No.	Cable Size	Conductor	Insulation
1.0	**H. T. CABLES**		
1.1	1 core 630 Sq. mm. (3.3/3.3 KV & 11/11KV (UE)	AL	XLPE (FRLSH)
1.2	3 core 185 Sq. mm. (3.3/3.3 KV & 11/11KV (UE)	AL	XLPE (FRLSH)
1.3	3 core 240 Sq. mm. (3.3/3.3 KV & 11/11KV (UE)	AL	XLPE (FRLSH)
1.4	3 core 300 Sq. mm. (3.3/3.3 KV & 11/11KV (UE)	AL	XLPE (FRLSH)
1.6	1 core 70 Sq. mm. (3.3/3.3 KV & 11/11KV (UE)	AL	XLPE (FRLSH)
2.0	**L. T. POWER CABLES**		
2.1	3 core 2.5 Sq. mm.	Cu	XLPE (FRLSH)
2.2	3 core 6 Sq. mm.	Cu	XLPE (FRLSH)
2.3	2 core 16 Sq. mm.	Cu	XLPE (FRLSH)
2.4	2 core 16 Sq. mm.	AL	XLPE (FRLSH)
2.5	3 core 16 Sq. mm.	AL	XLPE (FRLSH)
2.6	4 core 16 Sq. mm.	AL	XLPE (FRLSH)
2.7	3 core 25 Sq. mm.	AL	XLPE (FRLSH)
2.8	2 core 35 Sq. mm.	AL	XLPE (FRLSH)
2.9	3 core 35 Sq. mm.	AL	XLPE (FRLSH)
2.10	4 core 35 Sq. mm.	AL	XLPE (FRLSH)
2.11	3 core 50 Sq. mm.	AL	XLPE (FRLSH)
2.12	4 core 70 Sq. mm.	AL	XLPE (FRLSH)
2.13	3 core 95 Sq. mm.	AL	XLPE (FRLSH)

Sl. No.	Cable Size	Conductor	Insulation
2.14	$3^1/_2$ core 95 Sq. mm.	AL	XLPE (FRLSH)
2.15	3 core 150 Sq. mm.	AL	XLPE (FRLSH)
2.16	3 core 185 Sq. mm.	AL	XLPE (FRLSH)
2.17	$3^1/_2$ core 185 Sq. mm.	AL	XLPE (FRLSH)
2.18	3 core 240 Sq. mm.	AL	XLPE (FRLSH)
2.19	$3^1/_2$ core 240 Sq. mm.	AL	XLPE (FRLSH)
2.20	3 core 300 Sq. mm.	AL	XLPE (FRLSH)
2.21	$3^1/_2$ core 300 Sq. mm.	AL	XLPE (FRLSH)
2.22	1 core 630 Sq. mm.	AL	XLPE (FRLSH)
3.0	CONTROL CABLE		
3.1	2 core 2.5 Sq. mm.	Cu.	PVC (FRLSH)
3.2	3 core 2.5 Sq. mm.	Cu.	PVC (FRLSH)
3.3	5 core 2.5 Sq. mm.	Cu.	PVC (FRLSH)
3.4	7 core 2.5 Sq. mm.	Cu.	PVC (FRLSH)
3.5	9 core 2.5 Sq. mm		PVC (FRLSH)
3.6	12 core 2.5 Sq. mm.	Cu.	PVC (FRLSH)
4.0	CABLES FOR ELECTRONIC EQUIPMENT GROUNDING		
4.1	1 core 35 Sq. mm.	Cu.	XLPE (FRLSH)
4.2	1 core 150 Sq. mm.	Cu.	XLPE (FRLSH)

ANNEXURE-I

SUB-VENDOR LIST

The list of approved make of the LT Motors are as mentioned below:

S.No.	LIST OF LT MOTORS
1.	BHARAT BIJLEE LTD.
2.	CROMPTON GREAVES
3.	ASEA BROWN BOVERI
4.	KIRLOSKAR ELECTRIC CO LTD.
5.	NGEF
6.	SIEMENS
7.	MARATHON
8.	GE-POWER
9.	RAJINDRA ELECT INDUSTRIES
10.	LAXMI HYDRAULICS PVT. LTD

However, the final list of makes for the LT Motors is subjected to BHEL/Customer approval, during contract stage, without any commercial implications.

	TITLE	SPECIFICATION NO.
	LV MOTOR	VOLUME II B
	DATA SHEET - C	SECTION II
		REV NO. 00 DATE
		SHEET 1 OF 2

S. No.	Description	Data to be filled by successful bidder
A.	**General**	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
B.	**Design and Performance Data**	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a Voltage	
6	b Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

S. No.	Description	Data to be filled by successful bidder
	c) At starting	
C.	**Constructional Features**	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level (kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	**Characteristic curves/ drawings** (To be enclosed for motors of rating ≥ 55KW)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00

1.0 INTENT OF SPECIFIATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer's work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0 CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement for rotating electrical machnines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibration of rotating electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0 DESIGN REQUIREMENTS

3.1 Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2 Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3 Starting Requirements

3.3.1 Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.3.2 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.

The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.

3.3.3 The following frequency of starts shall apply

i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.

ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)

iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for mimimum 20,000 starts during the life time of the motor

3.4 **Running Requirements**

3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.

3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.

3.5 **Stress During bus Transfer**

3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.

3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.

3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.

4.0 **CONSTRUCTIONAL FEATURES**

4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy

4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.

Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled

4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.

4.4. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.

4.5 Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.

4.6 In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation.
In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.

4.7 **Terminals and Terminal Boxes**

4.7.1 Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.

Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".

4.7.2 unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.

4.7.3 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W & V respectively.

4.7.4 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.

4.7.5 Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.

4.7.6 Degree of protection for terminal boxes shall be IP 55 as per IS 4691.

4.7.7 Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.

4.7.8. Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.

4.7.9 Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.

4.8 Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.

4.9 **General**

4.9.1 Motors provided for similar drives shall be interchangeable.

4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.

4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.

4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.

4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.

4.9.6 Name plate with all particulars as per IS: 325 shall be provided

4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.

5.0 INSPECTION AND TESTING

5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.

5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.

5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.

5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.

6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT

a) OGA drawing showing the position of terminal boxes, earthing connections etc.
b) Arrangement drawing of terminal boxes.
c) Characteristic curves:
(*To be given for motor above 55 kW unless otherwise specified in Data Sheet*).

i) Current vs. time at rated voltage and minimum starting voltage.
ii) Speed vs. time at rated voltage and minimum starting voltage.
iii) Torque vs. speed at rated voltage and minimum voltage.
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.
iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))	SYSTEM:	SECTION: II	SHEET 1 of 2

S. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D	**			
					M	C/ N					M	C	N	
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	-	MFG. SPEC.	MFG. SPEC.	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	VISUAL	100%	-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	LOG BOOK		P	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	-	MFG.SPEC./	MFG.SPEC.	LOG BOOK		P	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	-	MFG. SPEC/ APPROVED DATASHEET	MFG. SPEC/ APPROVED DATASHEET	LOG BOOK	✓	P	V	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST	MA	VISUAL	100%	-	IS-325 / IS-12615/ APPROVED DATA SHEET	IS-325 / IS-12615/ APPROVED DATA SHEET	TEST/ INSPN. REPORT	✓	P	V *	-	* NOTE -1
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	-	APPROVED DRG/ DATA SHEET	APPROVED DRG/ DATA SHEET	TEST/ INSPN. REPORT	✓	P	V *	-	* NOTE -1 & NOTE-2

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	HEMA KUSHWAHA	HEMA KUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))	SYSTEM:	SECTION: II	SHEET 2 of 2

		3.NAMEPLATE DETAILS	MA	VISUAL	100%	-	IS-325 / IS-12615 / APPROVED DATA SHEET	SAME AS COL. 7	TEST/ INSPN. REPORT	✓	P	V	-	
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MFG. STANDARD / (#)	AS PER MFG. STANDARD / (#).	INSPC. REPORT	✓	P	W	-	(#) REFER NOTE-8

NOTES:
1. Routine tests on 100% motors shall be done by the vendor. However, BHEL/ Customer shall witness routine tests on random samples. The sampling plan shall be mutually agreed upon.
2. For exhaust/ventilation fan motors of rating up to 1.5 KW, only routine test certificates shall be furnished for scrutiny.
3. In case test certificates for these tests on similar type, size and design of motor from independent laboratory are available, the same is valid for 5 years.
4. BHEL reserves the right to perform repeat test, if required.
5. After packing and prior to issue MDCC, photographs of items to be despatched shall be sent to BHEL for review.
6. In case of any changes in QP commented by customer at contract stage, same shall be carried out by bidder without any implication to BHEL/ Customer.
7. Project specific QP to be developed based on customer requirement.
8. For export job, BHEL technical specification for seaworthy packing to be followed.
9. Packing shall be suitable for storage at site in tropical climate conditions.
10. Latest revision/ year of issue of all the standards (IS/ ASME/ IEC etc.) indicated in QP shall be referred.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, B: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **C**: CUSTOMER,
P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE
MA: MAJOR, **MI**: MINOR**, CR:** CRITICAL
D: DOCUMENTATION

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
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Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:17.04.2020
	CUSTOMER :		QP NO.: PE-QP-999-Q-007, REV-04	
	PROJECT:		PO NO.:	
	ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))	SYSTEM:	SECTION: II	SHEET 1 OF 9

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
1.0	RAW MATERIAL & BOUGHT OUT CONTROL													
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	1.SURFACE CONDITION	MA	VISUAL	100%	-	-	FREE FROM BLINKS, CRACKS, WAVINESS ETC	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	LOG BOOK		P	-	-	
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	SAMPLE	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	TEST REPORT		P/V	-		
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%	-		FREE FROM CRACKS, UN-EVENNESS ETC.	TEST REPORT		P	-	-	
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	TC		P/V	-	-	PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%	-	MANUFACTURER'S DRG./SPEC	FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK		P/V	-		
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	TC		P/V	-		HEAT NO. SHALL BE VERIFIED
		3.DIMENSIONS	MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG.	MANUFACTURER'S DRG.	LOG BOOK		P/V	-		
1.4	PAINT & VARNISH	1.MAKE, SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	LOG BOOK		P/V	-		

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	HEMA KUSHWAHA	HEMA KHUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	R K JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Doc No:			
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Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:17.04.2020
	CUSTOMER :		QP NO.: PE-QP-999-Q-007, REV-04	
	PROJECT:		PO NO.:	
	ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))	SYSTEM:	SECTION: II	SHEET 2 OF 9

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK		P	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	-	MANUFACTURER'S DRG./ SPEC.	MANUFACTURER'S DRG./ STD.	TC		P/V	-		
		3. DIMENSIONS	MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG./ SPEC.	MANUFACTURER'S DRG.	LOG BOOK		P/V	-		
		4.INTERNAL FLAWS	CR	ULTRASONIC TEST	100%	-	ASTM-A388	MANUFACTURER'S STD.	INSPECTION REPORT	✔	P/W	V	-	FOR DIA OF 55 MM & ABOVE
1.6	SPACE HEATERS, CONNEC-TORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	100%	-	MANUFACTURER'S DRG./STD.	MANUFACTURER'S DRG./STD.	INSPECTION REPORT		P/V	-	-	
		2. PHYSICAL COND.	MA	VISUAL	100%	-	MANUFACTURER'S DRG./STD.	NO PHYS. DAMAGE, NO ELECTRICAL DISCONTINUITY	INSPECTION REPORT		P/V	-	-	
		3.DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG./ STD	MANUFACTURER'S DRG. / STD.	INSPECTION REPORT		P/V	-	-	
		4.PERFORMANCE/ CALIBRATION	MA	TEST	100%	-	MANUFACTURER'S DRG./ STD	MANUFACTURER'S DRG. / STD.	TEST REPORT		P/V	-	-	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	HEMA KUSHWAHA	HEMA KHUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	R K JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	
	CUSTOMER :		QP NO.: PE-QP-999-Q-007, REV-04	DATE:17.04.2020
	PROJECT:		PO NO.:	
	ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))	SYSTEM:	SECTION: II	SHEET 3 OF 9

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. ETC.	MA	VISUAL	100%	-	-	NO VISUAL DEFECTS	TEST REPORT		P/V	-	-	
		2.DIMENSION(BORE DIA, WALL THICKNESS, BDV AS RECEIVED, BDV AFTER FOLDING AT 180°	MA	TEST	SAMPLE	-	MANUFACTURER'S STD.	MANUFACTURER'S STD.	LOG BOOK AND OR SUPPLIER'S TC		P/V	-	-	
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND.	MA	VISUAL	100%	-	-	NO VISUAL DEFECTS (FREE FROM BURS)	LOG BOOK		P	-	-	
		2.DIMENSIONS INCLUDING BURS HEIGHT	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG. .	MANUFACTURER'S DRG.	LOG BOOK		P/V	-	-	
		3. ACCEPTANCE TESTS	MA	ELECT. & MECH TESTS	SAMPLE	-	MANUFACTURER'S DRG./ STD.	MANUFACTURER'S DRG./ STD.	TC		P/V	-	-	
1.9	CONDUCTORS	1. SURFACE FINISH	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK		*P/V	-	-	* MOTOR MANUFACTURER TO CONDUCT VISUAL CHECK FOR SURFACE FINISH ON RANDOM BASIS (10% SAMPLE) AT HIS WORKS AND MAINTAIN RECORD FOR VERIFICATION BY
		2.ELECT. PROP, & MECH. PROP	MA	ELECT. & MECH.TEST	SAMPLES	-	MANUFACTURER'S DRG./ SPEC.	MANUFACTURER'S / SPEC.	TC & VENDOR'S TEST REPORTS		P/V	-	-	

BHEL					
ENGINEERING			QUALITY		
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Prepared by:	HEMA KUSHWAHA	HEMA KHUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	R K JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:17.04.2020
	CUSTOMER :		QP NO.: PE-QP-999-Q-007, REV-04	
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	ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))	SYSTEM:	SECTION: II	SHEET 4 OF 9

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLES	-	MANUFACTURER'S DRG./ SPEC.	MANUFACTURER'S / SPEC.	LOG BOOK		P/V	-	-	
1.10	BEARINGS	1.MAKE & TYPE	MA	VISUAL	100%	-	MANUFACTURER'S DRG./ APPROVED DATASHEET	MANUFACTURER'S DRG./ APPROVED DATASHEET	LOG BOOK		P/V	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	APPROVED DATASHEET	APPROVED DATASHEET/ BEARING MANUF'S CATALOGUES	LOG BOOK		P/V	-	-	
		3.SURFACE FINISH	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK		P/V	-	-	
1.11	SLIP RING (WHEREVER APPLICABLE)	1.SURFACE COND.	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	LOG BOOK		P	-	-	
		3.TEMP.WITH-STAND CAPACITY	MA	ELECT.TEST	SAMPLE	-	MANUFACTURER'S STD./ APPROVED DATASHEET	MANUFACTURER'S STD./ APPROVED DATASHEET	LOG BOOK		P/V	-	-	
		4.HV/IR	MA	-DO-	100%	-	MANUFACTURER'S STD./ APPROVED DATASHEET	MANUFACTURER'S STD./ APPROVED DATASHEET	LOG BOOK		P/V	-	-	
1.12	OIL SEALS & GASKETS	1.MATERIAL OF GASKET	MA	VISUAL	100%	-	MANUFACTURER'S DRG/SPECS	MANUFACTURER'S DRG./ SPECS.	LOG BOOK		P	-	-	
		2.SURFACE COND.	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK		P	-	-	
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	LOG BOOK		P	-	-	

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Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
2.0	IN PROCESS													
2.1	STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1.WORKMANSHIP & CLEANNESS	MA	VISUAL	100%	-	MANUFACTURER'S DRG	GOOD FINISH	LOG BOOK		P/W	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	LOG BOOK		P	-	-	
2.2	MACHINING	1.FINISH	MA	VISUAL	100%	-	-DO-	GOOD FINISH	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	LOG BOOK		P	-	-	
		3.SHAFT SURFACE FLOWS	MA	PT	100%	-	MANUFACTURER'S STD./ ASTM-E165	MANUFACTURER'S STD./ APPROVED DATASHEET.	LOG BOOK	✔	P	V	-	
2.3	PAINTING	1.SURFACE PREPARATION	MA	VISUAL	100%	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	
		2.PAINT THICKNESS (BOTH PRIMER & FINISH COAT)	MA	MEASUREMENT BY ELCOMETER	SAMPLE	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	
		3.SHADE	MA	VISUAL	SAMPLE	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	
		4.ADHESION	MA	CROSS CUTTING & TAPE TEST	SAMPLE	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	

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Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	R K JAISWAL

BIDDER/ SUPPLIER	
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Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S STD.	MANUFACTURER'S STD.	LOG BOOK		P	-	-	
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-	MANUFACTURER'S STD.	MANUFACTURER'S STD.	LOG BOOK		P	-	-	
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	
		2.CLEANLINESS	CR	VISUAL	100%	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	
		3.IR-HV-IR	CR	ELECT. TEST	100%	-	IS-325//IS-12615/IEC-60034 PART-1	IS-325//IS-12615/IEC-60034 PART-1	TEST/INSPC. REPORT	✔	P	V	-	
		4.RESISTANCE	CR	ELECT. TEST	100%	-	IS-325//IS-12615/IEC-60034 PART-1	IS-325//IS-12615/IEC-60034 PART-1	TEST/INSPC. REPORT	✔	P	V	-	
		5.INTERTURN INSULATION	CR	ELECT. TEST	100%	-	IS-325//IS-12615/IEC-60034 PART-1	IS-325//IS-12615/IEC-60034 PART-1	TEST/INSPC. REPORT		P	-	-	
2.6	IMPREGNATION	1.VISCOSCITY	MA	PHY. TEST	AT STARTING	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK		P	-	-	
		2.TEMP. PRESSURE VACCUM	MA	PROCESS CHECK	CONTINUOUS	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK		P	-	-	
		3.NO. OF DIPS	MA	PROCESS CHECK	CONTINUOUS	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK	✔	P	V	-	THREE DIPS TO BE GIVEN

BHEL					
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Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	R K JAISWAL

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Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		4.DURATION	MA	PROCESS CHECK	CONTINUOUS	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK	✔	P	V	-	
2.7	COMPLETE STATOR ASSEMBLY	1.COMPACTNESS & CLEANLINESS	MA	VISUAL	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK		P	-	-	
2.8	BRAZING/COMPRESSION JOINT	1.COMPLETENESS	CR	VISUAL	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK		P	-	-	
		2.SOUNDNESS	CR	MALLET TEST & UT	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	TEST/INSPC. REPORT	✔	P	V	-	
		3.HV	MA	ELECT. TEST	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	TEST/INSPC. REPORT	✔	P	V	-	
2.9	COMPLETE ROTOR ASSEMBLY	1.RESIDUAL UNBALANCE	CR	DYN. BALANCE	100%	-	MANUFACTURER'S SPEC./ ISO 1940	MANUFACTURER'S DWG.	LOG BOOK		P	-	-	
		2.SOUNDNESS OF DIE CASTING	CR	ELECT. (GROWLER TEST)	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	TEST/INSPC. REPORT	✔	P	V	-	
2.10	ASSEMBLY	1.ALIGNMENT	MA	MEAS.	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-	-	
		2.WORKMANSHIP	MA	VISUAL	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-	-	
		3.AXIAL PLAY	MA	MEAS.	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK	✔	P	V	-	
		4.DIMENSIONS	MA	MEAS.	100%	-	MANUFACTURER'S DRG./ MANUFACTURER'S SPEC.	MANUFACTURER'S DRG./ MANUFACTURER'S SPEC.	LOG BOOK		P	-	-	
		5.CORRECTNESS, COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-	-	
		6. RTD, BTD & SPACE HEATER MOUNTING.	MA	VISUAL	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK	✔	P	V	-	

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Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	R K JAISWAL

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1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS	MA	ELECT.TEST	1/TYPE/SIZE	1/TYPE/SIZE	IS-325//IS-12615/APPROVED DATASHEET	IS-325/IS-12615/APPROVED DATASHEET	TEST REPORT	✔	P	W*	-	* NOTE - 1
		2.ROUTINE TESTS INCLUDING SPECIAL TEST	MA	ELECT.TEST	100%	-	IS-325//IS-12615/APPROVED DATASHEET	IS-325/IS-12615/APPROVED DATASHEET	TEST REPORT	✔	P	V$	-	$ NOTE - 2
		3.VIBRATION & NOISE LEVEL	MA	ELECT.TEST	100%	-	IS: 12075 / IEC 60034-14 & IS-12065	IS: 12075 / IEC 60034-14 & IS-12065	TEST REPORT	✔	P	V$	-	$ NOTE - 2
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET &	TEST/INSPC. REPORT	✔	P	W	-	
		5.DEGREE OF PROTECTION	MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	-	IEC 60034-5/IS-12615	APPROVED DATASHEET	TC	✔	P	V	-	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		6. MEASUREMENT OF RESISTANCE OF RTD & BTD	MA	ELECT. & MECH. TEST	100%	-	IS-325//IS-12615/IEC-60034 PART-1/IS: 12802	IS-325/IS-12615/IEC-60034 PART-1/IS: 12802	TC	✔	P	V$	-	$ NOTE - 2
		7. MEASUREMENT OF RESISTANCE, IR OF SPACE HEATER	MA	ELECT. & MECH. TEST	100%	-	IS-325//IS-12615/IEC-60034 PART-1	IS-325/IS-12615/IEC-60034 PART-1	TC	✔	P	V$	-	$ NOTE - 2
		8. NAME PLATE DETAILS	MA	VISUAL	100%	-	IS-325//IS-12615& DATA SHEET	IS-325//IS-12615 & DATA SHEET	TEST/INSPC. REPORT	✔	P	V$	-	$ NOTE - 2
		9.EXPLOSION FLAME PROOF NESS (IF SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	1/TYPE	-	IS 2148 / IEC 60079-1	IS 2148 / IEC 60079-1	TC	✔	P	V	-	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		10. PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	SAMPLE	APPROVED DATASHEET	APPROVED DATASHEET	TC	✔	P	W$	-	SAMPLING PLAN TO BE DECIDED BY INSPECTION AGENCY $ NOTE - 2

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4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MANUFACT. STANDARD / (#)	AS PER MANUFACT. STANDARD / (#)	INSPC. REPORT	✔	P	W	-	(#): REFER NOTE-8

NOTES:

1 DEPENDING UPON THE SIZE AND CRITICALLY, WITNESSING BY BHEL SHALL BE DECIDED.

2 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL/CUSTOMER SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON.

3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THE SAME IS VALID FOR 5 YEARS.

4 BHEL RESERVES THE RIGHT TO PERFORM REPEAT TEST, IF REQUIRED.

5 AFTER PACKING AND PRIOR TO ISSUE MDCC, PHOTOGRAPHS OF ITEMS TO BE DESPATCHED SHALL BE SENT TO BHEL PURCHASE GROUP FOR REVIEW.

6 IN CASE , ANY CHANGES IN QP COMMENTED BY CUSTOMER AT CONTRACT STAGE SHALL BE CARRIED OUT BY BIDDER WITHOUT ANY IMPLICATION TO BHEL/ CUSTOMER.

7 PROJECT SPECIFIC QP TO BE DEVELOPED BASED ON CUSTOMER REQUIREMENT.

8 FOR EXPORT JOB, BHEL TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING TO BE FOLLOWED.

9 PACKING SHALL BE SUITABLE FOR STORAGE AT SITE IN TROPICAL CLIMATE CONDITIONS.

10 LATEST REVISION/ YEAR OF ISSUE OF ALL THE STANDARDS (IS/ ASME/ IEC ETC.) INDICATED IN QP SHALL BE REFERRED.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, B: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **C**: CUSTOMER,

P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE

MA: MAJOR, **MI**: MINOR, **CR:** CRITICAL

D: DOCUMENT

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ENGINEERING			QUALITY		
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Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	R K JAISWAL

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SECTION -IC

DATA SHEET

SECTION -IC

DATA SHEET-A

BHEL PEM	DATA SHEET FOR LUBE OIL PUMPS		DOC. NO. PE-DC-445-100-N137
			SHEET NO. 01 OF 01
	PROJECT TITLE : 1X660 MW SAGARDIGHI UNIT 5		
1.0	SERVICE IDENTIFICATION	**CLEAN OIL PUMP**	**DIRTY OIL PUMP**
2.0	DRAWING NO.	PE-DG-445-100-N108	PE-DG-445-100-N108
3.0	SYSTEM	CENTRAL LUBE OIL SYSTEM	CENTRAL LUBE OIL SYSTEM
4.0	TYPE	ROTARY POSITIVE DISPLACEMENT	ROTARY POSITIVE DISPLACEMENT
5.0	NUMBER REQUIRED	ONE (01) NO.	ONE (01) NO.
6.0	FLOW RATE (MAX.)	6600 LPH	6600 LPH
7.0	DISCHARGE PRESSURE	2.0 KG/CM^2 (g)	2.0 KG/CM^2 (g)
8.0	SUCTION CONDITION	FLOODED (MAX -4 MLC TO BE CONSIDERED)	FLOODED (MAX -4 MLC TO BE CONSIDERED)
9.0	LOCATION OF INSTALLATION	INDOOR	INDOOR
10.0	LIQUID PUMPED	TURBINE LUBE OIL (TURBINOL-46-HPC / SERVOPRIME 46-IOC)	TURBINE LUBE OIL (TURBINOL-46-HPC / SERVOPRIME 46-IOC)
11.0	PROPERTIES OF FLUID	DENSITY- 0.9 GM/CC AT 15°C FLASH POINT - 210 °C VISCOSITY -28 CST AT 50 °C / 48 CST AT 37.8°C / 140 CST AT 20°C	DENSITY- 0.9 GM/CC AT 15°C FLASH POINT - 210 °C VISCOSITY -28 CST AT 50 °C / 48 CST AT 37.8°C / 140 CST AT 20°C
12.0	TEMPERATURE NORMAL / MAX	AMBIENT / 70 ^{0} C	AMBIENT / 70 ^{0} C
13.0	SUCTION / DISCHARGE PIPING CONNECTION	OD 88.9 X 5.49 / OD 88.9 X 5.49	OD 88.9 X 5.49 / OD 88.9 X 5.49
14.0	RELIEF VALVE	BUILT-IN ON EACH PUMP	BUILT-IN ON EACH PUMP
15.0	SUCTION STRAINER	DUPLEX TYPE STRAINER WITH CHANGE-OVER VALVE, SS ELEMENT MESH SIZE 20 & BLOW DOWN VALVE	DUPLEX TYPE STRAINER WITH CHANGE-OVER VALVE, SS ELEMENT MESH SIZE 20 & BLOW DOWN VALVE
16.0	MATERIALS OF CONSTRUCTION CASING GEARS SHAFT	 CAST IRON - IS 210 - FG260 EN-8/9 EN-8/9	 CAST IRON - IS 210 - FG260 EN-8/9 EN-8/9
17.0	APPLICABLE CODES / STATUTORY REGULATIONS	AS APPLICABLE IS, BS, API STANDARDS	AS APPLICABLE IS, BS, API STANDARDS
18.0	DRIVE TYPE	INDUCTION MOTOR 415 V, 50 Hz	INDUCTION MOTOR 415 V, 50 Hz
19.0	INSTRUMENTS	NA	NA

NOTE : ALL OTHER GENERAL TECHNICAL REQUIREMENTS / ACCESSORIES & SPARES IN LINE WITH CUSTOMER SPEC.

SECTION -IC

DATA SHEET -C

"*" marked details will be furnished by the bidder for review and approval by customer

1.00	**Project Information**	
1.01	Enquiry No.	*
1.02	Project	*
2.00	**Service Condition**	
2.01	Service	Clean Oil/ Dirty Oil/Drain Oil (*bidder to tick mark the applicable service)
2.02	No. of units	*
2.03	Location	Indoor
2.04	Duty	Intermittent
3.00	**Operating Condition**	
3.01	Liquid to be pumped	Turbine Lube Oil
3.02	Pumping Temperature	Ambient/70°C
3.03 Viscosity		
	a) Highest	140cSt @20°C
	b) Lowest	28cSt @50°C
	c) Normal	48cSt @37.8°C
3.04	Design Viscosity of oil (cSt)	28cSt for capacity , 140cSt for power consumption
3.05	Specific Gravity	0.9
3.06	Suction Conditions available	Flooded
3.07 i)	Rated capacity (LPM)	*
ii)	Pump Maximum flow (LPM) & corresponding head (kg/cm^2 (g))	*
3.08	Rated head – kg/cm^2 (g)	*
3.09	R..V.Press.Setting	*
4.00	**Pump**	
4.01	Manufacturer	*
4.02	Type	External gear with herringbone gears
4.03	Model No.	*
4.04 (i)	Design & Manufacturing Standard	API 676
4.04 (ii)	Testing Standard	HIS (ANSI/HI-3.6-2000 /

s

VDMA 24284 , Accuracy Class-2, Group-II
(* Bidder to tick the standard adopted)

4.05	Rotation (Viewed from pump shaft end)	*
4.06	Shut off head, if applicable	Not applicable
4.07	Suction flange	Size 80 NB Standard ANSI B 16.5 Rating 150 lb Facing RF Location (as viewed from drive end) -*(Bidder to tick the applicable) Top End Side
4.08	Discharge flange	Size 80 NB Standard ANSI B 16.5 Rating 150 lb Facing RF Location (as viewed from drive end) -*(Bidder to tick the applicable)
4.09	Timing Gear	Not applicable for gear pumps
4.10	Relief Valve	Built-in
	a) Manufacturer	Pump manufacturer (OEM)
	b) Type	*
	c) Size (NB)	*
	d) Capacity, litre/min	110% of the pump max. flow
	e) Valve, setting pressure adjustable & range of adjustability, in case adjustable	Yes/No (* bidder to indicate the applicable) - *
	f) **Material**	
	g) Spring, Material	Spring Steel
	h) Relief valve cover-Material	Same as MOC of pump body
	i) Bonnet-Material	Same as MOC of pump body
4.11	Shaft Sealing	Mechanical seal
4.12	Bearing	
	a) Type	*
	b) Nos. Provided	*
	c) Method of lubrication	*
	d) Temperature rise over oil temperature	*

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4.13	Type of Coupling	*
4.14	Type of Impeller	External gear- Herringbone profile
4.15	BHP consumed at Rated viscosity (at pump shaft)	*
4.16	BHP consumed at Max. viscosity (at pump shaft)	*
4.17	BHP consumed at Min. viscosity (at pump shaft)	*
4.18	BHP consumed at the R.V. Set Pressure (at pump shaft) @ 48 cSt at maximum value of set pressure range	*
4.19	Pump Efficiency at rated condition @ 48 cSt	
	a) Mechanical	*
	b) Volumetric	*
	c) Overall	*
4.20	Recommended motor rating at 50 º C ambient (kw)	*
4.21	Motor RPM	*
4.22	Design pressure of the pump body and end covers - kg/cm^2 (g)- * (Should be at least 6 kg/cm^2 (g))	
5.00	**Material of Construction**	
5.01	Casing and End covers	CAST IRON IS210 FG 260
5.02 VOID		
5.03	Rotor/Gear	EN-8 BS 970 Part-I Hardness- *
5.04	Shaft/Shaft Sleeve	SS 316
5.05	Seal	*
5.06	Gasket	GRAFOIL/ Any other asbestos free material subject to customer acceptance (* bidder to indicate)
5.07	Bearing	*
5.08	Relief Valve Components	*
5.09	Base Plate	MS to IS 2062
6.00	**Spares**	
6.01	Commissioning Spares	1 set of gaskets/1 no. gasket compound tube 1 No. mechanical seal
6.02	Essential Spares for Pump, if applicable	* (Project specific)

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6.03	Essential Spares for Motor, if applicable	* (Project specific)
6.04	Recommended Spares for Pump for 3 Years	*
6.05	Recommended Spare for Motor for 3 Years	*
7.00	**Weight of**	
7.01	Pump	*
7.02	Motor	*
7.03	Base plate	*
7.04	Other Accessories (Please specify)	*
8.00	**Strainer/Filter**	
8.01	**Manufacturer** Bhatia Engineering Company/ Filtration Engineers (I) Pvt.Ltd / Jaypee Industries Pvt. Ltd./Multitex Filtration Engineers/ Otoklin Plants & Equipment Ltd/ OEM subject to condition that strainer of similar type & capacity have been working satisfactorily at least two plants. (Bidder to tick the make considered)	*
8.02	Type & Size	* (Type -Project specific; size –to match pump suction)
8.03	Nos. provided	* (Project specific)
8.04	Size of Screen mesh & wire dia (min)	40 mesh & 34 SWG
8.05	Design Pressure (kg/cm^2) (Should be at least 4 kg/cm^2)	*
8.06	Capacity (LPM)	To match pump flow
8.07	Design Viscosity	140cSt @ 20 °C
8.08	End Connection	Flanged ANSI B 16.5, Class –150 lb

D

8.09	Maximum Pressure drop at design viscosity (kg/cm2)	
	a) Clean	*
	b) Dirty (50% clogged)	*
8.10	Material of construction	
	a) Strainer body	*
	b) Screen	SS316
	c) Gaskets	GRAFOIL/ Any other asbestos free material subject to customer acceptance (* bidder to indicate)
8.10	a) Inlet pipe Area	*
	b) Free straining area	*
	c) Ration of Free straining area to inlet pipe area (should be $\geq$ 6:1)	*

9.00 Accessories to be provided

Common base plate plate	Yes- MS fabricated from IS 2062 Common for pump & motor
Coupling & Coupling Guard	Yes
Foundation bolts & nuts	Yes
Flanges & Companion flanges	Yes, Class 150 lb, RF to ANSI B 16.5
Nuts, bolts & gaskets	Yes
Lifting lugs, Eye bolts etc	Yes
Name plate for all the equipment	Yes

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SECTION -II

SECTION -II

STANDARD TECHNICAL REQUIREMENT

1.0 GENERAL

This specification covers the design material constructional features manufacture assembly inspection & testing at manufacturer's or his subcontractor's works, suitable painting & packing requirements of Lube Oil transfer pumps and drives along with all accessories as specified hereinafter.

2.0 CODES & STANDARDS

All equipment, systems and works covered under this specification shall comply with all currently applicable statutes regulations and safety codes in the locality where they will be installed. They shall comply with the latest editions of the codes and standards as given below.

a) American National Standards Institute (ANSI)

b) American Society of Testing & Materials (ASTM)

c) American society of Mechanical Engineers (ASME)

d) Hydraulic Institute Standards (HIS)

e) American Petroleum Institute (API)

f) American Gear Manufacturer's Association (AGMA)

g) National Electrical Manufacturer's Association (NEMA)

h) National Fire Protection Association (NFPA)

i) Indian Standards Institute (ISI)

Other International/National standards such as DIN, VDI, BS, IS etc. shall also be accepted subject to the owner's approval for which the bidder shall furnish along with the offer adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned above together with the complete word to word translation of the standard that are normally not published in English. In the event of any conflict between the Codes and Standards and their requirements of this specification, the requirement of this specification shall govern.

All equipment covered by this specification shall comply with all applicable laws and regulations of the Republic of India.

In case of any change in code, standards and regulations between the date of purchase order and the date when vendors proceeds with fabrication the purchaser shall have the option to incorporate changed requirements without additional commercial implication. It shall be the responsibility of vendor to advise purchaser of the resulting effect.

3.0 DESIGN REQUIREMENTS & CONSTRUCTIONAL FEATURES

3.1 **Casting**

The pump shall be horizontal, positive displacement type, designed for oil service and suitable for occasional dry running. The casing shall also have end plates/pump cover which close the ends of the body to form the pumping chamber. The casing shall house rotating assembly. Gear type with a drive shaft.

3.2 **Rotor**

The rotor shall constitute of a shaft on which either Gear are mounted. The rotating assembly shall be encased in the casing and shall be properly sealed. Mechanical Seal could be offered for sealing purpose. The seal material shall have low coefficient of friction and shall be suitable for the fluid handled.

3.3 **Bearing & Lubrication**

Bearings of adequate design shall be provided for taking the entire pump load arising from all probable conditions for continuous operation throughout its range of operation. The bearing shall be designed on the basis of 20,000 Working hours minimum for the load corresponding to the duty point. Proper Lubricating arrangement for the bearing shall be provided. Bearings shall be easily accessible without disturbing the pump assembly. The pump bearings shall be antifriction ball/ roller type of adequate size to carry both radial and axial loads. Any other type of bearing may be accepted subject to acceptance by customer.

3.4 **Coupling**

The pumps shall be directly coupled to their drives through a flexible coupling. Suitable coupling guards also shall be provided along with the coupling. The pump and its drive motor shall be mounted on machined base frame.

3.5 **Base Frame**

Common/individual base frame shall be provided for pump and motor. The base frame shall be fabricated/casted construction providing rigidity and stability and shall be capable of supporting the weight and reactions of the pump & motor. The base plate will have a drip pan with suitable draining arrangement and shall be suitably drilled for the anchor bolts. The material of construction shall be of tested quality structural steel as per IS-2062 or equivalent.

Anchor bolts, nuts, lock nuts, seating steel work as required shall be supplied with the equipment. Only hexagonal nuts shall be used for holding down the equipment.

3.6 **Lifting Arrangement**

Each pump shall incorporate suitable lifting attachments e.g. lifting lugs or eye bolts etc. to facilitate erection & maintenance.

3.7 **Rating Plates & Name Plate**

Each equipment shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturers name, equipment type or serial number.

4.0 OTHER TECHNICAL / DESIGN & GENERAL REQUIREMENTS

4.1 The data sheets for Pump and motors placed under vol-III of specification forms part of specification. The "*" marked details are to be filled up by the bidder without altering the data already filled up.

4.2 The material of construction of Strainer body will be either ASTM A 106 Gr.B pipe or ASTM A216 WCB or fabricated from IS 2062 plates. However, the exact MOC is subject to acceptance by customer and there will be no additional commercial implication on account of above.

4.3 The driving motor power shall be selected based on highest viscosity of oil. The selection of pump motor rating shall be based on criterion given in the electrical portion of the specification.

4.4 VOID.

4.5 The pump shall be designed for the normal operating temperature specified in the data sheet. However, the pump should be able to perform without any malfunctioning at the maximum temperature also as indicated in the data sheet.

4.6 VOID.

4.7 VOID.

4.8 VOID.

4.9 Pumps shall be designed for smooth pulsation and noise free operation. Pump shall be designed to have maximum efficiency at the normal duty point.

4.10 The design of pump shall be so as to minimize the end thrust.

4.11 The pump shall have minimum vibration, noise and capacity reduction even when the viscosity of oil increases during winter season. The maximum permissible noise level of the pump set shall be 85 dBa measured at a distance of 1 metre horizontal and 1.5 metre vertical from the edge of pump motor set.

4.12 Material of construction for the vital parts shall be as shown in data sheet or elsewhere in the specification. The material of construction of the other parts of the pump shall be subject to Customer's approval during detail engineering and any changes therein as required by the customer shall be provided by the successful bidder without any commercial implication. All materials used for manufacture of the pump and its components shall be of tested quality. Relevant test certificates shall be made available to the purchaser before taking up fabrication work. In the absence of such certificates the vendor shall arrange to carry out necessary tests required by the code at his cost.

4.13 The revision made by successful bidder in any drawings and documents shall be highlighted by indicating the no. of revisions in a triangle without fail so that the minimum time is required by customer to review the drawings and documents.

4.14 If required by the customer during detail engineering, the successful bidder will submit separate drawing of various assembly / sub - assembly in addition to GA drawing without any commercial implication to the customer.

4.15 The recommended civil foundation drawing to be furnished by the bidder during detail engineering shall include the followings:-

a) Scope of work by BHEL and vendor shall be indicated with different legend or in the form of note.

b) Weight of moving parts, its frequency and its height from floor shall be furnished.

c) Recommended location of cable trench for feeding cable to machine along with the details of cable entry.

d) Civil loads per bolt / pocket (static and dynamic) in tabular form considering worst case.

4.16 The successful bidder will have to depute competent designer (s) at BHEL's office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL. However, the vendor will be informed in advance by minimum 7 days.

4.17 All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

4.18 All the drawings and documents including general arrangement drawing, data sheet, calculation etc. shall be furnished to the customer during detailed engineering stage and include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance and information etc.:-

a) All drawings and documents shall bear BHEL's title block and drawing / document number. However, BHEL's drawing / document-numbering scheme shall be furnished to the successful bidder after the placement of L.O.I.

b) All drawings and documents shall indicate the list of all reference drawings including general arrangement.

c) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view of all major self manufactured and bought out items shall be labelled and included in BOQ / BOM in tabular form.

d) Specification of painting shall be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade name.

e) Technical parameters of the equipment (capacity, pressure, fluid handled, vibration limit, noise level at a distance of 1.0 meter at a level of 1.5 meters above ground, details of coupling, details of motor, details of gears of pump, recommended capacity of hoist, weight of heaviest (single) part / component of the equipment and total weight etc.) in general arrangement drawing and these shall be indicated in the drawing with dimensions to the extent possible.

f) The supplier's drawings and data shall set forth overall and detailed dimensions; location and centre lines; pipe conduit and other connections schematic and wiring diagrams; clearance and load points; space required for withdrawal or removal of equipment or parts and such information as will be needed by Owner in order to provide adequate space for and connection to the equipment.

g) Details of cable entry for pump shall be shown in all the 3 views (plan, elevation and side view) indicating dimensions from a reference point.

4.19 All calculations which are required to be submitted shall be done manually and necessarily in SI units and the same shall be furnished along with the copy of authentic supporting literature e.g. Code, Hand book, National / international Standards etc.

5.0 TESTING & INSPECTION AT MANUFACTURE'S WORKS

5.1 VOID

5.2 The supplier shall provide inspection to establish and maintain quality of workmanship in his works and that of his subcontractors to ensure the mechanical accuracy of components, compliance with drawings, identity and acceptability of all materials, part and equipment. He shall conduct all tests required to ensure that the equipment and material furnished shall conform to the requirements of the applicable codes. All tests and test procedure proposed by the manufacturer shall be submitted to the purchaser for his prior approval. The purchaser shall be notified well in advance of the fabrication and major shop test of the equipment for the purpose of making general inspections and for the progress report. The purchaser's representative shall be given full access to the shop in which the equipment is being manufactured or tested and all test records shall be made available to him. A final inspection will be made by the purchaser's representative before the dispatch of the equipment. Final performance tests for the complete units shall be carried out in the presence of purchaser's representative.

All material used for manufacture of the equipment covered under this specification shall be of tested quality. Relevant test certificate shall be made available to the purchaser before the final shop inspection. In case the relevant correlating test certificates are not available, the supplier shall arrange to carry out the necessary tests required by code at his cost.

5.3 Steel forging used in pumps shall be tested for both physical properties and chemical composition.

5.4 The castings shall be sound, clean and free from porosity blowholes, hard duration and other harmful defect.

Areas, which in the opinion of the purchaser will create doubts about soundness to the castings, shall be subjected to dye-penetration test as per ASTM Specification A-165-95.

No welding or repairs shall be carried out without prior permission of the purchaser. The entire surface of the castings shall be subjected to Dye penetrant test as per ASTM A-165-95. Evaluation of indication shall be as per relevant standard.

5.5 Welding procedure, equipment, welders and operators shall be qualified, prior to taking Up any welding. Liquid penetrant examination shall be carried out on the weldments in accordance with the requirement of ASME Code.

The welding procedures shall clearly state the type of material thickness joint details, preheat temperature maintained, post weld heat treatment given, welding current & voltage used during qualification of welding procedure. For all pressure parts and high-pressure weld joints, the latest applicable requirement of the code must be complied with. All records in line with the above shall be maintained and made available to the purchaser. The welding test shall be carried out on the following:

i) Root pass of single groove welded but joint.

ii) Finish surfaces of all fillet weld.

iii) Before weld repair after defect has been rouged out and grounded to ensure removal of defect.

iv) On impellers after any heat treatment.

v) Radiography of butt weld joints shall be carried out in accordance with the relevant code.

5.6 Heat treatment operations including stress relieving shall be performed in accordance with the applicable codes. Recording of temperature with thermocouples placed in direct contact with the job for recording the metal temperature during heat treatment shall be done.

5.7 Ultrasonic examination of pump shaft above 50 mm diameter as per the governing specifications. In absence of these, ultrasonic testing should conform to ASTM A 388 and evaluation of indications as per relevant standard.

5.8 All the impellers shall be statically and dynamically balanced at the operating speed as per the requirement of ISO 1940 G 6.3.

5.9 **Performance Tests**

Performance tests shall be conducted for each of the pump with unit motor at the manufacturer's works in the presence of the purchaser or his authorized agent in accordance with relevant Indian/ equivalent standards. At least 5 points, approximately equally spaced on the characteristic curve including relief valve set pressure, rated flow & pressure shall be tested and acceptance will be determined as per the relevant standard. These tests shall be conducted with actual drive motor being furnished. In general, performance tests shall include the following tests.

a) Establish flow and pressure characteristic

b) Establish flow and power characteristic

c) Establish flow and efficiency characteristic

Purchaser or their authorized representative shall have access to all the tests. Prior intimation shall be given allowing adequate time for preparation of the witness of the test. After the performance testing, the observations noted and the computation of results for rated performance shall be submitted to purchaser for approval. On approval the pump shall be undertaken for strip testing and its components shall be examined for visual and other tests before being taken for dispatch in the presence of purchaser or their authorized inspection agencies.

Test on each pump for vibration level in the transverse, horizontal and vertical directions shall be carried out. Noise level shall be measured at the rated speed. Measurement of oil leakage at seal/stuffing box shall be recorded if any.

5.10 **Test at Site**

The pumps will be tested at site to verify its mechanical performance and checking the vibration and noise level. If the pumps fail to operate smoothly then such deficiencies shall be

rectified by the supplier by making suitable alterations in the pump set and additional tests required to show the effect of such alterations shall be performed by him. The change made in the pump shall be certified with technical back up information to the satisfaction of the purchaser.

5.11 **Performance Guarantee**

The vendor shall *guarantee* the material and workmanship of all equipment as well as the operation of the pump as per requirement of this specification.

The vendor shall also *guarantee* for each pump the discharge pressure at the specified rated capacity and also corresponding efficiency, brake horsepower and relief valve set pressure .

6.0 **CLEANING PROTECTION & PAINTING**

Before shipment of the equipment to be supplied under this specification, internal surfaces of all parts shall be cleaned to remove loose dirt, weld rod stubs and other foreign objects prior to final assembly of the equipment.

Liquid used for hydro testing or cleaning shall be drained from the parts. Excess oil and grease shall be removed by wiping. All openings shall be covered to guard against damage and entrance of foreign objects during shipment. Hydraulic tested parts shall not be packed till the inside surface becomes dry.

Particular care shall be taken to ensure that all foundry sand and loose material is properly removed by fetting.

Ends shall be protected from external damage and sealed against the ingress of dirt.

A thin short steel circular blanking plate of a diameter 1/4" less than the bolt holes inner PCD shall be firmly fixed to the flange faces by the application of adhesive after first ensuring that the flange faces have been thoroughly degreased. A wooden blank should then be bolted to the flange using a minimum of four bolts.

All piping shall be closed after shop assembly by shot blasting or other means approved by owner. Lube oil piping or carbon steel piping shall be pickled.

The metal surface shall be painted with two (2) coats of approved anti-corrosive primer paint as per paint supplier's instruction. All machined surface shall have two (2) coats of water repellent grease after thorough cleaning. All exposed surfaces shall have two (2) coats of approved finish paint in addition to primer as per paint supplier's instruction.

All parts shall be properly boxed, crated or otherwise protected for transportation. All openings should be properly covered before crating/boxing to prevent ingress of dirt/dust/moisture and other undesirables. Spare parts shall be packed for long storage without injury.

For export jobs, seaworthy packing shall be used. Details of Seaworthy packing will be either project specific. In case there is no specification for seaworthy packing, the same shall be furnished by the bidder for BHEL’s approval. However, there will not be any additional cost implication on account of the same.

7.0 **DRAWINGS/DOCUMENTS TO BE SUBMITTED WITH THE BID:**

i) Clarification Schedule as per format given under Vol-III

ii) Deviation Schedule as per format given under Vol-III

8.0 DRAWINGS/DOCUMENTS AND DATA TO BE FURNISHED BY VENDOR AFTER AWARD OF THE CONTRACT.

After award of Contract, the vendor will give following drawings for all the configurations for Pump- Motor Set and Strainers leaving project specific details as blank which can be filled up depending upon project requirement.

i) Fully dimensional outline General Arrangement drawings along with foundation details of the pump with motor assembly unit.

ii) Fully dimensional outline General Arrangement and foundation arrangement drawings of the strainer unit.

iii) Cross sectional drawing of the equipment showing the details of assembly of components and their material of construction with standard applicable codes.

iv) Characteristic curves of pump at minimum, maximum and rated viscosity of oil showing the following:

a) Flow Vs. Pressure

b) Flow Vs. Power

c) Flow Vs. Efficiency

v) Duly filled up data sheet of Pump, Motor

vi) Calculation for selection of Motor Rating

vii) Pressure drop calculation across strainer

viii) Operation maintenance manual .

ix) Quality plans duly corrected in line with customer's comments, if any.

9.0 MANUFACTURERS NAME AND TAG PLATES:

Each pump shall have a permanently attached brass metal tag on the body indicating the following information both in Hindi and English:

a) Manufacturer's name and trade mark.

b) Capacity and Pressure.

c) Design Pressure.

d) Equipment tag no as furnished during the contract.

The equipment tag no will be indicated by the engineer on the drawing submitted for approval by the vendor.

SECTION -II

O & M MANUAL FORMAT

Format for Operation & Maintenance Manual

Project name :
Project number :
Package Name :
PO reference :
Document number :
Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	Cover page				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	Index				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	Description of Plant/System				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				

4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	Operation Guidelines for plant personal/user/operator				
5. 1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5. 2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5. 3	Do's & Don't of the equipments.				
5. 4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5. 5	Parameters to be monitored with normal values and limiting values				
5. 6	Trouble shooting with causes and remedial measures				
5. 7	Routine operational checks, recommended logs & records				
5. 8	Changeover schedule if more than one auxiliary for the same purpose is given				
5. 9	Painting requirement and schedule				
5. 10	Inspection, repair , Testing and calibration procedures				
6.0	Maintenance guidelines for plant personal				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				

6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	**Statutory and other specific requirements considerations.**				
8.0	**List of reference documents**				
9.0	**Binding as per requirement**				

SECTION -II

SITE STORAGE AND PRESERVATION

SITE STORAGE AND PRESERVATION GUIDELINES

FOR

MECHNANICAL BOPs

(Doc No: PE-DC-SSG-A001 REV.00)

PROJECT ENGINEERING MANAGEMENT, POWER SECTOR

BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, loose some of their properties and become unusable due to atmospheric conditions and biological elements.

3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. 'No smoking' signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.

11. Following preservatives/preservation methods can be used depending upon type of equipment

    a. Rust preventive fluid (RPF)

    b. Rust protective paints

    c. Tarpaulin covers, in case of outdoor storage

    d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –

    - Ingress of moisture and corrosion damages.
    - Damage to protective coating.
    - Open ends in pipes, vessels and equipment -
        - In case any open ends are noticed, same shall be capped.

2. Any damages to equipment / materials.

    - In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
    - Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere**. (C)

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.

ii **Semi-closed storage**. (S)

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.

iii Open storage (O)

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.

The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
Raw material /mechanical items like pipes, plates, structure sections etc.)				
1.	Steel pipes (lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
Fabricated mechanical items (pressure vessels, tanks etc.)				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
Mechanical components like valves, fittings, cables glands, spares etc.)				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers(INTERNALS)	S	Damage , packing	
50.	Air conditioners (split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators(CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
Miscellaneous items like chain pulley blocks, hoists etc.				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
Chemicals and consumables (acid, alkali, paints, oils, reagents and special chemicals)				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H_2SO_4)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals(powder)	C	Damage, Packing self-life	
77.	Laboratory chemicals(liquid)	C	Damage, Packing self-life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	**Description of the equipment**	**Type of Storage**	**Check for**	**Remarks**
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
Electrical and C & I items (motors, cables etc.)				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS ,JB	S	Damage, Packing	
95.	Instruments(gauges/analysers)	C	Damage	
Special items		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

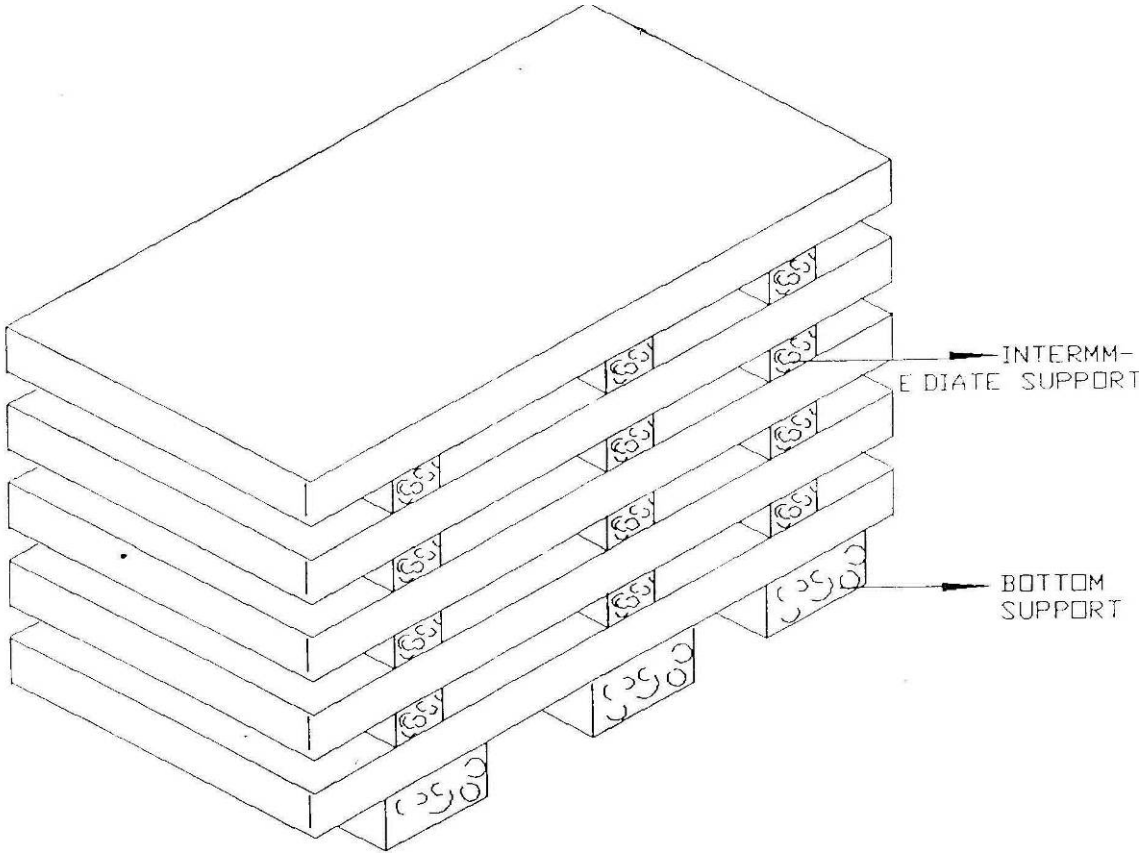

Figure – 1 – PLATE STACKING ARRANGEMENT

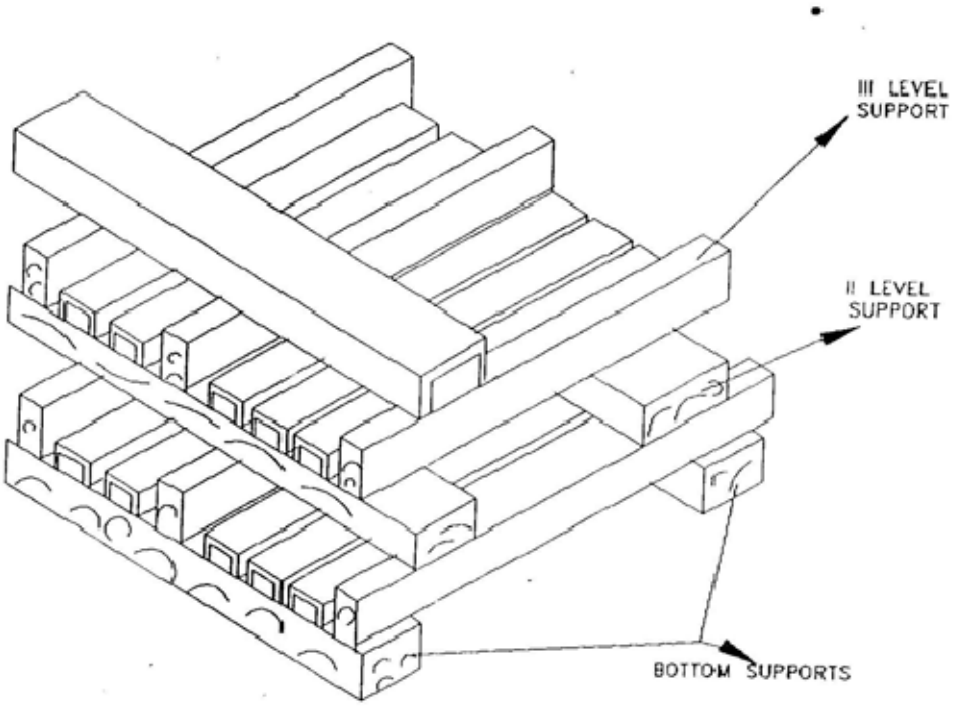

Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT

SECTION -III

DOCUMENTS TO BE SUBMITTED BY BIDDER

SECTION -IIIA

LIST OF DOCUMENTS TO BE SUBMITTED WITH BID

LIST OF DOCUMENTS TO BE SUBMITTED WITH THE BID

a. Prebid clarification schedule as per format given under Section-IIIC, in case of any clarification.

b. Deviation schedule as per format given under Section-IIID, in case of any deviation by bidder.

c. Compliance cum confirmation certificate as given under Section-IIIB.

d. Unpriced price schedule.

In addition to the above, documents required along with bid given under electrical portion of specification shall be furnished by bidder.

NOTES:

- OFFER WILL BE CONSIDERED AS INCOMPLETE IN ABSENCE OF ANY OF THE ABOVE DOCUMENTS.

- DOCUMENTS OTHER THAN ABOVE, IF ANY, SUBMITTED WITH THE OFFER WILL NOT FORM PART OF CONTACT AND ACCORDINGLY WILL NOT BE CONSIDERDE FOR BID EVALUATION

SECTION -IIIB

COMPLIANCE CUM CONFIRMATION CERTIFICATE

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate (every sheet) and furnish same with the offer.

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions other than those mentioned under "exclusion" in section C and those resolved as per 'Schedule of Deviations', if applicable, with regard to same.

b) There are no other deviations w. r. t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'.

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.

d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified/ intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre - bid discussions, otherwise BHEL/ Customer's decision shall be binding on the bidder whenever the deficiency is pointed out for components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.

g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.

h) Guarantee for plant /equipment shall be as per relevant clause of GCC /SCC /Other Commercial Terms & Conditions.

i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price and within purview of the tender specification even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities.

j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

k) As built drawings shall be submitted as and when required during the project execution.

l) The bidder has not tampered with this compliance cum confirmation certificate and if at any stage any tampering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

m) All technical deviations (if any) have been indicated in technical deviation schedule. Any commercial deviation/ document shall not be considered during technical evaluation. However, if any issue in the commercial documents / deviation related to technical requirements needs to be highlighted and resolve in technical evaluation only.

n) No aspect of commercial issues needs to be highlighted / resolved in technical evaluation and their offer is strictly in compliance with technical specification. Any technical deviations (e.g. related to MDL, required documentation etc. for completion of the project) raised by them in commercial deviation either explicit or implicit shall be considered null and void even if agreed by BHEL during commercial evaluation stage.

o) Bidder agreed to confirm and compliance with technical specification and subsequent clarification on bids during pre- award discussion

SECTION -IIIC

PRE- BID CLARIFICATION SCHEDULE

PRE-BID CLARIFICATION SCHEDULE

S. No.	Section/Clause /Page No.	Statement of the referred clause	Clarification Required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

SECTION -III D

SCHEDULE OF TECHNICAL DEVIATION

DEVIATION SHEET (COST OF WITHDRAWL)

PACKAGE:- LUBE OIL TRANSFER PUMPS

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	**DESIGNATIONS**	**SIGN & DATE**	

NOTES:

1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawl of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.
14. In case of descrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

SECTION -III E

ELECTRICAL LOAD DATA

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.	VERIFICATION FROM MOTOR DATASHEET (Y/N)	KKS NO
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
ANNEXURE-II																				
CLEAN OIL TRANSFER PUMP	3.7KW		-	1	-	D	U	-	-	-	TG Hall									
DIRTY OIL TRANSFER PUMP	3.7KW		-	1	-	D	U	-	-	-	TG Hall									

NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER

2. ABBREVIATIONS : * VOLTAGE CODE (7): - (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V

: ** FEEDER CODE (8): - U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

	LOAD DATA (ELECTRICAL)	JOB NO.	445	ORIGINATING AGENCY		PEM (ELECTRICAL)
		PROJECT TITLE	SAGARDIGHI THERMAL POWER PROJECT,1X 660 MW UNIT NO.5, PHASE-III	NAME		DATA FILLED UP ON
		SYSTEM	LUBE OIL TRANSFER PUMP	SIGN.		DATA ENTERED ON
		DEPTT. / SECTION	MAUX	SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE