Bid Number/बोली क्रमांक (बिड संख्या): GEM/2023/B/4133312
Dated/दिनांक : 26-10-2023

Bid Document/ बिड दस्तावेज़

Bid Details/बिड विवरण	
Bid End Date/Time/बिड बंद होने की तारीख/समय	06-11-2023 15:00:00
Bid Opening Date/Time/बिड खुलने की तारीख/समय	06-11-2023 15:30:00
Bid Offer Validity (From End Date)/बिड पेशकश वैधता (बंद होने की तारीख से)	80 (Days)
Ministry/State Name/मंत्रालय/राज्य का नाम	Ministry Of Heavy Industries And Public Enterprises
Department Name/विभाग का नाम	Department Of Heavy Industry
Organisation Name/संगठन का नाम	Bharat Heavy Electricals Limited (bhel)
Office Name/कार्यालय का नाम	10250020-pem, Noida
Total Quantity/कुल मात्रा	3
Item Category/मद केटेगरी	Main Supply -Sump Pumps/Submersible Pumps (Q3) , Sump Pumps -Mandatory Spares (Q3)
MSE Exemption for Years of Experience and Turnover/ अनुभव के वर्षों से एमएसई छूट	No
Startup Exemption for Years of Experience and Turnover/ अनुभव के वर्षों से स्टार्टअप छूट	No
Document required from seller/विक्रेता से मांगे गए दस्तावेज़	Additional Doc 1 (Requested in ATC),Compliance of BoQ specification and supporting document *In case any bidder is seeking exemption from Experience / Turnover Criteria, the supporting documents to prove his eligibility for exemption must be uploaded for evaluation by the buyer
Bid to RA enabled/बिड से रिवर्स नीलामी सक्रिय किया	Yes
RA Qualification Rule	H1-Highest Priced Bid Elimination
Type of Bid/बिड का प्रकार	Two Packet Bid
Primary product category	Main Supply -Sump Pumps/Submersible Pumps
Time allowed for Technical Clarifications during technical evaluation/तकनीकी मूल्यांकन के दौरान तकनीकी स्पष्टीकरण हेतु अनुमत समय	7 Days
Inspection Required (By Empanelled Inspection Authority / Agencies pre-registered with GeM)	No

Bid Details/बिड विवरण	
Payment Timelines	Payments shall be made to the Seller within **90** days of issue of consignee receipt-cum-acceptance certificate (CRAC) and on-line submission of bills (This is in supersession of 10 days time as provided in clause 12 of GeM GTC)
Evaluation Method/मूल्यांकन पद्धति	Total value wise evaluation

EMD Detail/ईएमडी विवरण

Required/आवश्यकता	No

ePBG Detail/ईपीबीजी विवरण

Advisory Bank/एडवाइजरी बैंक	State Bank of India
ePBG Percentage(%)/ईपीबीजी प्रतिशत (%)	5.00
Duration of ePBG required (Months)/ईपीबीजी की अपेक्षित अवधि (महीने).	26

(a). EMD & Performance security should be in favour of Beneficiary, wherever it is applicable./ईएमडी और संपादन जमानत राशि, जहां यह लागू होती है, लाभार्थी के पक्ष में होनी चाहिए।

Beneficiary/लाभार्थी :

PEM Noida
10250020-PEM, Noida, Department of Heavy Industry, Bharat Heavy Electricals Limited (BHEL), Ministry of Heavy Industries and Public Enterprises A/c No. -39922687394 IFSC code-SBIN0017313 Branch- CAG II NEW DELHI (Bhel)

Splitting/विभाजन

Bid splitting not applied/बोली विभाजन लागू नहीं किया गया.

MSE Purchase Preference/एमएसई खरीद वरीयता

MSE Purchase Preference/एमएसई खरीद वरीयता	No

Details of the Competent Authority for MSE

Name of Competent Authority	Rahul Bhatnagar
Designation of Competent Authority	Mgr
Office / Department / Division of Competent Authority	BHEL PEM Noida
CA Approval Number	123

Competent Authority Approval Date	25-10-2023
Brief Description of the Approval Granted by Competent Authority	Being non divisible quantity, MSE preference shall not be given as per internal policy.

Competent Authority Approval for not opting Micro and Small Enterprises Preference : View Document

Reserved for Make In India products

Reserved for Make In India products	Yes

1. Bid reserved for Make In India products: : Procurement under this bid is reserved for purchase from Class 1 local supplier as defined in public procurement (Preference to Make in India), Order 2017 as amended from time to time and its subsequent Orders/Notifications issued by concerned Nodal Ministry for specific Goods/Products. However, eligible micro and small enterprises will be allowed to participate. The minimum local content to qualify as a class 1 local supplier is denoted in the bid document. All bidders must upload a certificate from the OEM regarding the percentage of the local content and the details of locations at which the local value addition is made along with their bid, failing which the bid is liable to be rejected. In case the bid value is more than Rs 10 Crore, the declaration relating to percentage of local content shall be certified by the statutory auditor or cost auditor, if the OEM is a company and by a practicing cost accountant or a chartered accountant for OEMs other than companies as per the Public Procurement (preference to Make-in -India) order 2017 dated 04.06.2020 . In case Buyer has selected Purchase preference to Micro and Small Enterprises clause in the bid, the same will get precedence over this clause.
2. Estimated Bid Value indicated above is being declared solely for the purpose of guidance on EMD amount and for determining the Eligibility Criteria related to Turn Over, Past Performance and Project / Past Experience etc. This has no relevance or bearing on the price to be quoted by the bidders and is also not going to have any impact on bid participation. Also this is not going to be used as a criteria in determining reasonableness of quoted prices which would be determined by the buyer based on its own assessment of reasonableness and based on competitive prices received in Bid / RA process.

3. Reverse Auction would be conducted amongst all the technically qualified bidders except the Highest quoting bidder. The technically qualified Highest Quoting bidder will not be allowed to participate in RA. However, H-1 will also be allowed to participate in RA in following cases:

i. If number of technically qualified bidders are only 2 or 3.
ii. If Buyer has chosen to split the bid amongst N sellers, and H1 bid is coming within N.
iii. In case Primary product of only one OEM is left in contention for participation in RA on elimination of H-1.
iv. If L-1 is non-MSE and H-1 is eligible MSE and H-1 price is coming within price band of 15% of Non-MSE L-1
v. If L-1 is non-MII and H-1 is eligible MII and H-1 price is coming within price band of 20% of Non-MII L-1

Main Supply -Sump Pumps/Submersible Pumps (2 pieces)

(Minimum 50% Local Content required for qualifying as Class 1 Local Supplier)

Technical Specifications/तकनीकी विशिष्टियाँ

Buyer Specification Document/क्रेता विशिष्टि दस्तावेज़	Download

Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Dinesh Kumar Vaishy	208020,Construction Manager, Bharat Heavy Electricals Limited c/o Chief Engineer (Projects), UPRVUNL PANKI TPS EXTENSION Panki , Dist. Kanpur (U.P) Pin-208020 (Uttar Prades)h	2	170

Sump Pumps -Mandatory Spares (1 set)

(Minimum 50% Local Content required for qualifying as Class 1 Local Supplier)

Technical Specifications/तकनीकी विशिष्टियाँ

Buyer Specification Document/क्रेता विशिष्टि दस्तावेज़	Download

Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Dinesh Kumar Vaishy	208020,Construction Manager, Bharat Heavy Electricals Limited c/o Chief Engineer (Projects), UPRVUNL PANKI TPS EXTENSION Panki , Dist. Kanpur (U.P) Pin-208020 (Uttar Prades)h	1	260

Buyer Added Bid Specific Terms and Conditions/क्रेता द्वारा जोड़ी गई बिड की विशेष शर्तें

1. **Generic**

   OPTION CLAUSE: The Purchaser reserves the right to increase or decrease the quantity to be ordered up to 25 percent of bid quantity at the time of placement of contract. The purchaser also reserves the right to increase the ordered quantity by up to 25% of the contracted quantity during the currency of the contract at the contracted rates. Bidders are bound to accept the orders accordingly.

2. **Inspection**

   Nominated Inspection Agency: On behalf of the Buyer organization, any one of the following

Inspection Agency would be conducting inspection of stores before acceptance:
Pre-dispatch Inspection at Seller Premises (applicable only if pre-dispatch inspection clause has been selected in ATC):

at vendor's works

Post Receipt Inspection at consignee site before acceptance of stores:
NA

3. **Certificates**

   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.

4. **Generic**

   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 %.

5. **Buyer Added Bid Specific ATC**

   Buyer uploaded ATC document Click here to view the file.

6. **Generic**

   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.

Disclaimer/अस्वीकरण

The additional terms and conditions have been incorporated by the Buyer after approval of the Competent Authority in Buyer Organization, whereby Buyer organization is solely responsible for the impact of these clauses on the bidding process, its outcome, and consequences thereof including any eccentricity / restriction arising in the bidding process due to these ATCs and due to modification of technical specifications and / or terms and conditions governing the bid. Any clause(s) incorporated by the Buyer regarding following shall be treated as null and void and would not be considered as part of bid:-

1. Definition of Class I and Class II suppliers in the bid not in line with the extant Order / Office Memorandum issued by DPIIT in this regard.
2. Seeking EMD submission from bidder(s), including via Additional Terms & Conditions, in contravention to exemption provided to such sellers under GeM GTC.
3. Publishing Custom / BOQ bids for items for which regular GeM categories are available without any Category item bunched with it.
4. Creating BoQ bid for single item.
5. Mentioning specific Brand or Make or Model or Manufacturer or Dealer name.
6. Mandating submission of documents in physical form as a pre-requisite to qualify bidders.
7. Floating / creation of work contracts as Custom Bids in Services.
8. Seeking sample with bid or approval of samples during bid evaluation process.
9. Mandating foreign / international certifications even in case of existence of Indian Standards without specifying equivalent Indian Certification / standards.
10. Seeking experience from specific organization / department / institute only or from foreign / export experience.
11. Creating bid for items from irrelevant categories.
12. Incorporating any clause against the MSME policy and Preference to Make in India Policy.
13. Reference of conditions published on any external site or reference to external documents/clauses.

14. Asking for any Tender fee / Bid Participation fee / Auction fee in case of Bids / Forward Auction, as the case may be.

Further, if any seller has any objection/grievance against these additional clauses or otherwise on any aspect of this bid, they can raise their representation against the same by using the Representation window provided in the bid details field in Seller dashboard after logging in as a seller within 4 days of bid publication on GeM. Buyer is duty bound to reply to all such representations and would not be allowed to open bids if he fails to reply to such representations.

This Bid is also governed by the General Terms and Conditions/ यह बिड सामान्य शर्तों के अंतर्गत भी शासित है

In terms of GeM GTC clause 26 regarding Restrictions on procurement from a bidder of a country which shares a land border with India, any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority. While participating in bid, Bidder has to undertake compliance of this and any false declaration and non-compliance of this would be a ground for immediate termination of the contract and further legal action in accordance with the laws./जेम की सामान्य शर्तों के खंड 26 के संदर्भ में भारत के साथ भूमि सीमा साझा करने वाले देश के बिडर से खरीद पर प्रतिबंध के संबंध में भारत के साथ भूमि सीमा साझा करने वाले देश का कोई भी बिडर इस निविदा में बिड देने के लिए तभी पात्र होगा जब वह बिड देने वाला सक्षम प्राधिकारी के पास पंजीकृत हो।बिड में भाग लेते समय बिडर को इसका अनुपालन करना होगा और कोई भी गलत घोषणा किए जाने व इसका अनुपालन न करने पर अनुबंध को तत्काल समाप्त करने और कानून के अनुसार आगे की कानूनी कार्रवाई का आधार होगा।

---Thank You/धन्यवाद---

Index of Annexures

GeM Tender Enquiry for Sump Pumps for
1x 660 MW Panki Project

Sl. No.	Description	Annexures
1.	Additional terms and conditions (ATC)	Annexure I
2.	BOQ	Annexure II
3.	Delivery Schedule	Annexure III
4.	Land border certificate	Annexure IV
5.	Certificate for local Content	Annexure V
6.	Technical PQR	-
7.	Technical Specification	-
8.	NTPC Sub vendor questionnaire	-

ANNEXURE –I (Sump Pumps)

Additional Terms and Conditions (ATC)

Additional Terms and Conditions for subject Tender Enquiry to be complied by Bidders for Consideration in this tender:

1. **Dispatch Markings: -**

   Each box shall be marked with Capital Letters in "Red" indicating the PEM supply (Main Supply/ Commissioning spare/ Mandatory Spare) for 1x 660 MW Panki Thermal Power Station Project. Each package delivered under the Contract shall be marked by Supplier and such marking must be distinct and in English Language (all previous irrelevant markings being carefully obliterated). Such marking shall show the description and quantity of contents, the name and address of consignee, the Gross weight and Net weight of the package, the name of the Supplier, PEM P.O. reference number, with a distinctive number of mark sufficient for purposes of identification. Besides above necessary, packing shall bear a special marking `TOP', `BOTTOM', 'DO NOT TURN OVER", "KEEP DRY", "HANDLE WITH CARE", etc.

   IMPORTANT

   - Two copies of respective standard manufacturer's erection instruction/operation instruction manual shall be kept in each package / container for immediate reference by BHEL site and same shall be reflected in packing slip also
   - The Packing list details for the consignment must be put inside the Box/Boxes.

   Commissioning Spares (if any): - 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 Box.

   Mandatory Spares: - The Mandatory spares shall be properly packed separately in separate box 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 CUSTOMER 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 MAHAGENCO. 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. Main Supply items, items for comm. Spares and Mandatory Spares must be packed separately.

2. **Liquidated Damages: -**

   a) **Main Supply:-** 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 excluding GST, of the total main supply & commissioning spares (as applicable) contract price excluding GST per week or part thereof, subject to a maximum of ten (10) percent of the total main supply & commissioning Spares (as applicable) 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.

ANNEXURE –I (Sump Pumps)

Additional Terms and Conditions (ATC)

b) b) **LD on mandatory spares portion:** - LD shall be applicable @ ½ percent and applicable GST thereon, of the total mandatory spares portion contract value excluding GST per week or part thereof, limiting to 10% of total contract value of mandatory spares excluding GST.

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.

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.

3. Risk & Cost Purchase

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-à-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.

ANNEXURE –I (Sump Pumps)

Additional Terms and Conditions (ATC)

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.

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.

3.1 **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).

3.2 *** 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.

ANNEXURE –I (Sump Pumps)

Additional Terms and Conditions (ATC)

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.

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

LD against delay in executed work shall be calculated in line with above LD clause, 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.

3.4 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.

ANNEXURE –I (Sump Pumps)

Additional Terms and Conditions (ATC)

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

4. For recognition of dispatch, vendor to submit following documents to BHEL by e-mail immediately on dispatch: - GST compliant invoice, LR (indicating Invoice No., no. of boxes, PTL (if applicable) etc.), 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

ANNEXURE –I (Sump Pumps)

Additional Terms and Conditions (ATC)

Following ATC available in GEM shall also be made part of NIT: -

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. 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. 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. The bidder is required to upload, along with the bid, all relevant certificates such as BIS license, type test certificate, approval certificates and other certificates as prescribed in the Product Specification given in the bid document.

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.

ANNEXURE –I (Sump Pumps)

Additional Terms and Conditions (ATC)

Additional Terms and Conditions for subject Tender Enquiry to be complied by bidders for consideration in this tender:

A. 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. In case the same is found not available, BHEL has the right to reject such document from evaluation.

B. "This item /package/system falls under the list of items defined in para 3 of ministry of finance guideline date 20.09.16 (procurement of items related to public safety, health, critical security operations and Equipment's etc.) & hence criteria of prior experience /turnover shall be same for all bidders including start up /MSME".

C. **Guarantee & Warrantee** shall be as per Cl. No. 10 of GTC on GeM for the bid. However, Guarantee & Warrantee time period shall be 18 months from the date of last supply in the contract.

D. Evaluation shall be on the basis of total all inclusive, landed price at consignee destination (Refer Cl. No. 6 of GTC on GEM).

E. **Terms of Delivery**: FOR Dispatch Station Basis. However, Transit insurance shall be in the scope of seller and unloading of items (at delivery point) shall be in buyer scope. Further, w.r.t. Transit Insurance supplier has to inform the details of dispatches (such as Policy No., Consignee Name, Consignment Packing details, Project Name, Purchase Order No., LR No. & date, Invoice No. & date, Dispatch Origin & destination details etc.) to policy underwriter under intimation to BHEL.

F. PQR criteria uploaded with Buyer uploaded Bid Specific document shall prevail value of Experience criteria and Past performance parameter mentioned in GeM bid.

G. **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 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.

H. All Bidders shall be required to submit applicable Freight % & GST % included in their prices, during clarification stage of Tender.

ANNEXURE –I (Sump Pumps)

Additional Terms and Conditions (ATC)

I. Performance Bank Guarantee: shall be as per Cl. No. 7 of GTC of GeM. Performance Security amount shall be @5% of the value of contract value.

J. **Payment Terms:** For Main Supply- As per clause no. 12 (i) of GTC on GeM. Payments shall be made to the Seller within 90 days (45 days for seller qualified and registered as Micro or small and 60 days for Medium enterprises as per MSMED Act.) of issue of consignee receipt-cum-acceptance certificate (CRAC) and on-line submission of bills (This is in supersession of 10 days' time as provided in clause 12 of GeM GTC). Supplier has to provide original+1 copy of Tax invoice, Packing List, LR/RR or AWB, CRAC, Insurance intimation, Guarantee Certificate, E-way bill (as applicable) for payment. Further, bidder to submit the final documents (O&M Manual, Final drgs & Inspection document) in 12 no.s of hard copies and 04 no.s of CD along with Invoice.

For Mandatory Spares: - Payment terms shall remain same as above, however no final docs required.

Provision of offline payment in GeM shall be utilized.

K. **Bid reserved for Make in India products: -** For subject tender, only Class I and class II local suppliers are eligible to bid as per para no. 5 of PPP-MII circular no P-45021/2/2017-PP (BE-II) Dtd-16-09-2020. In case of subsequent orders issued by 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".

Purchase Preference -As per of Public Procurement (Preference to Make in India), (PPP-MII) Order 2017 dt. 16/09/2020 issued by DPIIT.

The local supplier at the time of tender, bidding, solicitation, shall be required to provide self-certification that as per the offered item, they meet the requirements of Class I local supplier (the minimum local content to qualify as a class 1 local supplier is denoted in the bid document as 50%) as per the provisions of PPP-MII Order of Govt. of India and relevant circulars issued by nodal ministry w.r.t. above mentioned orders and shall give details of location(s) at which the local value addition is made in annexure V.

L. **This is conditional tender enquiry. Financial bid opening (Part-II) of a bidder shall be subjected to following: -**

(i) Techno-Commercial evaluation/recommendation by BHEL
(ii) Qualification of Technical PQR
(iii) Offered item should mandatorily conform to PP-MII order provisions.
(iv) Approval of bidder by Customer (NTPC/UPRVUNL)- Bidders offering pumps having motor rating upto 45 KW are considered as end customer approved bidders, for other case vendor approval from end customer shall be sought based on the credentials submitted by bidders as per NTPC sub vendor questionnaire.

M. **Consignee Details** (for PRC - Provisional Receipt Certificate & CRAC - Consignee's Receipt cum Acceptance Certificate, as applicable) shall be as per Project Site official details.

N. The Bidder has to 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.

O. Bidders to ensure the following: -

• Ensure compliance to Ministry of Power (MoP) 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-IV** of Ministry of Finance (MoF) Order (Public Procurement No. 1 & 2) F. No. 6/18/2019/PPD dt. 23/07/2020, 08/02/21, 06/09/22 & 23.02.23. Bidder to submit the following undertaking on their letter head duly signed from the highest competent authority at your end (i.e Owner, partner, CMD, Director etc.)

P. Delivery Period: As per attached Annexure-III.

Q. 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.

R. Quantity Variation shall be limited to +/-10%.

S. CIF is not applicable for subject tender.

T. PVC shall not be applicable for subject package

U. MSE Preference: - Subject package is not divisible and accordingly MSE preference shall not be given.

V. Bidder to note the following: -

A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Procuring Entity's interests. The bidder found to have a conflict of interest shall be disqualified. A bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if:

- they have controlling partner (s) in common;' or
- they receive or have received any direct or indirect subsidy/ financial stake from any of them; or
- they have the same legal representative/agent for purposes of this bid; or
- they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder; or
- Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid, or
- In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorize only one agent/dealer. There can be only one bid from the following:

  1. The principal manufacturer directly or through one Indian agent on his behalf; and
  2. Indian/foreign agent on behalf of only one principal,'

  or
- A Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid, or

ANNEXURE –I (Sump Pumps)

Additional Terms and Conditions (ATC)

- In case of a holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business. "

W. Prices of Mandatory Spares shall be obtained in 01 lot in GeM portal as per BOQ, however L1 bidder to furnish the breakup of same before PO placement.

X. All other terms & conditions shall be as per GeM bid, selected Additional Terms & Conditions from GeM library and GTC on GeM 4.0 (version 1.12) available on GeM Portal on enquiry floating date shall be applicable.

1 X 660 MW UPRVUNL Panki TPS

ANNEXURE - II TO BOQ CUM UNPRICE SCHEUDLE FOR SUMP PUMP

SL. NO.		DESCRIPTIONS OF WORKS OR EQUIPMENT	UNIT	QTY	HSN Code	UNIT EX-WORKS PRICE (INR)	TOTAL EX-WORKS PRICE (INR)	FREIGHT RATE @.....% OF TOTAL EX-WORKS PRICE	FREIGHT CHARGES (INR)	TOTAL EX-WORKS PRICE + FREIGHT CHARGES (INR)	APPLICABLE GST RATE @.....% ON (TOTAL EX WORKS PRICE + FREIGHT)	TOTAL GST AMOUNT (INR)	TOTAL PRICE F.O.R. (INR)
	Total price for design, manufacture, assembly, inspection, testing, packed for transportation and delivery including special tools/tackles, and standard & special accessories, etc. and Mandatory Spares as specified and necessary in Technical specification (No: PE-TS-426-100-N002A Rev 00) for SUMP PUMPS:												
		Vertical Wet pit type Sump Pumps											
	1	Sump Pump price:	No's	2	84137010								
	2	Mandatory Spares	Lot	1	84139120								
		Breakup of Mandatory spare											
	2(a)	Terminal plates	10 Nos. each for small motors upto 30 kW & 4 Nos. each for more than 30 Kw	1									
	2(b)	Heaters	2 sets	1									
	2(c)	Greasing arrangements	4 sets each type of motor	1									
	2(d)	Motor of each type and rating	10% of the installed quantity or minimum 1 number whichever be higher	1									
	2(e)	Bearings (DE and NDE) for each type and rating of motors.	4 sets	1									
	2(f)	Stator winding coils for all type of LT motors	One (1) set	1									
	2(g)	Dust seals and gaskets for each type of motors	Three (3) sets	1									
TOTAL OF MAIN SUPPLY + MANDATORY SPARES (1+2)													

NOTES:

a) Deleted.

b) Price of commissioning & erection spares, special Tools & tackle and other accessories not listed above shall be included in the price of sump pump & shall be supplied with the Sump pump.

c) Deleted.

d) Please refer technical specification for detail.

e) Mandatory Spare Note:
1. Spares not applicable for the Package to be specifically quoted as “NOT APPLICABLE”.
2. In case if such items of spares indicated as “not applicable” by bidder in its offer, are found applicable at a later date during execution of the project, such items of spares are to be supplied within the ordered cost of the mandatory spares.
3. Wherever % is indicated for the mandatory spares, the quantity shall be calculated for % of supply for total quantity for station, unless otherwise specified. The quantity to be reckoned for % indicated shall be rounded off to the next higher whole number. For example if the % arrived is 0.2 the quantity to be supplied shall be 1 and if the % arrived is 5.1 the quantity to be supplied shall be 6.
4. In respect of quantity mentioned as 'Set' means the total quantity of all the components/items used in particular equipment unless otherwise specified.

Bidder shall furnish this price Schedule indicating "Quoted/Not-Quoted" along with technical offer and actual prices in his price offer.

NAME	DESIGNATION

Annexure III to Delivery terms

1. **Delivery Schedule**

   a. **Main Supply including quantity variation:** Delivery completion for Main supply shall be 170 days from the PO date.

   b. **Mandatory Spares** 90 days from BHEL clearance.

   List of applicable drawings/ documents as per Section-IA of Technical Specification No. of PE-TS-426-100-N002A (REV. 0) shall be considered for delivery and their submission / re-submission schedule shall be as follows: -

   1st submission of drawings / documents – 15 days

   BHEL comments – 10 days

   Re-submission of drawings / documents – 7 days

   BHEL & Customer comments / approval – 18 days

   All the documents except O&M Manual of Sump Pumps (PE-V8-426-100-N006A) are primary documents. O&M Manual of Sump Pump is secondary document.

Notes:

a. Supplier to start manufacturing/supply only after getting the applicable engineering drgs. /docs approved from BHEL/End Customer.

b. Drawings /documents submission/re-submission schedule shall be as indicated in technical specification which shall be used for progress monitoring purpose and required course correction, if any.

c. The delivery date specified is for completion of the deliveries. Deliveries to start progressively so as to meet the completion schedule.

d. The delivery conditions specified are for contractual purposes. However, to meet project requirement, BHEL may ask for early deliveries without any compensation thereof.

2. **Validity of contract (PO rates, terms and conditions):** Vendor has to make supply of goods/services as per the delivery time mentioned above. However, due to unavoidable circumstances if delay happens in providing inputs/ clearances (inputs, Engineering approvals, deputing inspector for inspection, issuance of MDCC and any hold imposed owing to site issues etc.) for which delivery time extension is admissible as per point no.3, in such situation it shall be obligatory at vendor part to execute the contract at PO rates, terms and conditions where inputs/ clearances has been accorded within validity of contract. Validity period for various activities shall be as defined below or as mentioned in the NIT.

   2.1. Validity of the contract for main supply including quantity variation.

   - Contract shall be valid for 365 days from the PO date. However, delay at vendor's end (if any) shall be added to the validity period and contract validity shall get extended by the delay period at vendor's end.

Annexure III to Delivery terms

For example: Original Delivery period for main supply: A (in days)
Delay at vendor's end: B (in days beyond "A" days)
Contract validity: C+B (in days)

2.2. Validity of the contract for supply of mandatory spares:

- Validity of contract for supply of mandatory spares applicable in the contract shall be one year over and above contractual validity period for main supply including quantity variation as specified at point no. 2.1 above.

Notes:

a. B is the Vendor delay days beyond original contractual delivery period for main supply /extended delivery period owing to time taken by BHEL at point no. 2 above.

b. Main supply including quantity variation and mandatory spares applicable in the contract released/ cleared for manufacturing within contractual validity period, to be supplied by vendor/supplier at PO rates, terms and conditions.

c. Execution of the contract quantities released beyond contract validity period shall be decided on mutual consent basis at PO rates, terms and conditions.

3. Delivery Extension: Extension of contractual delivery time:

Delivery time mentioned in the NIT includes Engineering completion time (time for drawing/document submission/resubmission by the vendor and review/approval of the same by the BHEL/End customer), manufacturing, inspection, Packing and dispatch time. Due diligence is to be observed by the vendor to ensure timely completion of engineering and supply.
During the execution of the contract, time loss occurred owing to the reason attributable to BHEL besides force majeure shall be considered for delivery time extension to the vendor as given below: -

i. Any Delay in providing comments/ approval on Primary drawing/documents beyond the stipulated time as specified in NIT.

ii. Time Loss in approval of the drawing/document as a result of increase in the iteration not attributable to the vendor (i.e. resubmission owing to end customer comments) as certified by BHEL. Time extension equivalent to the resubmission time noted in the tech. spec and consequential increase in the approval time in lieu of increase in iteration shall be applicable. However, for incomplete re- submission time loss shall be in vendor account.

iii. Delay in providing engineering input/material by BHEL.

iv. Delay in deputing inspector for inspection and delay in release of MDCC in line with GCC/ GEM ATC terms.

v. Any hold put by BHEL for whatever reasons during execution of contract (within contract validity period), time extension equivalent to hold period shall be admissible. However, in the event hold period continues for more than 30 days then, an additional fifteen days for the purposes of mobilization and demobilization of resources shall also be admissible.

Note: Extension in delivery period if any with or without imposition of LD shall be considered after detailed delay analysis based on provisions given above. However, no delay analysis will be applicable if supply is completed within delivery schedule as specified in Purchase order.

Annexure IV

An undertaking regarding Model Clauses on company letter head only

(To be provided along with bid)

Reference: NIT No.-

Package: - Sump Pumps

Project: 1x 660 MW PANKI TPS

TO WHOM SO IT MAY CONCERN

This is with reference to Ministry of Finance circular dated 23.07.20, 08.02.21, 06.09.22 & 23.02.23 reg. restriction under rule 144 (xi) of GFR.

"I have read the clause 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 such a country and is eligible to be considered/participate in tender enquiry for against aforesaid tender enquiry.

Sign & Signature (Not below Director/owner of the company)

Date:

Place:

ANNEXURE V
1x 660 MW PANKI TPS
Sump Pumps

Letter head of Company

Ref……. Date……..

To,
Bharat Heavy Electricals Limited
PEM, PPEI Building, Plot No 25,
Sector -16A, Noida (U.P) -201301

Subject: - Certification regarding local content

Reference: Tender Enquiry No-……

Name of Package: Sump Pumps

Dear Sir,

We hereby certify that items offered by us of Sump Pumps for 1x 660 MW Panki Project ……..(minimum % of local content) meets the requirement of minimum local content in line with applicable clause of Make In India and the Public Procurement (Preference to Make in India), Order 2017 dated-15.06.2017, 28.05.2018 & 29.05.2019, 04.06.20, 16.09.20 and subsequent order dated 16.11.21.

We further confirm that details of location at which the local value addition is made will be our registered works at ……(address of the works)

Yours very truly

……. (authorized signatory of company)

…… (firm name)

authorized signatory
of company

FORM NO. PEM 6100-9

BHEL	PRE - QUALIFYING REQUIREMENTS (TECHNICAL)--SUMP PUMPS/SUBMERSIBLE PUMPS	TECHNICAL SPECIFICATION NO: TECHNICAL PQR NO: REV NO. DATE STANDARD PQR NO: PE-PQ-STD-100-N001 REVISION NO: 02 DATE: 22.02.2020 SHEET: 1 of 2

ENQUIRY NO:

PROJECT: 1x660 MW PANKI TPS

PACKAGE: SUMP PUMPS/ SUBMERSIBLE PUMPS

1. The bidder should have designed, manufactured, tested, inspected & supplied the Submersible pumps and sump pumps (as applicable) with minimum 5.5 KW rating for fixed/portable type, which have been successfully in use for at least 1 year in thermal power plant or similar industry/ application and bidder is in business of Submersible pumps/ sump pumps (as applicable) on continuous basis.

2. The Bidders shall furnish following support documents for assessment of Bidder w.r.t. PQR as indicated at Sl. No. 1 above:

A. Bidder's Experience list of Submersible pumps/ sump pumps (as applicable) for last 5 years (as on enquiry/NIT date) for assessment of bidder for supplying the Submersible pumps and sump pumps (as applicable) on regular basis for establishing business continuity in enclosed format- Annexure-1.

Bidder shall furnish the PO copy of at least one (1) executed Contract as indicated in the experience list.

B. Bidder shall furnish any one from below in support of successful performance of Submersible pumps/ sump pumps (as applicable) for one year:

i. Satisfactory Performance feedback certificates from End Customer (Owner) (in English) for at least one successfully executed contract which has been in use for at least One year indicating salient features like year of commissioning of Submersible pumps and sump pumps (as applicable), rating of project, Flow, head & rating of Submersible pumps and sump pumps (as applicable), project name etc., date of issue of certificate and name/ designation of the certificate issuer for power plant/similar application industry. The time duration of satisfactory performance completion should be before the date of subject enquiry/NIT.

OR

ii. The bidder has been awarded One repeat contract for Submersible pumps and sump pumps (as applicable) from End Customer (Owner) / Purchaser (in English) for power plant/similar application industry. Repeat contract shall be considered when the second contract is given by the same purchaser/ owner after lapse of minimum 1 year from execution (viz. supply) of first contract. Supporting documents for execution of the Contract like dispatch [N2] details or commissioning report or PG test report along with the PO Copy to be furnished, if bidder intends to submit the documents for Repeat Contracts. The date of Repeat contract order should not be latter than the date of subject Enquiry/NIT.

BHEL	PRE - QUALIFYING REQUIREMENTS (TECHNICAL)--SUMP PUMPS/SUBMERSIBLE PUMPS	TECHNICAL SPECIFICATION NO: TECHNICAL PQR NO: REV NO. DATE STANDARD PQR NO: PE-PQ-STD-100-N001 REVISION NO: 02 DATE: 22.02.2020 SHEET: 2 of 2

Notes:

N1 -- Purchase order copy, supporting drgs/technical data sheets etc. are to be submitted along with the bid for which the bidder intends to furnish the performance feedbacks / repeat contracts for reference purpose only.

N2 – Dispatch details shall include any one of the following documents:

a. Tax Invoice

b. Site receipt/Receipted LR

c. Customer's material dispatch clearance certificate.

Any additional document required in support of above documents to establish the co-relation between the above documents and the supplied item shall be provided by the bidder.

N3 – Purchase order for spare items shall not be considered as repeat order qualifying criteria.

N4 -- 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.

N5 -- Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.

N6 -- After satisfactory fulfilment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

N7 -- In case specification requirement is for both the options (viz. sump pump and submersible pump), the credentials/all relevant supporting documents for both the options shall be applicable/required and the same to be furnished by bidder separately.

ANNEXURE-1

EXPERIENCE LIST

PACKAGE: SUMP PUMPS/SUBMERSIBLE PUMPS **VENDOR:**

S. NO.	PROJECT/ INSTALLATION	CUSTOMER/ CONSULTANT	YEAR OF SUPPLY	TYPE OF SUMP PUMP (Vertical sump pump/Horizontal sump pump/submersible pump)	FLOW (CUM/HR)	PUMP TDH (MWC)	RATING (KW/HP)	MOC (Casing/Impeller etc.)	QUALITY OF WATER	QUANTITY	PERFORMANCE FEEDBACK CERTIFICATE ENCLOSED (YES/NO)

COMPANY SEAL

UPRVUNL
1X660 MW PANKI TPS

TECHNICAL SPECIFICATION
FOR
SUMP PUMPS

Specification No.: PE-TS-426-100-N002A (Rev-00)

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA-201301

CONTENTS

Notes:

1) In case there is conflict in different clauses of specification, most stringent clause (as decided by BHEL / end customer) shall be followed, if no specific deviation is taken by bidder and accepted by BHEL during tender stage in that regard.

SECTION - I

SPECIFIC TECHNICAL REQUIREMENTS

SUB-SECTION IA - Specific Technical Requirements (Mech.)
SUB-SECTION IB - Specific Technical Requirements (Electrical)
SUB-SECTION IC - Specific Technical Requirements (C & I)
SUB-SECTION ID – Datasheet-A

SUB-SECTION – IA

SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)

1.0 SCOPE:

This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works, proper packing for delivery and installation checks at site and mandatory spares (if applicable) complete with all accessories as per the requirements specified in this specification and any other services, etc. if called for in the succeeding sections of the specification.

1X660 MW PANKI TPS

Evaluation of sump pumps as indicated in technical specification shall be as per NIT.

Note:

a) The bidder shall include complete supplies for the project in his scope, part supplies offered for project shall disqualify the offer.
b) Sump pumps details viz. quantity, Capacity, Head, Materials of construction, Mandatory spares and other particulars are detailed in Data Sheet-A at Section-ID of the specification.

2.0 SCOPE OF SUPPLY:

2.1.1 Scope of supply includes Pumps, motors with standard/special accessories which shall necessarily be the part of the pump bidder scope.

2.1.2 The pumps shall be complete with following standard/ special accessories- as applicable.

2.2.1 Standard accessories to be supplied with each pump.

a) Electric motor drive with cable glands.
b) Self-contained lubrication system.
c) Erection & commissioning spares, as required.
d) Supply of first fill of lubricants including second fill/ replenishment as necessary after commissioning and handing over of equipment.

2.2.2 Special accessories included in Bidder's scope of supply:

The following accessories besides those stipulated in Data Sheet-A shall be in bidder's scope.

Fixed Vertical wet pit type sump pumps

The following to be included in pump bidder scope.

- Pump flange and Counter Flanges with Nuts, Bolts, Gaskets etc.
- Flanges, nuts and bolts & matching counter-flange with nuts, bolts and gaskets for connecting with pump discharge at one end & discharge pipe works of purchaser at other end (150 NB).
- Delivery bends and MS discharge piping from pump delivery bend upto motor support level (EL 0.00M) with associated flange / counter flange at both ends.
- Suction strainer.
- Accessories as per data sheet.

- Pumps shall be wet pit type sump pump, vertical shaft, centrifugal, vertical submerged suction, non-clog volute type complete with enclosed shaft, discharge pipe, head assembly thrust bearing & drive assembly, cover plates etc.

- Any other standard accessory required for safe and trouble free operation of Pumps to be provided by Bidder.

2.2.3 Rust inhibiter paint at Manufacturer's works.

2.2.4 Arrangement of connecting delivery pipe with pump discharge & discharge pipe of purchaser. One end of the discharge flange of the pump shall be connected to the delivery bend of suitable size. Suitable sized expander/ reducer if required shall be connected with necessary flanges at both ends (bidder scope).

2.2.5 One set of special tools & tackles for maintenance of equipment for each project shall be in bidder's scope.

2.2.6 Bidder shall provide various drawings, data, calculations, test reports/ certificates operation & maintenance manuals including As Built drawings, etc. as specified and as necessary for the project.

2.2.7 Adequate nos of properly designed bearings shall be furnished. Bearings for pumps shall be antifriction type and lubricated by grease. Line shaft bearings of vertical pumps shall also be grease lubricated. All necessary grease gun, grease cup and tubing shall be included.

3.0 Works excluded from Bidder's scope. The following/ services shall be provided by purchaser.

a) Civil foundation
b) Power supply
c) Control panel
d) Instruments viz. Level transmitters, Level gauge, Pressure gauge, pressure transmitters etc.

4.0 The pumps will be subjected to mechanical running at works and site by the purchaser. If the site performance is found not meeting the requirements including vibration and noise as specified, then the equipment shall be rectified or replaced by the vendor, at no extra cost to the purchaser.

5.0 High, reliability of the pumps is an essential requirement. It is therefore essential that the bidder chooses a standard proven model from the range of pumps manufactured. A comprehensive list of similar installations shall be submitted along with the bid.

6.0 OTHER REQUIREMENTS:

6.1 The Sump pumps shall meet the technical requirements of Section-I as well as Section-II.

6.2 The Quality Plans enclosed in the specification are for bidder's guidance only. The bidder shall comply with these and other minimum requirements specified in the specification and shall furnish their own quality plan in the event of order based upon

guidance given therein, for approval of BHEL/Customer as applicable to respective project.

7.0 Operational philosophy:

7.1 Controls for Fixed Vertical wet pit type sump pumps:

Vertical Type Sump Pumps shall be controlled from Operator Work Station (OWS) in CCR through station DDCMIS, no local control panel is envisaged.

8.0 No external water supply shall be available for the cooling/sealing of sump pumps.

9.0 The materials of construction for various components specified are the minimum requirements and materials of construction for other components not specified shall be similarly selected by the bidder for the intended duty.

10.0 The makes of various Bought-Out-Items of bidder shall be subject to Purchaser's approval.

11.0 It is mandatory for the bidder to submit along with the bid, the deviations if any whether major or minor in the schedule of deviations only. In the absence of deviations listed in the Schedule of Deviations, the offer shall be deemed to be in full conformity with the specification, notwithstanding anything else stated elsewhere in bidder's offer, data sheets etc. The bidder's deviations or implied/ indirect deviations in data sheets, etc. shall not be binding on the purchaser.

12.0 The bidder shall guarantee the performance of pump- motor units along with accessories for rated, performance duties, including the acoustical/ vibrational aspects for the stipulated limits specified elsewhere in the specification.

13.0 DRAWINGS/ DOCUMENTS DISTRIBUTION SCHEDULE:

a. Delivery of Equipment shall be as per NIT.

b. The drawings to be submitted by bidder in event of award of contract:

- TDS & performance curves of pump
- TDS and curves of motor
- GA drawings of pumps
- Quality Plan.
- O & M Manual.

c. Drawings MDL after the award of contract shall be as below:

PACKAGE	BHEL DRG NO	DRG TITLE
Vertical wet pit type Sump Pumps	PE-V8-426-100-N001A	TDS AND PERFORMACE CURVES OF SUMP PUMPS
	PE-V8-426-100-N002A	GENERAL ARRANGEMENT AND CROSS SECTIONAL -SUMP PUMPS
	PE-V8-426-100-N003A	TDS AND CURVES FOR MOTORS OF SUMP PUMPS
	PE-V8-426-100-N005A	QP- SUMP PUMPS
	PE-V8-426-100-N006A	O&M MANUAL-SUMP PUMPS

14.0 Sub-Vendor List shall be furnished during detailed engineering. In case, Bidder offer makes other than the given list, the same shall be subject to approval of Customer/BHEL.

15.0 It is mandatory for the bidders to submit along with the bid the deviations if any whether major or minor in the schedule of deviations only. ***In the absence of deviations listed in the schedule of deviations the offer shall be deemed to be in full conformity with the specification "non-withstanding" anything else stated elsewhere in bidder's offer, data sheets etc. The implied/ indirect deviations in data sheets etc. Shall not be binding on the purchaser.***

16.0 The following documents only shall be furnished by the bidder with his offer:

a) Compliance certificate duly signed and stamped.

b) GA drawings of pumps with motors (shall be only for reference purpose, same shall not be reviewed/commented by purchaser at this stage and shall be subject to approval only during contract).

Apart from above no other drgs./docs./data sheets etc. are required to be submitted at bid stage and even if furnished shall not be taken cognizance of.

In case of any deviation from this technical specification, the same shall be indicated in the schedule of deviations as per Section-IIIC or NIT. In the absence of duly filled schedules it will be assumed that the bid strictly conforms to the specification.

17.0 Sump pumps/submersible pumps packing procedure before dispatch

The purpose of this procedure is to outline the requirements and procedures for protecting the equipment's during shipment and preserving during the storage.

17.1 Preparation for Packing:

- After testing, operation, all fluids e.g. water etc., shall be completely drained from all parts, and the equipment blown dry.
- All material shall be cleaned internally and externally to remove, scale, rust fillings and any other foreign material.
- The pumps shall be placed on a strong wooden base & bolted to the wooden base using the foundation holes for further transportation up to site.

17.2 Protection of parts:

- Pumps shall be packed in properly in high grade bubble plastic wrap for transportation, and long storage at site.
- Sump pumps items shall be packed in proper sizes of wooden cases. High grade woods like Rubber woods, jungle wood, hard wood, mango wood, pine wood, etc. is used for packing.
- Loose material, & Electrical & Electronics items shall be packed in corrugated box and plastic bags with proper tagging and marking of handle with care in proper sizes of wooden cases
- All finished (or) machined (External C.S. Surfaces shall be protected against corrosion with corrosion resisting coating, which is easily removable (Compound shall be such that it will remain on the surface at temperature normally encountered during shipping & storage).
- All machined surfaces shall be protected from mechanical damage. All external unfinished carbon steel surfaces shall be sand blasted & shall be coated with rust preventive primer.
- Flanged opening if any shall be covered with blank flanges sealed with blank gasket of natural rubber or equivalent. Butt welded opening shall be closed with temporary closing covers. Internal threads shall be protected with metal plug sealed with Teflon tape (if applicable). External thread shall be protected with PVC sleeve.
- Wooden cases shall be covered with HDPE cloth from inside wooden box and the top. All the opening in sump pumps shall be closed properly by suitably covering to prevent foreign material entering in opened space.
- All the equipment shall be protected for entire period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and storage. All MS parts which are not painted shall be provided with coating of grease.
- Clay Desiccant or such other moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.

17.3 Preservation

The equipment's shall be stored under closed/open space in packed condition until installation. The packages containing loose plates and gaskets are to be protected from extreme climatic conditions.

17.4 Additional Dispatch Requirements

MDCC after final inspection shall be provided to vendor on the basis of following: -

i) List of items packed in each box with description & quantity.

ii) Photograph of each sump pump, control panel, hose pipe and each box in open & closed condition.

iii) Bidder to include handling instructions in engineering drg/doc and packing to be done in such a way to avoid damage of items in transit and long storage at site and same shall be approved in contract stage by BHEL/Customer

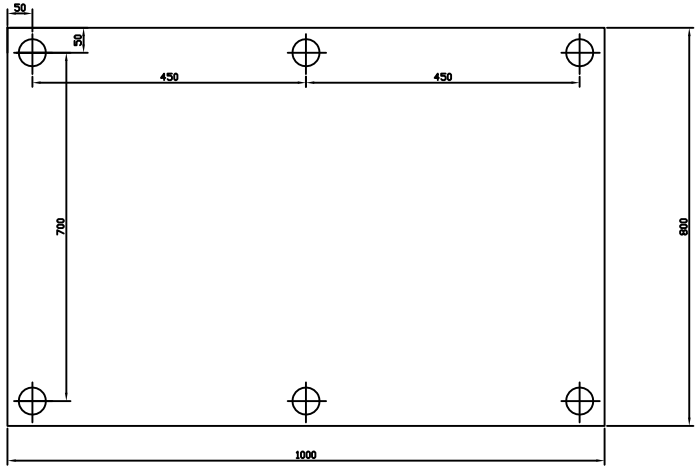
18.0 BIDDER TO COMPLY FOLLOWING AFTER PLACEMENT OF PO:

i. Supplier to submit detailed ' Bill of Material ' (BOM) at the time of drawing /document submission after placement of PO. Each item of the BOM to be uniquely identified with item code no. or item serial no.

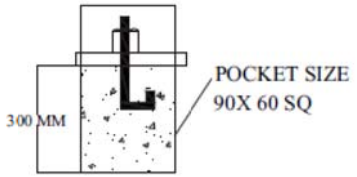
ii. Supplier to ensure that all items which will find separate mention in the packing list are covered in this detailed BOM.

iii. 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 item(s)/package will be supplied free of cost in most reasonable time."



TOP VIEW OF PUMP SUPPORT PLATE
(IN BIDDER SCOPE)



SKETCH NO. PE-DG-426-172-NS01
1X660 MW PANKI TPS EXTENSION
BASE PLATE AND POCKET DETAILS

SUB-SECTION – IB

SPECIFIC TECHNICAL REQUIREMENTS (ELECTRICAL)

`

TECHNICAL SPECIFICATION

FOR

SUMP PUMPS
(ELECTRICAL PORTION)

1.0 **EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:**

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 same shall be provided by the bidder without any extra charge.

c) Supply of mandatory spares as specified in the specifications of mechanical equipments.

d) Electrical load requirement for **SUMP 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, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.

h) Motor shall meet minimum requirement of motor specification.

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

j) 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 The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification 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 :

a) Electrical scope between BHEL & vendor

b) Quality plan for motors

c) Datasheet A (Annexure- I)

d) Customer (M/s DCPL) specification for Motors

e) Datasheet-C

f) Electrical Load data format (Annexure –II)

g) BHEL cable listing format (Annexure –III)

REV: 0 DATE: 01.02.2020

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGE: SUMP PUMP (Supply Package)

PROJECT: 1X660 MW UPRVUNL PANKI TPS

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415 V MCC	BHEL	BHEL	240 V AC (supply feeder)/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. Screened control cable between DCS & field equipment will also 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.

DATA SHEET A		
SL NO.	DESCRIPTION	1X660 MW UPRVUNL PANKI TPS EXT.
A	**General**	
1	Manufacturer & country of origin	DURING DETAILED ENGINEERING
2	Motor type	SQUIREL CAGE INDUCTION MOTOR
3	Efficiency class	IE3
4	Type of starting	DOL
5	Maximum acceptable kW rating of LV motor	200
6	Rating up to which Single phase motors permitted.	
7	Installation (Indoors/ Outdoors)	indoor/outdoor
8	Degree Of Protection	IP55 WITH CANOPY FOR OUTDOOR IP55 FOR INDOOR
9	Name of the equipment driven by motor & Quantity	DURING DETAILED ENGINEERING
10	Maximum Power requirement of driven equipment	DURING DETAILED ENGINEERING
11	Rated speed of Driven Equipment	As per system requirement
12	Design ambient temperature (Degree Celcius)	50 deg C
B	**Design and Performance Data**	
1	Frame size & type designation	DURING DETAILED ENGINEERING
2	Type of duty	AS PER REQUIREMENT
3	Rated Voltage	240/415 V
4	Rated Frequency	50 Hz
5	System fault level at rated voltage	50kA for 1 sec
6	LV System grounding	solidly grounded
7	Permissible variation for	
a	Voltage	+/-10%
b	Frequency	+/-5%
c	Combined voltage & frequency	10%
8	Rated output at design ambient temp (by resistance method)	as per requirement
9	Synchronous speed & Rated slip	as per requirement

10	Minimum permissible starting voltage	80% of rated voltage
11	TYPE OF STARTER PROVIDED IN MCC	As per system requirement
12	Starting time in sec with mechanism coupled	
a	At rated voltage	As per system requirement
b	At min starting voltage	
13	Locked rotor current as percentage of FLC (including IS tolerance)	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) (a) Below 110KW : 10.0 (b) From 110 KW & upto 200 KW : 9.0
14	Torque	
a	Starting	a) Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque. B) Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.
b	Maximum	
15	Permissible temp rise at rated output over ambient temp & method	Thermal class 155 (F) insulation, temperature rise limited to class-B.
16	Noise level in (dB)	85 (dB) at 1 M
17	Amplitude of vibration	As per IS-12075/IEC-60034-14
18	Efficiency & P.F. at rated voltage & frequency	
a	At 100% load	Efficiency as per IS 12615, IEC: 60034-30 (Latest

b	At 75% load	revision), P.F. as per requirement.
c	At starting	Efficiency as per IS 12615, IEC: 60034-30 (Latest revision), P.F in line with starting requirement as per relevant standard.
C	**Constructional Features**	
1	Method of connection of motor driven equipment	As per system requirement
2	Applicable Standard	as per relevant standard
3	DOP of Enclosure	IP55 WITH CANOPY FOR OUTDOOR IP55 FOR INDOOR
4	Method of cooling	IC 411 (TEFC), IC 511 (TETV) or IC 611 (CACA).
5	Class of insulation	All motors shall have class F insulation but limited to class B temperature rise
6	Main terminal box	
a	Type	Refer Specific technical requirement for motors
b	Power Cable details (Conductor, size, armour/unarmour)	1.1 kV XLPE armour cable, size shall be provided during detailed engineering
c	Cable Gland & lugs details (Size, type & material)	Refer Specific technical requirement for motors
d	Permissible Fault level (kArms & duration in sec)	
e	Degree of Protection	
7	Earth Conductor Size & Material	Refer Specific technical requirement for motors
8	Space heater details (30KW & ABOVE) (Voltage & watts)	Refer Specific technical requirement for motors
9	Flame proof motor details (if applicable)	During detailed engineering
a	Enclosure	
b	suitability for hazardous area	
i	Zone O / I / II	
ii	Group IIA / IIB / IIC	
c	Degree of Protection	
9	No. of Stator winding	As per system requirement
10	Winding connection	As per system requirement
11	Kind of rotor winding	As per system requirement
12	Kind of bearings	Refer Specific technical requirement for motors
13	Direction of rotation when viewed from NDE	Motor shall be bi-directional

14	Paint Shade & type	Glossy light grey finish no 631 of IS 5, for details refer Specific technical requirement for motors
15	Net weight of motor	DURING DETAILED ENGINEERING
16	Outline mounting drawing No (To be enclosed as annexure)	DURING DETAILED ENGINEERING
D	**Characteristic curves/ drawings**	
1	(To be enclosed for motors of rating >55KW)	DURING DETAILED ENGINEERING
2	Torque speed characteristic	
3	Thermal withstand characteristic	
4	Current vs time	
5	Speed vs time	
E	**Tests on motors**	As applicable (As per QAP/For Project specific requirement if any refer Specific technical requirement for motors)

CHAPTER 17 : AC & DC MOTORS

1.00 MOTORS

1.1 SCOPE

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

SITE CONDITIONS

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

1.2 Gases, Fumes & Dust Particles

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

1.2.02 **Dust Particles**

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

2 Indoor Locations.

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

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

1.2.03 **Special Fumes**

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

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

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

1.3 **LOCATION OF MOTOR** - As required

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

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

1.5 TYPE

1.5.1 AC Motors:

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

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

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

1.5.2 DC Motors Shunt wound.

1.6 **VOLTAGE (NOMINAL)**

1.6.1 **LV Motors**

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

1.6.2 **MV MOTORS**

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

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

1.6.3 **HV Motors**

For motors above 1500kW - eleven(11) KV

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

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

1.8 NUMBER OF PHASES - Three (3)

1.9 SPEED - As required by the driven equipment

1.10 TYPE OF STARTING :

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

1.11 DUTY

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

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

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

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

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

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

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

1.12 **SUPPLY VARIATIONS**

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

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

1.13 **ABNORMAL CONDITIONS CAPABILITY**

Motor shall have following capabilities as specified design ambient temperature:

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

1.13.2 Low Voltage Running :

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

1.13.3 Momentary Low Voltage Withstanding :

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

1.14 **STARTING CAPABILITY**

1.14.1 Low Voltage Starting :

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

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

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

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

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

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

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

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

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

1.14.5.3 **Starting voltage requirement**

a) All Motors (except Mill Motors)

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

b) For Mill Motors:

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

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

1.14.5.4 **Starting Time**

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

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

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

1.14.5.5 **Torque Requirements:-**

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

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

1.15 **SAFE STALL TIME**

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

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

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

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

1.16 **CLASS OF INSULATION**

1.16.1 LV Motors ..... Class F.

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

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

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

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

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

1.18 **BUS TRANSFER WITHSTAND CAPABILITY**

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

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

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

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

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

1.19 **TYPE OF ENCLOSURE**

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

1.19.02 Indoor Motors ..... IP 55

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

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

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

1.20 **METHOD OF COOLING**

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

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

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

1.21 **MAXIMUM MECHANICAL VIBRATIONS**

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

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

1.21.02 Noise level

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

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

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

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

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

TABLE - I

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

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

Above 125 KW-upto 200 KW 203

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

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

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

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

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

1.22 **WINDING & INSULATION**

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

1.23 **DIRECTION OF ROTATION**

1.23.1 As needed by driven equipment.

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

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

1.24 **BEARINGS**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1.31.1 Temperature rise under normal/abnormal conditions.

1.31.2 Type of bearing and recommended lubricants.

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

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

1.33 **TERMINAL BOXES**

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

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

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

1.33.2 **Main Terminal Box**

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

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

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

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

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

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

Min. fault level for MV Motors - 40 KA

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

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

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

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

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

1.34 **TYPE AND SIZE OF CABLES**

1.34.1 **Space Heaters**

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

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

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

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

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

1.34.5 **For Main Terminals**

LT Motors

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

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

HT Motors

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

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

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

1.35 **EARTHING**

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

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

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

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

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

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

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

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

1.39 **HOT AIR TEMPERATURE DETECTOR**

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

1.40 **WATER FLOW INDICATOR**

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

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

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

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

1.44 **TYPE TEST**

1.44.01 **HT MOTORS**

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

b) The type tests shall be carried out in presence of the Purchaser's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the Purchaser's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set–up, instruments to be used, procedure acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.

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

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

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

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

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

ii) Measurement of noise at no load.

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

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

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

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

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

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

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

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

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

1.44.02 **LT Motors**

a) LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Purchaser's approval the reports of all the type tests as listed in this specification and carried out within last five years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

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

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

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

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

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

1.45 **INFORMATION WITH PROPOSAL**

1.45.1 AC Motor Data Sheet.

1.45.2 Dimension Drawing/Foundation load details of motor and driven equipment.
1.45.03 Manufacturer's catalogue showing constructional details.

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

1.46.01 Motor Data Sheet.

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

1.46.03 Following characteristics curves:

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

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

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

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

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

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

1.46.03.07 Negative phase sequence current withstand characteristics.

1.47 COMMISIONING CHECK LIST (HT MOTORS)

A PRELIMINARY CHECKS

Check the following:

1. Check the name plate details according to specification. Discrepancies, if any, to be satisfactorily resolved.

2. Check tightness of all bolts, clamps and connecting terminals.

3. Check body earthing

4. Check whether bearing lubrication is adequate

5. Check clearance inside terminal box

6. Checking stator (motor air gap) Check – Grease lubrication (for ball or roller bearing) is adequate if the motor was in storage for very long period replace the grease, by fresh grease after flushing the bearing clean. Excess grease in the bearing (housing … is overheat of bearings) Check 0 the free rotation of the rotor in decoupled condition. Check the air gap between stator and rotor at four positions 90o apart at driving and non-driving end. Compare the recorded values with factory results. For slip ring motors : with starting resistances.

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

B COMMISSIONING CHECKS

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

1.48 COMMISIONING CHECK LIST (LT MOTORS)

A PRELIMINARY CHECKS

Check the following:

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

B COMMISSIONING CHECKS

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

1.49 DC MOTOR SPECIFICATION

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

Contractor will furnish the data in respect of DC motors.

DATASHEET

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

SUB-SECTION – IC

SPECIFIC TECHNICAL REQUIREMENTS (C &I)

SUB-SECTION – ID

DATASHEET-A

	UPRVUNL - 1X660 MW PANKI TPS		PE-TS-426-100-N002A Rev-00
	TECHNICAL SPECIFICATION FOR SUMP PUMPS		Section-1D
	DATA SHEET - A (SUMP PUMPS)		23.01.2023
CL. NO.	**DESCRIPTION**	**UNIT**	**Vertical wet pit type Sump Pumps**
1.0.0	**GENERAL**		
1.1.0	Service /Location of Sump pumps		Storm Water pump House
1.2.0	Equipment name		Sump Pump
1.3.0	Pump type		Vertical wet pit type Sump Pumps
1.4.0	Duty		Intermittent
1.5.0	Location		Indoor
1.6.0	Maximum Ambient Temperature	°C	60.0
1.7.0	Drive		Motor Driven
1.8.0	Motor Rating		Continuous motor rating (at 50 deg. C ambient) shall be 15% above the max power requirement at any condition of the entire characteristic curve of the pump (viz. 0-130%). The discharge rate of sump pump is uncontrolled.
2.0.0	**PUMP PARAMETERS**		
2.1.0	Design capacity	M3/hr	120.0
2.2.0	Total head at rated capacity	MWC	42.0
2.3.0	Total no.of pumps installed	Nos.	2 nos
2.4.0	No. of pumps working / Standby	Nos.	1 W + 1 S
2.5.0	Parallel operation required		YES
2.6.0	Pump RPM		1500 (Max.)
2.7.0	Range of operation	%	30 to 150 % of the rated flow
2.8.0	Pump design standard		IS 5120/IS 1710/IS 5600
2.9.0	Max. particle size to be handled	mm	25
3.0.0	**LIQUID DATA**		
3.1.0	Liquid handled		Rain water / strorm water with suspended particles, silica, polluted liquid etc.
3.2.0	Specific gravity		1.1
3.3.0	Temperature (max.)	°C	50
4.0.0	**DESIGN AND CONSTRUCTION**		
	FEATURES		
4.1.0	Impeller type		Open/Semi-open, Non-clog type
4.2.0	Flange drilling standard		ANSI B 16.5
4.3.1	Motor Support elevation		EL (+) 0.0 M
4.3.2	Pump Sump invert level		EL (-) 7.5M
4.4.0	Sump pit size L X B X HT. (where pumps to be installed)		-
5.0.0	**MATERIAL OF CONSTRUCTION**		
5.1.0	Casing / Suction bell		2.0 % Ni CI to IS 210 Gr. FG 260
5.2.0	Impeller		ASTM A 351 Gr. CF8M
5.3.0	Pump/Impeller shaft		SS-410
5.4.0	Wear ring (where applicable)		SS-316 or eq casting grade
5.5.0	Shaft sleeve (where applicable)		SS-316
5.6.0	Shaft coupling		SS-410
5.7.0	Coulmn Pipe (where applicable)		Carbon steel ERW as per IS:1239 (heavy Grade)
5.8.0	Pump and motor coupling		SS-316
5.9.0	Shaft bearing		SS-410
5.10.0	Fasteners		SS 316
5.11.0	Gland		2.0 % Ni CI to IS 210 Gr. FG 260
5.12.0	Gland Packing (Asbestos Free)		Teflon Impregnated
5.13.0	Mechanical seal		As per manufacturer's practice
5.14.0	Pump Lubrication		Oil / Grease
5.15.0	Pump line shaft lubrication		Oil / Grease
5.16.0	Strainer (Body / Mesh)		Body: 2 % Ni CI to IS 210 Gr. FG 260 and Mesh: SS 316
5.19.0	Base Plate/ Cover plate		MS TO IS-2062 Epoxy Coating
5.19.0	Connecting Pipe material (for deciding delivery pipe material)		Piping shall be Carbon steel ERW as per IS:1239 (heavy Grade) Purchaser's connecting pipe size: 150 NB (OD -166.5mm, Thickness - 5.4 mm)
Note :	**Bidder's may offer alternative materials, if they are superior to that specified above for the indicated service of the pump.**		
6.0.0	**INSPECTION AND TESTING**		yes at Works
7.0.0	**SUPPLY OF ACCESSORIES AND SERVICE.**		
7.1.0	Counter Flanges with Nuts,Bolts, Gaskets etc.		Yes
7.2.0	Elastomer cables for connecting pump with its panel length (M)		Not Applicable
7.3.0	Relay based control panel with integral starter		Not Applicable
7.4.0	Suction and Discharge pressure gauge with root valve / pump		Not Applicable
7.5.0	Discharge hose/ Pipe		
	- Hose/ Pipe length per pump		Not Applicable
	- Hose/Pipe dia		Not Applicable
	- No. of Hose pipe per pump		Not Applicable
7.6.0	Orifice Plate and its arrangement at Pump Discharge (Refer note-3)		Not Applicable
7.7.0	Cables (*) for connecting the starter panel with the power supply source - Length (M) / pump (*)including plug matching with purchaser's 63 Amp welding socket		Not Applicable
7.8.0	Chains		Not Applicable
7.9.0	Suction Strainers		Yes
7.10.0	Pump Stool		Yes, If required
7.11.0	Wheel trolley required per pump		No
7.12.0	Level switches for		Not Applicable
	- Very Low level		-
	- High level		-
	- Very high level		-
8.0.0	**Levels for installation**		
8.1.0	Pump/Motor Support Elevation		EL 0.0 M
8.2.0	Pump sump Invert Level		EL (-) 7.5 M
9.0.0	**Special Requirements**		
9.1.0	Male/female hose coupling with accessories for connecting two hose pipes		Not applicable
10.0.0	**Mandatory Spares**		Yes
10.1.0	**C&I Spares**		NA
10.2.0	**415V MOTORS (LT Motors) spares**		
10.2.1	Terminal plates		10 Nos. each for small motors upto 30 kW & 4 Nos. each for more than 30 kW
10.2.2	Heaters		2 sets
10.2.3	Greasing arrangements		4 sets each type of motor
10.2.4	Motor of each type and rating		10% of the installed quantity or minimum 1 number whichever be higher
10.2.5	Bearings (DE and NDE) for each type and rating of motors.		5 sets
10.2.6	Stator winding coils for all type of LT motors		One (1) set
10.2.7	Dust seals and gaskets for each type of motors		Three (3) sets

Notes for Mandatory spares:-

1	Whenever the quantity is indicated as a percentage, it shall mean percentage of total population of that item in the station (project) unless specified otherwise, and the fraction will be rounded off to the next higher whole number. Wherever the requirement has been specified a 'set', it will include the total requirement of the item for a unit, module or the station or as specified. Where it is not specified, a 'set' would mean the requirement for the single equipment/system as the case may be. Also, the 'set' would include all components required to replace the item
2	Wherever quantity is specified both as a percentage and a value, the bidder has to supply the higher quantity until and unless specified otherwise
3	Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc. these shall cover all the items supplied and installed and the break up for these shall be furnished in the bid.
4	In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed as above.
5	Each spare shall be clearly marked and labeled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.

NOTE:

1	The clearance between stationary and moving parts should be such as to allow sustained performance without exclusive maintenance.
2	Material of construction for other components not specified above shall be similarly selected in line with the above for the duty intended and subject to approval.
3	For items stated as not applicable by bidder, shall have to be supplied without any cost implication to BHEL in the event they are found to be applicable during detail engineering stage.
4	Wherever SS material is coming in contact with non SS material, suitable isolation (rubber etc.) shall be provided to avoid galvanic corrosion.

SUB-SECTION - IIA

STANDARD TECHNICAL SPECIFICATION (MECHANICAL)

1.00.00 GENERAL

1.01.00 This specification covers the design, performance requirement, constructional features, material requirements, manufacture, inspection and testing at the manufacturer's and/or his sub-contractor's works and painting requirements for delivery of Sump Pump/submersible pumps complete with all accessories as specified hereinafter.

1.02.00 The design, performance, major constructional features, materials of construction etc., of the Sump Pumps/submersible pumps shall be guided by Data Sheet-A. The requirements of this specification shall also be taken care of.

2.00.00 Codes and Standards

2.01.00 The design, performance requirement, material requirements, manufacture, inspection and testing of the Sump Pumps shall generally comply with the requirements of all applicable Indian/British/American/DIN standards, in particular the following :

IS 8034	:	Technical requirements for submersible pump sets
IS 5600	:	Technical requirements for rotodynamic pumps for handling sewage and drainage.
IS 1710	:	Vertical turbine pumps for clear, cold and fresh water.
IS 5120	:	Technical requirements - Rotodynamic special purpose pumps
IS 5600	:	Sewage and drainage pumps
IS 5639	:	Pumps for handling chemical and corrosive mixed flow and axial flow pumps
IS 9137	:	Code for acceptance for centrifugal, mixed flow and axial flow pumps
BS 5316	:	Acceptance tests for centrifugal, mixed flow and axial flow pumps
Hydraulic Institute Standards of USA		
API 610	:	Centrifugal pumps general refinery services

2.02.00 In case of any contradiction between the above standards and this specifiation, the

stipulations in this specification shall prevail and shall be binding on the bidder.

3.00.00 General Description

3.01.00 Sump pumps/submersible pumps specified hereinafter shall be used to dewater various sump pits in the power house and other plant area where gravity draining is not envisaged to ensure general housekeeping.

Type of Sump Pumps required under this specification are described in Section-ID/Data Sheet-A, the following requirements shall be taken care, as applicable.

3.01.01 Fixed Type Sump Pumps

Fixed type Sump pumps shall be electric motor driven permanently installed and shall be vertical wet pit bottom suction volute type and will handle drainage water, containing solid particles with sludges, polluted liquid etc. from the area where they are installed. These pumps will run continuously by the use of high and low level switches in the sump. Particle size expected in the water may be of the order of 30mm.

3.01.02 Fixed Duty Type Submersible Pumps

Fixed duty type submersible pumps shall be electric motor driven permanently installed and the motor shall be integral part of the pumps and the pump & motor shall be single unit i.e. monoblock type which be submerged in the water. Submersible pump will handle drainage water, containing solid particles with sludges, polluted liquid etc. from the area where they are installed. These pumps will run continuously by the use of high and low level switches in the sump. Particle size expected in the water may be of the order of 30mm.

3.01.03 Trolley Mounted portable sump pumps

These pumps shall be horizontal centrifugal, either electric motor driven or Diesel engine driven as specified in Data Sheet-A and shall be portable type. Each pump set alongwith drive, control panel etc., shall be mounted on a trolley for ease of transportation. These pumps shall be suitable for handling drainage water containing hard solid particles, sludge, polluted liquid with expected particle size of 30mm.

3.01.04 Trolley Mounted Vertical Submersible portable type pump

These pumps shall be vertical submersible portable type pump motor sets with suitable arrangement for carrying to any place and for lowering to and raising from various water reservoirs and pits. The pump motor set shall be monoblock type and shall be mounted on trolley and shall be suitable for handling water containing mud/sludge, solid particles, cotton waste, silica, ash particles, coal particles, polluted liquid etc. The particle size expected in water may be 30mm.

4.00.00 GENERAL PERFORMANCE REQUIREMENT

4.01.00 The pumps shall be designed to have best efficiency at the specified duty point. The pump set shall be suitable for continuous operation at any point within the "Range of Operation".

4.02.00 Pumps shall have a continuously rising head capacity characteristics from the specified duty point towards shut off point, the maximum head being at shut off.

4.03.00 Permanently installed vertical sump pumps/submersible pumps, wherever specified, shall be suitable for parallel operation. The head vs capacity, the bhp capacity characteristics etc. shall match to ensure equal load sharing and trouble free operation throughout the range. Drive motor shall not be overloaded when pump discharge is more than rated.

4.04.00 The static head requirement of portable type sump pumps may have a considerably wide range of variation depending upon the depth of pit being dewatered. While the pump shall have adequate capacity at the maximum head, its drive shall be sufficiently rated to cater for any overloading during the pump operation at its minimum possible head, i.e. maximum discharge.

4.05.00 Pump with its drive unit shall run smooth without undue noise and vibration. Acceptable peak to peak vibration limits shall generally be guided by Hydraulic Institute Standards (latest edition)/as per applicable IS standard.

5.00.00 GENERAL

5.01.00 Pumps as described in Section-IA/ID (DataSheet-A) shall be complete with their drives, couplings and other accessories as also those needed to make the pump sets complete in all respect, for proper operation and maintenance.

6.00.00 DESIGN AND CONSTRUCTION

6.01.00 The design, construction testing and other details of the sump pumps and related accessories shall be in line with the stipulations and data in this section and as per data sheet-A.

6.02.00 Each sump pump shall be equipped and coupled with a drive motor with rating so selected as to have atleast 25% margin over the maximum power required by the pump, throughout its range of operation.

The discharge rate of sump pump is very much uncontrolled. As such pump should be capable to operate even under a condition of as low as 25% of specified total head.

6.03.00 All integral piping shall be as per IS-1239 of heavy grade (as suited for the maximum operating pressure) and shall be either galvanised or painted with approved rust inhibiting paint.

6.04.00 All valves shall be steel body type as per applicable IS/BA/ANSI standard, with pressure class compatible with the maximum working pressure.

6.05.00 All hoses shall be of steel wire reinforced type. Pump suction hose shall be suitable for working under vacuum. Pump discharge hose shall be suitable to withstand the maximum pressure that it may be subject to in all working conditions, including hydrostatic testing of the sump pump discharge line.

6.06.00 Pump suctions strainer (applicable only for Portable Horizontal Sump Pumps) shall have openings large enough just to permit the entry of solids having maximum size as stipulated in the specification.

6.07.00 Pressure gauges shall be of Bourdon type, with sealing diaphragm to prevent ingress of the work fluid. Selected range of pressure gauge shall be such that the entire range of working pressure covers about 1/3rd to 2/3rd to its range. Accuracy of measurement shall be within ± 1% of scale range. The suction pressure gauge shall be compound type. Pressure gauge dial size shall be 100mm or more.

6.08.00 Pumps

6.08.01 Fixed type Sump Pumps shall be wet pit type, vertical shaft, centrifugal, vertical submerged suction, non-clog volute type complete with enclosed shaft, discharge pipe, head assembly thrust bearing and drive assembly, cover plates etc.

6.08.02 Fixed duty type Submersible pumps shall be monoblock type in which electric motor shall be integral part of the pump and this monoblock of pump & motor set shall be submerged in the water. The pump shall be single stage and non-clog design.

6.08.03 Trolley mounted portable sump pumps shall be of horizontal shaft, single stage, end suction, radially split casing, centrifugal, non-clog design complete with common base plate, drive assembly etc. These pumps shall be trolley mounted portable type.

6.08.04 Vertical Submersible Portable type pumps shall be submersible pump motor type, single stage and non-clog design and shall be portable type.

6.08.04 Casing

a) Casing shall be so designed to allow free passage of specified maximum size of solid.

b) Casing shall be designed to withstand the maximum shut off pressure developed by the pump.

c) The casings shall be cast, free from blow holes, sand holes, other detrimental defects. The casing shall be complete with suction and discharge connections.

d) For submersible type sump pumps adequate seal arrangement shall be made to keep leakage of liquid from casing to column assembly to minimum and adequate drain shall be provided in column assembly to permit escape of the leakage flow. The casing shall also include the bearing housing of the bottom pump shaft

bearing.

e) Trolley mounted portable sump pumps shall be provided with vent connections and drain connections with valves. These pumps shall be manually primed.

6.08.05 Impeller

a) The impeller shall be non-clog type, cast in one piece and specially designed to pass large solids or unscreened liquids. The clearance between stationary and moving parts should be such as to allow sustained performance without excessive maintenance.

b) Impellers of Fixed type sump pumps shall have provision for adjustment from an accessible location.

6.08.06 Pump shaft

a) Shaft size selected shall be such that critical speed is at least 20% away from the operating speed and the runway speed.

b) The shaft shall be ground and polished to final dimension and of ample size to withstand all stresses resulting from rotor weight, hydraulic loads and across the line starting. Shaft shall be provided with renewable sleeves particularly under stuffing boxes and other locations as recommended by pump manufacturers.

c) The coupling between shafts shall be so designed that they become tight during pump operation.

6.08.07 Column Pipe for fixed type sump pumps (As applicable for vertical sump pumps)

The discharge pipe shaft assembly shall be flanged or screwed as per manufacturer's standard and standard length of each piece of column pipe shall be in conformity to the shaft piece lengths from consideration of easy handling.

6.08.08 Bearings

a) Adequate nos. of properly designed bearings shall be furnished. Bearings for fixed type Sump Pumps shall be Oil lubricated and Bearings for trolley mounted Horizontal pumps shall be antifriction type and lubricated by oil/grease. All necessary grease gun, grease cup and tubing shall be included.

b) Thrust bearing of adequate design shall be furnished for taking the entire pump thrust arising from all probable conditions of continuous operation through out its "range of operation" and also the shut off condition life of thrust bearing shall be 20,000 working hour minimum for the load corresponding to the duty point. The bearings shall be lubricated by grease or oil from a location conveniently accessible. Design shall be such that the lubricant can not contaminate the

handling liquid.

6.08.09 Wearing Ring/Liner Plate

Renewable wearing rings/liner plates shall be provided either on impeller or on the casing or on both impeller and casing.

6.08.10 **Stuffing Box**

Stuffing box of Fixed type sump pumps shall be of mechanical packing type. Trolley mounted portable sump pumps shall have mechanical seal of reliable design.

6.08.11 **Coupling**

Pump and motor shall be connected with a suitable flexible coupling. Coupling shall be provided with coupling guard.

6.08.12 Fixed type sump pumps shall be provided with a suitable mounting plate. The mounting plate shall be adequately sized to accommodate the level switches, discharge pipe, oil cups etc. Trolley mounted portable sump pumps and drives shall be mounted on one base plate. Base plate shall be of rigid construction properly ribbed as needed. Suitable drain with valve, vent with valve and drain funnel shall be furnished by the Bidder.

The necessary supporting plate, mounting frame, base plate, etc., as required shall be supplied under this specification alongwith anchor bolts, foundation bolts, pipe, sleeves etc. Lifting lug, eye bolts etc., as required for the proper handling of each pump set shall be furnished.

6.08.13 **Suction Bell**

Fixed type sump pumps and vertical submersible portable type pumps shall be complete with adequately dimensioned suction bell to guide and streamline intake fluid.

7.00.00 INSPECTION AND TESTING

The contractor shall carry out the following minimum specific tests & inspections to ensure that the equipment furnished lies in strict conformance with the specification & in accordance with codes/standards and good engineering practice.

a) Material identification and testing shall include but shall not be limited to the following components:

   i) Impeller & wearing rings.

ii) Shafts & shaft sleeves.

iii) Couplings

iv) Bearings

v) Coloumn pipes

vi) Discharge head

b) Tests shall also include but shall not be limited to the following :

i) The entire surface of the impeller castings shall be subjected to D.P. test as per ASTM-E-165.

ii) Shaft shall be subject to D.P. & Ultrasonic test.

iii) Wearing rings shall be subject to D.P. test.

iv) Witnessing of NDT/review of NDT reports.

v) Static balance test for impeller & dynamic balance of complete rotating parts as per ISO-1940.

vi) Complete inspection of assembled pump

c) Hydrostatic test shall be done for the following components (as minimum) at 150% of the shut-off pressure. Pressure shall be maintained for a period of not less than one (1) hour.

i) Bowls/suction bells
ii) Column pipe
iii) Discharge head
iv) Any other applicable pressure parts.

d) Performance tests at shop

i) Each pump shall have to be tested to determine performance curves of the pumps. These tests are to be conducted in the presence of Owner's representative as per the requirements of the Standards of Hydraulic Institute of USA (ASME-Power Test Code PTC 8.2/BS-599) or any other equivalent standard but the tolerences on Head, Discharge & Power shall be specified in HIS, USA.

ii) Performance tests are to be conducted to cover the entire range of operation of the pumps. These shall be carried out to span 130% of rated capacity upto pump shut-off condition. A minimum of five combinations of head & capacity are to be achieved during testing to establish the performance curves, including the design capacity point, shut-off point and the two extremities of the range of operation as specified in the annexures. After completion of performance test, all pumps shall be stripped down for inspection of internals.

iii) Tests shall be conducted with actual drive motors being furnished

iv) The Bidder shall submit in his proposal the facilities available at his works to conduct performance testing.

v) NPSH tests are to be conducted on one pump of each type at 3% head drop conditions, if specified in the pump Annexures.

vi) All rotating components of the pumps shall be subjected to static and dynamic balancing tests. The assembled rotor will be subjected to dynamic balancing tests.

vii) Mechanical run test shall be carried out on all pumps to determine the vibration levels, noise levels etc. This test shall be conducted at site also. However, test value at site shall be used for the acceptance of the equipment.

7.01.00 The pump integral accessories like thrust bearing, pump motor coupling etc., shall be subject to tests as per manufacturer's standard.

7.02.00 Test on motors, control panels, starter panels, cables shall be conducted as per the requirement of this specification.

7.03.00 After erection at site, pumps shall be operated to prove satisfactory and trouble free performance.

7.04.00 A typical quality plan is enclosed for bidder's guidance, the bidder shall furnish detailed Quality Plan based on same for Purchaser's approval, in the event of order.

8.00.00 Drawings, data, curves and information

8.01.00 Following drawings, data and information for the equipments are required to be submitted by the bidder alongwith his formal proposal.

8.01.01 General Arrangement drawings of the pumps showing various dimensions, suction and discharge locations.

8.01.02 Typical cross-section drawings of the pumps, seal rings, etc., and materials of construction for all items.

8.01.03 Characteristic curves of pumps showing effective head, pump input power, efficiency, submergence and NPSH, against capacity ranging from shut off condition to 150% of rated capacity.

8.01.04 Speed vs. torque curve of the pump corresponding to recommended mode of pump starting, super-imposed on speed vs. torque of the motor, corresponding to 80% and 100% rated voltage.

8.01.05 Diagram showing the type of lubrication system etc.

8.01.06 Completely filled up schedules enclosed under Vol.III of this specification.

8.01.07 GA drawing of Control Panel.

8.01.08 A write up describing clearly the procedure for installing the pump and also for overhauling the fixed type pumps. A procedure for lowering and raising the vertical submersible portable type pumps shall also be given.

8.02.00 Drawings, data, curves and information to be submitted by the successful tenderer after placement of order.

8.02.01 The drawings/data asked against clause nos.8.01.00 to 8.01.07 above shall also be furnished in a finalised form by the successful tenderer for the approval of the purchaser/his consultant. In addition following documents shall also be submitted for Purchaser's/consultant's approval.

8.02.02 Pump foundation details with static and dynamic loads.

8.02.03 Pump and drive sealing, bearing lubrication and cooling arrangement drawing.

8.02.04 Drive data

8.02.05 Reports on shop tests and test certificates.

8.02.06 All other drawings/documents and data as specified and deemed necessary.

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-XXX-100-N002	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-100-N005, Rev-02	DATE: 6-May-2020
	PROJECT:		PO NO.:	DATE:
	ITEM: Sump Pump/Submersible Pump	SYSTEM: Plant Water/Common	SECTION: II	SHEET Page 1 of 3

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	*	**			
					M	C/ N				D	M	C	N	
1.0 RAW MATERIAL														
1.1a	Pump Casing	Mechanical and Chemical properties	CR	Mechanical and Chemical Analysis	1 / Heat / Batch	1 / Heat / Batch	Approved Drawing/ Data sheet	Relevant Material specification	Lab Report/ MTC	√	P	V	V	
1.1b	Impeller	Mechanical and Chemical properties	CR	Mechanical and Chemical Analysis	1 / Heat / Batch	1 / Heat / Batch	Approved Drawing/ Data sheet	Relevant Material specification	Lab Report/ MTC	√	P	V	V	
1.2	Heat treatment of Stainless Steel Castings	Heat Cycle	MA	Verification of HT chart	All Batches	All Batches	Relevant Material specification	Relevant Material specification	Correlated HT charts	√	P	V	V	
1.3	Bars / forgings for pump and motor shafts	Mechanical and Chemical Properties	CR	Mechanical and Chemical Analysis	1 / Bar	1 / Bar	Approved Drawing/ Data sheet	Relevant Material specification	Lab Report/ MTC	√	P	V	V	
		Dimensions	MA	Measurement	100%	100%	Manufacturers Drawing	Manufacturers Drawing	IR	√	P	V	V	
		Internal defects for 40 mm and above diameter	CR	UT	100%	100%	ASTM A-388	Refer Note 2	IR	√	P	V	V	
1.4	Cable Type: PVC insulated, multi core, copper conductor	Routine TC and acceptance TC as per IS 694/Is1554, Length and size	MA	Measurement	100%	100%	Approved Datasheet / IS 694/IS1554	Approved Datasheet / IS 694/IS1555	IR & TC	√	P	V	V	Compliance certificate to be submitted by Vendor
1.5	Bearings	Make, Bearing No., Surface finish	MA	Visual Examination	100%	100%	Manufacturers Std	Manufacturers Std	IR	√	P	V	-	
2.0 INPROCESS CONTROL														
2.1	All Components	Visual Defects	MA	Visual	100%	100%	Manufacturers Drawing	No harmful defects	Log book / IR	√	P	V	V	
		Dimensions	MA	Measurement	100%	100%	Manufacturers Drawing	Manufacturers Drawing	Log book / IR	√	P	V	V	
2.2	Pump discharge casing	Leak tightness	CR	Hydro test (Duration 30 minutes min.)	100%	100%	Refer Remark.	No leakage	IR	√	P	W	V	Test Pressure=2 times duty point pressure OR 1.5 times pump shut off head, whichever is higher

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	4/9/2020	Girish Chandra	Checked by:	04.09.2020	Mohit Kumar		
Reviewed by:	4/9/2020	Vishal Kumar Yadav	Reviewed by:	04/9/2020	Ritesh Kumar Jaiswal		

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-100-N002	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-100-N005, Rev-02	DATE: 6-May-2020
	PROJECT:		PO NO.:	DATE:
	ITEM: Sump Pump/Submersible Pump	SYSTEM: Plant Water/Common	SECTION: II	SHEET Page 2 of 3

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					
					M	C/ N				D	M	C	N	
	Motor Housing	Leak tightness	CR	Air test (Duration 30 Minutes min)	100%	100%	Air test at 0.5 kg/cm2 (gauge pressure)	No leakage	IR	√	P	V	V	
2.3	Casing & Impeller (machined surfaces)	Surface Defects	CR	DPT	100%	100%	ASTME:165	Appendix 8 of ASME Sec.VIII, Div.1	IR	√	P	V	V	On machined surface only
2.4	Impeller	Static & Dynamic residual unbalance	CR	Static, Dynamic balancing	100%	100%	ISO : 1940	ISO 1940 Gr. 6.3	IR	√	P	V	V	
2.5	Pump Motor Shaft	Internal Defects	CR	UT	100%	100%	ASTME:388	ASTME:388, Refer note 2	IR	√	P	V	V	On machined surface only
		Surface Defects	CR	DPT	100%	100%	ASTME:165	Appendix 8 of ASME Sec.VIII, Div.1	IR	√	P	V	V	On machined surface only
3.0 SUB-ASSEMBLY, ASSEMBLY CONTROL														
3.1	Pump, Motor, Rotor	Eccentricity	MA	Measurement	100%	100%	Manufacturers Drawing	Manufacturers Drawing	Log book / IR	√	P	V	V	
3.2	Pump and Motor assembly	Completeness, correctness	MA	Visual Examination	100%	100%	Manufacturers Drawing	Manufacturers Drawing	IR	√	P	V	V	
4.0 FINAL INSPECTION, PAINTING & PACKING														
4.1	Pump set (Pump+ Motor)	Q Vs Head, Q Vs Power, Q Vs Efficiency	CR	Performance test	100%	100%	Tech. Spec., Appd. Data Sheet, Appd. Curves, HIS, Test procedure	Tech. Spec., Appd. Data Sheet, Appd. Curves, HIS	Performance test record, Plotted Curves	√	P	W	V	
4.2	Routine Test on motor	HV, IR, Locked Rotor, No Load, Make type, Rating	CR	Electrical tests	100%	100%	IS 325	Approved Data Sheet	IR	√	P	V	V	Winding resistance Degree of protection shall be IP 68, HV at 2.5 KV AC for 1 Minute.
4.3	Strip down after Performance test	Undue wear, tear and breakages	CR	Visual examination of Casing & Impeller after stripping	100%	100%	Undue wer, tear and breakages	No undue wear, tear and breakages	IR	√	P	W	V	Witnessing one no. of each type
4.4	Complete Pump	Completeness, Correctness,	MA	Visual examination	100%	100%	Approved GA Drg	Approved GA Drg	IR	√	P	V	V	Compliance report for accessories will be submitted.

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:	Girishchandra 4/9/2020	Girish Chandra	Checked by:	04.09.2020	Mohit Kumar			Reviewed by:			
Reviewed by:		Vishal Kumar Yadav	Reviewed by:		Ritesh Kumar Jaiswal			Approved by:			
	4/9/2020			04/9/2020							

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-TS-XXX-100-N002	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-100-N005, Rev-02	DATE: 6-May-2020
	PROJECT:		PO NO.:	DATE:
	ITEM: Sump Pump/Submersible Pump	SYSTEM: Plant Water/Common	SECTION: II	SHEET Page 3 of 3

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								
		Workmanship and finish, overall dimensions												
4.5	Painting	Surface finish, DFT, Markings etc.	MA	Visual Exam. Measurement, Aesthetic	100%	100%	Approved Drg/Docs	Approved Drg/Docs	IR	√	P	V	V	Compliance report by Manufacturer
4.6	Packing, Marking	Soundness of packing	MI	Visual Aesthetic	100%	100%	Technical Specification / Approved procedure	Technical Specification / Approved procedure	IR	√	P	V	-	Photograph of packed material to be verified by BHEL before issuing MDCC.

NOTES:

1. For accessories and bought out items, Manufacturer will submit Compliance for review.
2. For UT test on shaft, defect echo < 20 % full screen height when back wall echo set @ 100 % screen height. Reduction in back wall echo to be <20%. Defect height > 20% of FSH is not acceptable, also loss in backwall echo>20 % not acceptable.
3. IP 68 protection certificate for test conducted on similar motor shall be submitted for review.
4. Compliance for provision of thermic switch for over heating protection of winding, reverse rotation protection device shall be submitted by Manufacurer.
5. For control panel separate QAP is applicable.
6. Before sending the documents for approval, supplier to ensure that "Reference documents" & "acceptance Norms" does contain data required for the Characteristic to be checked" as indicated in QP.
7. BHEL reserves the right for conducting repeat test, if required.
8. Photographs of packed material to be submitted to BHEL before issuing MDCC.
9. Project specific QP to be developed based on customer requirement.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION, **D**: 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, MTC: MILL TEST CERTIFICATE. **IR**: INSPECTION REPORT **GA DRG**: GENERAL ARRANGMENT DRAWING

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	4/9/2020	Girish Chandra	Checked by:	04.09.2020	Mohit Kumar		
Reviewed by:	4/9/2020	Vishal Kumar Yadav	Reviewed by:	04/9/2020	Ritesh Kumar Jaiswal		

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

SUB-SECTION - IIB

STANDARD TECHNICAL SPECIFICATION (ELECTRICAL)

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.

QUALITY PLAN FOR MOTORS BELOW 55 KW (LV)

		QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :				
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION TITLE				
		SHEET 1 OF 2	SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION			VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS	
1	2	3	4	5	6	7	8	9	10			11	
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-		
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	-		
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-		
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-		
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1		NOTE -1 & NOTE-3	
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	NOTE -1 & NOTE-3	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**
	NAME	
	SIGNATURE	

	QUALITY PLAN	CUSTOMER :		PROJECT TITLE			SPECIFICATION : NUMBER :			
		BIDDER/ : VENDOR		QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION : TITLE :			
	SHEET 2 OF 2	SYSTEM		ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10	10	10	11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	

NOTES:

1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON

2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.

3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.

Legends for Inspection agency

1. BHEL/CUSTOMER
2. VENDOR (MOTOR MANUFACTURER)
3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)

P. PERFORM
W. WITNESS
V. VERIFY

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

QUALITY PLAN FOR MOTORS 55 KW & ABOVE

		QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
		SHEET 1 OF 9	SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10	10	10	11
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	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	-DO-	3	-	-	
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	-DO-	-DO-	-DO-	INSPEC. REPORT	3	-	2	
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, UN-EVENNESS ETC.	-DO-	3	-	-	
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	MANFR'S DRG./SPEC BOOK	RELEVENT IS/SPEC.	SUPPLIERS TC & LOG	3	-	2	PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK	3	-	2	
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	MANFR'S DRG./SPEC	RELEVENT IS/	SUPPLIER'S TC	3	-	2	HEAT NO. SHALL BE VERIFIED
		3.DIMENSIONS	MA	MEASUREMENT	100%	MANUFR'S DRG.	MANUFR'S DRG.	LOG BOOK	3	-	2	
1.4	PAINT & VARNISH	1.MAKE, SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	LOG BOOK	3	-	2	
BHEL			**PARTICULARS**		**BIDDER/VENDOR**							
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

	QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
	SHEET 2 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	MFG. DRG. SPEC.	RELEVANT IS	SUPPLIER'S TC	3	-	2	
		3. DIMENSIONS	MA	MEASUREMENT	100%	-DO-	MANUFR'S DRG.	LOG BOOK	3	-	2	
		4.INTERNAL FLAWS	CR	UT	-DO-	ASTM-A388	MANUFR'S SPEC. BHEL SPEC.	-DO-	3	2	1	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	-DO-	MANUFR'S DRG. SPEC.	MANUFR'S DRG. SPEC.	-DO-	3	-	2	
		2. PHYSICAL COND.	MA	-DO-	-DO-	-	NO PHYS. DAMAGE, NO ELECTRICAL DISCONTINUITY	-DO-	3	-	2	
		3.DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG./ SPEC.	MANUFR'S DRG. / SPEC.	-DO-	3	-	2	
		4.PERFORMANCE/ CALIBRATION	MA	TEST	100%	-DO-	-DO-	INSP. REPORT	3	-	2	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
	SHEET 3 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	**W**	**V**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. ETC.	MA	VISUAL	100%	-	NO VISUAL DEFECTS	INSPT. REPORT	3	-	2	
		2. OTHER CHARACTERISTICS	MA	TEST	SAMPLE	MANUF'S SPEC.	MANUF'S SPEC.	LOG BOOK AND OR SUPPLIER'S TC	3	-	2	
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND.	MA	VISUAL	100%	-	NO VISUAL DEFECTS (FREE FROM BURS)	LOG BOOK	3	-	-	
		2.DIMENSIONS INCLUDING BURS HEIGHT	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG. .	MANUFR'S DRG.	-DO-	3	-	2	FOR MV MOTOR INSULA-TION/VARNISH THICKNESS SHALL BE MORE THAN THE BURS HEIGHT
		3. ACCEPTANCE TESTS	MA	ELECT. & MECH TESTS	-DO-	MANUF'S SPEC./ RELEVANT IS	RELEVANT IS	SUPPLIER'S TC	3	-	2	
1.9	CONDUCTORS	1. SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	LOG BOOK	3*	-	2*	* MOTOR MANUFACTURER TO CONDUCT VISUAL CHECK FOR SURFACE FINISH ON RANDOM BASIS (10% SAMPLE) AT HIS WORKS AND MAINTAIN RECORD FOR VERIFICATION BY BHEL/CUSTOMER.
		2.ELECT. PROP, & MECH. PROP	MA	ELECT. & MECH.TEST	SAMPLES	RELEVANT IS/ BS OR OTHER STANDARDS	RELEVANT IS/ BS OR OTHER STANDARDS	SUPPLIERS TC & VENDOR'S INSPN. REPORTS	3	-	2	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
	SHEET 4 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	**W**	**V**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
		3.DIMENSIONS	MA	MEASUREMENT	-DO-	-DO-	-DO-	Log Book	3	-	2	
1.10	BEARINGS	1.MAKE & TYPE	MA	VISUAL	100%	MANFR'S DRG./ APPROVED DATASHEET	MANFR'S DRG./ APPROVED DATASHEET	-DO-	3	-	2	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	BHEL DATA SHEET	BHEL DATA SHEET BEARING MANUF'S CATALOGUES	-DO-	3	-	2	
		3.SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	2	
1.11	SLIP RING (WHEREVER APPLICABLE)	1.SURFACE COND.	MA	VISUAL	100%	-	-DO-	-DO-	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	
		3.TEMP.WITH-STAND CAPACITY	MA	ELECT.TEST	-DO-	MANUF'S SPEC./ BHEL SPEC.	MANUF'S SPEC./ BHEL SPEC.	-DO-	3	-	2	
		4.HV/IR	MA	-DO-	100%	-DO-	-DO-	-DO-	3	-	2	
1.12	OIL SEALS & GASKETS	1.MATERIAL OF GASKET	MA	VISUAL	100%	MANUF'S DRG/SPECS	MANUF'S DRG./ SPECS.	-DO-	3	-	-	
		2.SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
		BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
	SHEET 5 OF 9	SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.0	IN PROCESS											
2.1	STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1.WORKMANSHIP & CLEANNESS	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	3/2	2	-	
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-	
2.2	MACHINING	1.FINISH	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	2	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-	
		3.SHAFT SURFACE FLOWS	MA	PT	-DO-	RELEVENT SPEC./ ASTM-E165	MANUFR'S SPEC./ BHEL SPEC./	-DO-	2	-	1	
2.3	PAINTING	1.SURFACE PREPARATION	MA	VISUAL	100%	MANFR'S SPEC/BHEL SPEC./ RELEVANT STAND	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
		2.PAINT THICKNESS (BOTH PRIMER & FINISH COAT)	MA	MEASUREMENT BY ELCOMETER	SAMPLE	-DO-	-DO-	-DO-	2	-	-	
		3.SHADE	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-	
		4.ADHESION	MA	CROSS CUTTING & TAPE TEST	-DO-	-DO-	-DO-	Log Book	2	-	-	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
	SHEET 6 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	MANUFR'S SPEC.	MANUFR'S SPEC.	Log Book	2	-	-	
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-DO-	-DO-	Log Book	2	-	-	
		3.CORE LOSS & HOTSPOT	MA	ELECT.TEST	-DO-	-DO-	-DO-	Log Book	2	1*	1	(FOR MOTORS OF 2MW AND ABOVE) * ON 10% RANDOM SAMPLE
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	MANUFR'S SPEC./BHEL SPEC.	MANUFR'S SPEC./BHEL SPEC.	Log Book	2	-	-	
		2.CLEANLINESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-	
		3.IR-HV-IR	CR	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	2	-	1	
		4.RESISTANCE	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
		5.INTERTURN INSULATION	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-	
		6.SURGE WITH STAND AND TAN. DELTA TEST	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	FOR MV MOTOR
2.6	IMPREGNATION	1.VISCOSCITY	MA	PHY. TEST	AT STARTING	-DO-	-DO-	Log Book	2	-	-	
		2.TEMP. PRESSURE VACCUM	MA	PROCESS CHECK	CONTINUOUS	-DO-	-DO-	Log Book	2	-	-	
		3.NO. OF DIPS	MA	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	THREE DIPS TO BE GIVEN

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
		BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
	SHEET 7 OF 9	SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	**W**	**V**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
		4.DURATION	MA	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
2.7	COMPLETE STATOR ASSEMBLY	1.COMPACTNESS & CLEANLINESS	MA	VISUAL	100%	-DO-	-DO-	Log Book	2	-	-	
2.8	BRAZING/COMPRESSION JOINT	1.COMPLETENESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-	
		2.SOUNDNESS	CR	MALLET TEST & UT	-DO-	-DO-	-DO-	Log Book	2		1	
		3.HV	MA	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	2		1	
2.9	COMPLETE ROTOR ASSEMBLY	1.RESIDUAL UNBALANCE	CR	DYN. BALANCE	-DO-	MFG SPEC./ ISO 1940	MFG. DWG.	Log Book	2		1	VERIFICATION FOR MV MOTOR ONLY
		2.SOUNDNESS OF DIE CASTING	CR	ELECT. (GROWLER TEST)	-DO-	MFG. SPEC.	MFG. SPEC.	Log Book	2		1	
2.10	ASSEMBLY	1.ALIGNMENT	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	2	-	-	
		2.WORKMANSHIP	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-	
		3.AXIAL PLAY	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	2	-	1	
		4.DIMENSIONS	MA	-DO-	-DO-	MFG.DRG./ MFG SPEC.	MFG. DRG/ RELEVANT IS	Log Book	2	-	-	
		5.CORRECTNESS, COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	2	-	-	
		6. RTD, BTD & SPACE HEATER MOUNTING.	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	2		1	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
	SHEET 8 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	**W**	**V**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS AS PER BHEL SPEC.	MA	ELECT.TEST	1/TYPE/SIZE	IS-325/ BHEL SPEC./ DATA SHEET	IS-325/ BHEL SPEC./ DATA SHEET	TEST REPORT	2	1*	1	* NOTE - 1
		2.ROUTINE TESTS INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1$	1	$ NOTE - 2
		3.VIBRATION & NOISE LEVEL	MA	-DO-	100%	IS-12075 & IS-12065	IS-12075 & IS-12065	-DO-	2	1$	1	$ NOTE - 2
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPC. REPORT	2	1	-	
		5.DEGREE OF PROTECTION	MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	RELEVANT IS	BHEL SPEC. AND DATA SHEET	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		6. MEASUREMENT OF RESISTANCE OF RTD & BTD	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1$	1	$ NOTE - 2
		7. MEASUREMENT OF RESISTANCE, IR OF SPACE HEATER	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1$	1	$ NOTE - 2
		8. NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPC. REPORT	2	1$	1	$ NOTE - 2
		9.EXPLOSION FLAME PROOF NESS (IF SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	1/TYPE	IS-3682 IS-8239 IS-8240	IS-3682 IS-8239 IS-8240	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		10. PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	BHEL SPEC. & DATA SHEET	BHEL SPEC. & DATA SHEET	TC	2	1$	1	SAMPLING PLAN TO BE DECIDED BY INSPECTION AGENCY $ NOTE - 2

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

	QUALITY PLAN	CUSTOMER :	PROJECT TITLE	SPECIFICATION : NUMBER :	
		BIDDER/ : VENDOR	QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03	SPECIFICATION : TITLE	
	SHEET 9 OF 9	SYSTEM	ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)	SECTION	VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11

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 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, THESE TEST MAY NOT BE REPEATED.

4 WHEREVER CUSTOMER IS INVOLVED IN INSPECTION, AGENCY (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.

Legends for Inspection agency

1. BHEL/CUSTOMER
2. VENDOR (MOTOR MANUFACTURER)
3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)

P. PERFORM
W. WITNESS
V. VERIFY

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

SUB-SECTION - IIC

STANDARD TECHNICAL SPECIFICATION (C &I)

SECTION III

DOCUMENTS TO BE SUBMITTED BY BIDDER

SECTION IIIA

COMPLIANCE CERTIFICATE

(TO BE SUBMITTED ALONG WITH BID)

	TITLE : TECHNICAL SPECIFICATION SUMP PUMPS 1X660 PANKI TPS	SPECIFICATION No. : PE-TS-426-100-N002A, Rev-00
	COMPLIANCE CERTIFICATE	SECTION: IIIA
		Date: 23.01.2023
		Sheet 1 of 1

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate 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/ deviations with regard to same.

b) QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein.

c) QP will be subject to BHEL/Customer approval in the event of order & 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.

d) All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/ Customer approval.

e) Bidder shall include the cost of Mandatory Spares, unless specified otherwise in Sec-IA of the specification or NIT.
Any mandatory spares stated as not applicable, shall have to be supplied without any cost implication to BHEL in the event they are found to be applicable during detail engineering stage.

f) There are no other deviation with respect to specification other than those furnished in the 'Schedule of Deviations'.

g) The offered materials should be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty. All materials shall be subject to approval in the event of order.

h) Prices for recommended spares (if any) for 3 years operation shall be furnished separately & not included in the base price.

i) The commissioning spares (if any) are supplied on 'As Required Basis' & prices for same included in the base price (If bidders reply to this is "No commissioning spares are required" and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL).

j) All sub vendors shall be as per BHEL/ Customer approved list.

k) Any special tools & tackles, if required, shall be in bidder's scope.

l) All models offered have been supplied by bidder in the past and are meeting the experience qualifying criteria of BHEL/ Customer (viz. The submersible pumps shall be of proven design. The pump manufacturer should have manufactured and supplied at least One (1) no. of submersible pump set for continuous duty for similar application, of type and capacity as offered or higher and which has been in successful operation for at least one (1) year prior to the date of Techno-Commercial bid opening. The pump set shall be suitable for pumping raw water with high turbidity and soft solids/fibrous solids which are generally observed in contaminated rivers / canal water. Components of Identical pumps shall be interchangeable. Any deviation to these criteria shall be suitably highlighted in deviation schedule).

m) All selected motor ratings have minimum margins as per Data sheet-A, section-1D of technical specification.

n) Power & Control circuits shall be with MCCB.

We the undersigned hereby undertake to meet the compliance requirements as listed above on the conditions as elsewhere specified.

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	

SECTION IIIB

GA DRAWING OF SUMP PUMPS

(TO BE SUBMITTED ALONG WITH BID--FOR REF. ONLY)

SECTION IIIC

DEVIATION SCHEDULE
(AS PER NIT FORMAT)

(TO BE SUBMITTED ALONG WITH BID)

SECTION IIID

ELECTRICAL LOAD DATA FORMAT

CABLE SCHEDULE

MOTOR DATA SHEET-C

AND BLALANCE DOCUMENT AS PER CL. 13.0 OF SECTION-IA

(TO BE SUBMITTED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT)

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.
	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

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.	426	ORIGINATING AGENCY		PEM (ELECTRICAL)	
	PROJECT TITLE	1X660MW PANKI	NAME		DATA FILLED UP ON	
	SYSTEM	SUMP PUMPS	SIGN.		DATA ENTERED ON	
	DEPTT. / SECTION	MSE	SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE	

CABLE SCHEDULE FORMAT **ANNEXURE III**

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

	TITLE	SPECIFICATION NO.
	MOTOR	VOLUME II B
		SECTION D
	DATA SHEET - C	REV NO. 00 DATE 29/08/2005
		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	

MOTORS

1. GENERAL

i) Manufacturer & Country of origin.

ii) Equipment driven by motor)

iii) Motor type

iv) Country of origin

iv) Quantity

2. DESIGN AND PERFORMANCE DATA

i) Frame size

ii) Type of duty

iii) Type of enclosure and method of cooling, Degree of protection

iv) Applicable standard to which motor generally conforms

v) Type of mounting

vi) Direction of rotation as viewed from DE END

vii) Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)

viii) (A) Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)

(B) Rating as specified in load list

ix) Rated Voltage (volts)

Rated Frequency (Hz)

x) Permissible variation of

a) Voltage (%)

b) Frequency (%)

c) Combined voltage and frequency

xi) Minimum permissible starting Voltage (Volts)

xii) Rated speed at rated voltage and frequency

xiii) At rated Voltage and frequency

a) Full load current (Amps)

b) No load current (Amps)

xiv) Power Factor at

a) 100% load

b) At duty point

c) 75% load

d) 50% load

e) NO load

f) Starting.

xv) Efficiency at rated voltage and frequrecy,

a) 100% load

b) At duty point

c) 75% load

d) 50% load

xvi). Starting current (amps) at

a. 100 % voltage

b. Minimum starting voltage

xvii). Starting time with minimum permissible voltage

a. Without driven equipment coupled

b. With driven equipment coupled

xviii) Safe stall time with 110% of rated voltage

a. From hot condition

b. From cold condition

xix.) Torques :

a. Starting torque at min. permissible voltage(kg-mtr.)

b. Pull up torque at rated voltage.

c. Pull out torque

d. Min accelerating torque (kg.m) available

e. Rated torque (kg.m)

xx). Stator winding resistance per phase (ohms at 20 Deg.C.)

xxi). GD^2 value of motors

xxii) No of permissible successive starts when & motor is in hot condition.

xxiii) a) Locked rotor KVA input (at rated voltage)
b) Locked rotor KVA/KW.

xxiv). Bearings

a. Type

b. Manufacturer

c. Self Lubricated or forced Lubricated

d. Recommended Lubricants

e. Guaranteed Life in Hours

f. Whether Dial Type thermometer provided

g. Oil pressure Gauge/switch

i. Range

ii. Contact Nos. & ratings

iii. Accuracy

xxv). Vibration

a) Velocity (mm/s)

b) Displacement (microns)

xxvi). Noise level (DB)

3. CONSTRUCTIONAL FEATURES

i). Stator winding insulation
- a. Class & Type
- b. Tropicalised (Yes/No)
- c. Temperature rise over specified max.
  - i. Cold water temperature of 38 DEG. C.
  - ii. Ambient Air 50 DEG. C.
- d. Method of temperature measurement
- e. Stator winding connection
- f. Number of terminals brought out

ii). Type of terminal box for
- a. stator leads
- b. space heater
- c. Temperature detectors
- d. Instrument switch etc.

iii). For main terminal box

a. Location
b. Entry of cables
c. Recommended cable size
(To be matched with cable size envisaged by owner)
d. Fault level (MVA)

i v). Temperature detector for stator winding

a Type
b. Nos. provided
c . Location
d. Make
e. Resistance value at 0 deg. C. (ohms)

v). Space Heaters

a. Number
b. Location
c. Power requirement (KW)

vi) Paint shade

vii). Weight of(approx)

a. Motor stator (KG)
b. Motor Rotor (KG)
c. Total weight (KG)

4. <u>CHARACTERISTIC CURVES</u>

i. Torque speed characteristic of the motor
ii. Thermal withstand characteristic
iii. starting. current Vs. Time
iv. starting. current Vs speed
v. P.F. and Effi. Vs Load

CORPORATE QUALITY ASSURANCE
SUB-VENDOR QUESTIONNAIRE

i.	***Item/Scope of Sub-contracting***			
ii.	***Address of the registered office***	***Details of Contact Person (Name, Designation, Mobile, Email)***		
iii.	***Name and Address of the proposed Sub-vendor's works where item is being manufactured***	***Details of Contact Person: (Name, Designation, Mobile, Email)***		
iv.	***Annual Production Capacity for proposed item/scope of sub-contracting***			
v.	***Annual production for last 3 years for proposed item/scope of sub-contracting***			
vi.	***Details of proposed works***			
1.	***Year of establishment of present works***			
2.	***Year of commencement of manufacturing at above works***			
3.	***Details of change in Works address in past (if any)***			
4.	***Total Area***			
	Covered Area			
5.	***Factory Registration Certificate***	***Details attached at Annexure – F2.1***		
6.	***Design/ Research & development set-up (No. of manpower, their qualification, machines & tools employed etc.)***	***Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design) Details attached at Annexure – F2.2 (if applicable)***		
7.	***Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc)***	***Details attached at Annexure – F2.3***		
8.	***After sales service set up in India, in case of foreign sub-vendor (Location, Contact Person, Contact details etc.)***	***Applicable / Not applicable Details attached at Annexure – F2.4***		
9.	***Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any***	***Details attached at Annexure – F2.5***		
10.	***Sources of Raw Material/Major Bought Out Item***	***Details attached at Annexure – F2.6***		
11.	***Quality Control exercised during receipt of raw material/BOI, in-process , Final Testing, packing***	***Details attached at Annexure – F2.7***		

CORPORATE QUALITY ASSURANCE
SUB-VENDOR QUESTIONNAIRE

12.	***Manufacturing facilities*** ***(List of machines, special process facilities, material handling etc.)***	***Details attached at Annexure – F2.8***
13.	***Testing facilities*** ***(List of testing equipment)***	***Details attached at Annexure – F2.9***
14.	***If manufacturing process involves fabrication then-***	***Applicable / Not applicable***
	List of qualified Welders	***Details attached at Annexure – F2.10***
	List of qualified NDT personnel with area of specialization	***(if applicable)***
15.	***List of out-sourced manufacturing processes with Sub-Vendors' names & addresses***	***Applicable / Not applicable*** ***Details attached at Annexure. –F2.11*** ***(if applicable)***
16.	***Supply reference list including recent supplies***	***Details attached at Annexure – F2.12*** ***(as per format given below)***

Project/ package	*Customer Name*	*Supplied Item (Type/Rating/Model /Capacity/Size etc)*	*PO ref no/date*	*Supplied Quantity*	*Date of Supply*

17.	***Product satisfactory performance feedback letter/certificates/End User Feedback***	***Attached at annexure - F2.13***
18.	***Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product (similar or higher rating)*** ***Note:- Reports need not to be submitted***	***Applicable / Not applicable*** ***Details attached at Annexure – F2.14*** ***(if applicable)***
19.	***Statutory / mandatory certification for the proposed product***	***Applicable / Not applicable*** ***Details attached at Annexure – F2.15*** ***(if applicable)***
20.	***Copy of ISO 9001 certificate*** ***(if available)***	***Attached at Annexure – F2.16***
21.	***Product technical catalogues for proposed item (if available)***	***Details attached at Annexure – F2.17***

Name:		***Desig:***		***Sign:***		***Date:***	

Company's Seal/Stamp:-