NTPC FEROZ GANDHI UNCHAHAR
1X500MW THERMAL POWER STATION, STAGE-IV

TECHNICAL SPECIFICATION

FOR

LUBE OIL TRANSFER PUMPS

SPECIFICATION NO.: PE-TS-401-567-A001

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERIING MANAGEMENT
PPEI, NOIDA-INDIA

INDEX

PREAMBLE

1.0 The Tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

1.1 **Volume –I CONDITIONS OF CONTRACT**

This consists of four parts as below:

Volume - I A	:	This part contains instructions to bidders for making bids to BHEL.
Volume - I B	:	This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.
Volume - I C	:	This part contains special conditions of contract.
Volume - I D	:	This part contains commercial conditions for erection and commissioning of site work, as applicable.

1.2 **Volume- II - TECHNICAL SPECIFICATIONS**

Technical requirements are stipulated in Volume II which comprises of:

Volume - II A	:	General Technical Requirements - NA
Volume - II B	:	Technical specification including drawings, if any

1.2.1 **Volume - II B:**

This volume is sub-divided into following sections:

Section - A	:	This section outlines the scope of enquiry.
Section - B	:	This section provides “Project Information”
Section - C	:	This section indicates technical requirements specific to the contract, not covered in Section-D.
Section - D	:	This section comprises of technical specifications of equipments complete with their data sheets, if any.

1.2.2 **Volume - III TECHNICAL SCHEDULES**

This volume contains technical schedules which are to be duly filled by the bidder and the same shall be furnished with the technical bid, as applicable.

TECHNICAL SPECIFICATIONS

FOR

LUBE OIL TRANSFER PUMPS

SECTION – A

(INTENT OF SPECIFICATION)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA

1.0 SCOPE OF INQUIRY / INTENT OF SPECIFICATION

1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, proper packing, delivery at site including freight, painting etc. for Lube **oil pumps** as per details in different sections / volumes of this specification.

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

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

1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.

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

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

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

1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.

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

1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder /vendor and Customer/ Purchaser/Employer will mean BHEL and /or BHEL's customer including their consultant as interpreted by BHEL in the relevant context.

TECHNICAL SPECIFICATIONS

FOR

LUBE OIL TRANSFER PUMPS

SECTION – B

(PROJECT INFORMATION)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA

1.00.00 BACKGROUND

Feroze Gandhi Unchahar Thermal Power Station, FGUTPS was conceived as a Load Centre coal based Power Station of 1050 MW capacity by UPSEB. The land for the project was acquired and stage-I (2x210MW) was implemented by UPSEB. The 2x210 MW Unchahar station was taken over by NTPC from Uttar Pradesh Rajya Vidyut Utpadan Nigam of Uttar Pradesh in 1992. Thereafter, NTPC implemented Stage- II (2x210 MW) and Stage-III (1X 210 MW).

The present expansion proposal is to install one additional unit of 500 MW under Stage-IV thus making the ultimate capacity of the FGUTPP 1550 MW.

1.01.00 LOCATION AND APPROACH

The plant is located in Raebareli district of Uttar Pradesh, having latitude and longitude of 25°54'50"N and 81°19'50"E respectively. It is bounded by villages Khnapur, Faridpur and Khaliqpur Khurd. Mustafabad town is located at a distance of about 3 Kms from the plant. Unchahar railway station on Allahabad-Raebareli broad gauge (BG) section of Northern Railway (NR) is 2 Kms away. The nearest airport is located at Lucknow a distance of approximately 110 km from the project site.

Vicinity Plan of the project is placed at **Annexure-I**

1.02.00 LAND REQUIREMENT

During the implementation of FGUTPS, Stage-I, II & III total area of about 2203 acres of land was acquired. The plant facilities, ash disposal and township for this expansion Stage-IV (1x500 MW) would be accommodated within the available land with dismantling and relocation of some buildings. No additional land has been envisaged to be acquired for this expansion project.

1.03.00 WATER

As per agreement between NTPC & Irrigation department, 105 Cusec of water is supplied through S.S Canal to NTPC-Unchahar. The Stage-IV (500MW) consumptive water requirement shall be accommodated within the existing commitment of water to FGUTPP. Sharda sahayak canal and Dalmau Pump House (DPH) on Purwa Branch Canal are available sources of water for the project and therefore, the make up water requirement for the plant is proposed to be drawn from these sources.

1.04.00 COAL AVAILABILITY AND TRANSPORTATION

1.04.01 Coal Availability

The coal requirement shall be about 2.7 Million tonnes per year.

The matter has been taken up with Ministry of Coal, Govt. of India for Long Term Coal Linkage for Stage-IV (1x500 MW)..Coal requirement for FGUTPP, Stage-I ,II & III is being met from North Karanpura Coal fields of CCL. For FR purposes, coal from North Karanpura Coal fields of CCL has been considered.

1.04.02 **Coal Transportation**

The envisaged mode of coal transportation from the coal mines to the power plant is by Indian Railways rakes. The rakes shall be unloaded at the track hopper.

1.04.03 **Coal Quality Parameters and Fuel Oil Characteristics**

The Coal quality parameters and Fuel Oil Characteristics are enclosed as **Annexures-II-1 and II-2** to this subsection.

1.05.00 **CAPACITY & POWER EVACUATION**

Stage- I	:	2x210 MW	Under Commercial Operation
Stage-II	:	2x210 MW	Under Commercial Operation
Stage-III	:	1x210 MW	Under Commercial Operation
Stage-IV		1x 500 MW	Present proposal

The existing capacity of plant is 1050 MW Step up/ power evacuation voltage for station is 220 KV. Presently 1000 MW is already being evacuated at 220 KV, addition of another 500 MW at 220 KV may cause overloading of 220 KV systems and lead to increase in fault levels at 220 KV system. Considering this 400 KV has been considered as step-up/power evacuation voltage for Stage-IV. Power Generated from FGUTPP- Stage IV, 500 MW unit would be stepped up to the evacuation voltage level through suitably rated Generator Transformer.

The power generated from Stage-IV is envisaged to be absorbed by Northern Region beneficiaries. For finalisation of Associated Transmission System (ATS) of the project, the matter would be taken up with Power Grid Corporation of India Ltd. (PGCIL)/CEA/appropriate authority depending on the various routes/options of power sale envisaged for the project.

1.06.00 **METEOROLOGICAL DATA**

Important meteorological data from nearest observatory at **Allahabad** is placed at **Annexure - III.**

1.07.00 **PLANT WATER SCHEME**

TECHNICAL SPECIFICATIONS

FOR

LUBE OIL TRANSFER PUMPS

SECTION – C
(Specific Technical Requirements)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI,NOIDA-INDIA

1.0 SCOPE OF WORK

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

The scope of equipment (Quantity, Capacity, Head and the type of strainer) to be supplied shall be as per Data sheet-A attached at last of this section C.

1.2 Mandatory spares: Not Applicable

1.3 Recommended Spares: Not Applicable

2.0 TERMINAL POINT

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

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

3.0 EXCLUSIONS

3.1 Power Cable
3.2 Motor starter in MCC
3.3 Local Push Button Station
3.4 Feeder for motor
3.5 Earthing of Pumps. However, earthing conductor is to be provided by the bidder.
3.6 Foundation & associated civil works.

4.0 CORROSION PROTECTION/ PAINTING SCHEDULE

	External
Surface preparation	Surface shall be degreased and prepared by brush/mechanical tool/sand. Blasting shall be as per manufacturing guide lines to SA 2.5.
Primer Coat	One coat of epoxy based zinc rich primer of minimum DFT 50 micron.
Intermediate coat	One coat of epoxy based TiO2 pigmented polyamide cured paint of DFT 50 microns.
Finish	Two coat, each of DFT 50 microns per coat of aliphatic acrylic 2 pack polyurethane finish paint. Thus a total DFT of 200 microns shall be achieved. Paint shade shall be RAL 5012(Blue).

Note:

I. Any change in painting specification at later date needs to be complied by bidder without any commercial implication.

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

5.0 QUALITY REQUIREMENTS

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

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

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

6.0 DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH THE BID

The drawings and documents to be submitted with the bid shall be as mentioned below:

a. Prebid clarification schedule as per format given under Vol-III, in case of any clarifications.
b. Deviation schedule as per format given under Vol-III, in case of any deviations by bidder.
c. Compliance cum confirmation certificate as given under Vol-III.

In addition to the above, docs required along with bid given under **electrical portion of specification** shall be furnished by bidder.

In absence of any of the above documents, bidder offer may be treated as incomplete and the same is liable for rejection

7.0 DRAWINGS AND DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

List of drawings / documents required during detail engineering along with submission Schedule is given under **Annexure-III**, Vol-III.

Further, bidder to prepare the drawings & docs in line with general Mech. & Elect. guidelines given under section-D.

BHEL PEM	DATA SHEET FOR LUBE OIL PUMPS		DOC. NO. PE-DC-401-100-N301 SHEET NO. 01 OF 01
	PROJECT TITLE : NTPC - UNCHAHAR FGUTPP-IV (1 X 500 MW)		
1.0	SERVICE IDENTIFICATION	CLEAN OIL PUMP	DIRTY OIL PUMP
2.0	SYSTEM	CENTRAL LUBE OIL SYSTEM	CENTRAL LUBE OIL SYSTEM
3.0	TYPE	ROTARY POSITIVE DISPLACEMENT	ROTARY POSITIVE DISPLACEMENT
4.0	NUMBER REQUIRED	ONE (01) NO. (COMMON FOR THE STATION)	ONE (01) NO. (COMMON FOR THE STATION)
5.0	FLOW RATE (MAX.)	8250 LPH	8250 LPH
6.0	DISCHARGE PRESSURE	2.0 KG/CM^2 (g)	2.0 KG/CM^2 (g)
7.0	SUCTION CONDITION	FLOODED (MAX -4 MLC TO BE CONSIDERED)	FLOODED (MAX -4 MLC TO BE CONSIDERED)
8.0	LOCATION OF INSTALLATION	INDOOR	INDOOR
9.0	LIQUID PUMPED	TURBINE LUBE OIL (TURBINOL-46-HPC / SERVOPRIME 46-IOC)	TURBINE LUBE OIL (TURBINOL-46-HPC / SERVOPRIME 46-IOC)
10.0	PROPERTIES OF FLUID	DENSITY- 0.9 GM/CC AT 15°C FLASH POINT - 210 °C VISCOSITY -28 CST AT 50 °C / 48 CST AT 37.8°C / 140 CST AT 20°C	DENSITY- 0.9 GM/CC AT 15°C FLASH POINT - 210 °C VISCOSITY -28 CST AT 50 °C / 48 CST AT 37.8°C / 140 CST AT 20°C
11.0	TEMPERATURE NORMAL / MAX	AMBIENT / 70 ^{0} C	AMBIENT / 70 ^{0} C
12.0	SUCTION / DISCHARGE PIPING CONNECTION	OD 88.9 X 5.49 / OD 88.9 X 5.49	OD 88.9 X 5.49 / OD 88.9 X 5.49
13.0	RELIEF VALVE	BUILT-IN ON EACH PUMP	BUILT-IN ON EACH PUMP
14.0	SUCTION STRAINER	DUPLEX TYPE STRAINER WITH CHANGE-OVER VALVE, SS ELEMENT MESH SIZE 20 & BLOW DOWN VALVE	DUPLEX TYPE STRAINER WITH CHANGE-OVER VALVE, SS ELEMENT MESH SIZE 20 & BLOW DOWN VALVE
15.0	MATERIALS OF CONSTRUCTION CASING GEARS SHAFT	 CAST IRON - IS 210 - FG260 EN-8/9 EN-8/9	 CAST IRON - IS 210 - FG260 EN-8/9 EN-8/9
16.0	APPLICABLE CODES / STATUTORY REGULATIONS	AS APPLICABLE IS, BS, API STANDARDS	AS APPLICABLE IS, BS, API STANDARDS
17.0	DRIVE TYPE	INDUCTION MOTOR 415 V, 50 Hz	INDUCTION MOTOR 415 V, 50 Hz

TECHNICAL SPECIFICATIONS

FOR

LUBE OIL TRANSFER PUMPS

SECTION – C

(ELECTRICAL PORTION)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA

SPECIFIC TECHNICAL REQUIREMENTS: ELECTRICAL

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

1.1 Scope for supply, and erection & commissioning of various equipment forming part of electrical system for this package shall be as per Annexure–I to Section – C [Scope of Work (Electrical)].

1.2 Make of various equipment/ items in the scope of bidder shall be to approval of owner during detailed engineering stage without any commercial implications.

1.3 Bidder shall furnish all AC as well as DC loads required for the system at different voltage levels (eg. 415V AC, 240 V AC, 220 V DC etc.) of all types, such as motor feeders, supply feeders in Electric load data format (Annexure-II) along with the offer.

1.4 All electrical equipment shall be suitable for the power supplies, fault levels and climatic conditions as given in this specification (under NTPC technical requirement and project information).

1.5 All drawings, data sheets, Quality Plan, calculations, test reports, test certificates, etc. shall be submitted during detailed engineering stage as per formats enclosed. The same shall be subject to approval without any commercial implications.

1.6 Technical requirements shall be as per specifications listed in Clause 4.1, 4.2, 4.3, 4.4 & 4.5 below.

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated. In line with this, the bidder as technical offer shall furnish two signed and stamped copies of the following:

a) A copy of the sheet “Electrical Equipment Specification for LUBE OIL TRF PUMP (DATASHEET-A OF MOTOR) and sheet “Electrical Scope between CUSTOMER and Vendor” with bidder’s signature and company stamp.
b) List of Erection and Commissioning spares.
c) List of Erection & Maintenance tools & tackles.
d) Electrical load requirement in the load data format (Annexure-II).

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

4.0 LIST OF ENCLOSURES

4.1 Electrical scope between BHEL & vendor (Annexure-I).
4.2 Technical specification no. PE-SS-999-506-E101 given under section-D.
4.3 415V Electric motor Data Sheets A
4.4 Quality Plan for motors given under section-D.
4.5 NTPC specification for Motors
4.6 Load data format (Annexure-II) given under Vol-III
4.7 415V Electric motor Data Sheets C (To be filled by bidder) given under Vol-III.

ANNEXURE-I
ELECTRICAL SCOPE BETWEEN CUSTOMER AND VENDOR

PROJECT: 1X500MW UNCHAHAR TPP Date: 30.06.2014, Rev-0

PACKAGE: LUBE OIL PUMPS

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V SWITCHGEAR	CUSTOMER	CUSTOMER	CUSTOMER will provide only 415V supply. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local push button station (Start/Stop)	CUSTOMER	CUSTOMER	
3	Power cables, ordinary control cables and screened control cables between equipments supplied by vendor.	CUSTOMER	Vendor	Vendor shall furnish size and quantity of cables required at contract stage.
4.	Power cables, ordinary control cables and screened control cables between equipments supplied by vendor & Customer.	CUSTOMER	CUSTOMER	
5	Any special type of cable like compensating. Co-axial, prefab, MICC and fibre optical	Vendor	Vendor	Erection materials for special cables shall be in the Scope of bidder.
6	Illumination	CUSTOMER	CUSTOMER	
7	Cabling material (cable trays, accessories and cable tray-supporting system, conduits, M Boxes/J Boxes) for cabling between equipments supplied by vendor and Customer.	CUSTOMER	CUSTOMER	
8	Equipment earthing.	CUSTOMER	CUSTOMER	BOQ to be furnished by vendor after award of contract.
9	Motors with Base frame and fixing hardware for motors.	Vendor	CUSTOMER	Makes shall be subject to CUSTOMER approval at contract stage.
10	a) Input cable schedules b) Cable interconnection details. c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for control cables for vendor-supplied equipment (soft copies in the customer cable schedule format) shall be furnished during detail engineering by vendor.
11	Equipment layout drawings.	Vendor	-	Layout details between vendor supplied equipments and installation drawings by vendor
12	Cable glands and lugs for equipment supplied by vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass glands. 2. Solder less crimping type heavy-duty tinned copper lugs for power cables. 3. Heavy duty tinned copper lugs for control cables.
13	Any other item for completeness of System	Vendor	CUSTOMER	Supply of any other item for completeness of electrical work (although not mentioned specifically but required for trouble free and efficient operation of the system) shall be deemed to be included in the scope of vendor without any extra charge.

Note- All QPs shall be subject to approval of Customer after award of contract.

SUB-SECTION – B-09

MOTORS

1.00.00 GENERAL REQUIREMENTS

1.01.00 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.

1.02.00 All equipments shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.

1.03.00 Contractor shall provide fully compatible electrical system, equipments, accessories and services.

1.04.00 All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.

1.05.00 The auxiliary AC voltage supply arrangement shall have 11kV, 3.3 kV and 415V systems. It shall be designed to limit voltage variations as given below under worst operating condition :

(a) 11kV, 3.3 kV +/- 6%

(b) 415/240V +/- 10%

1.06.00 The voltage level for motors shall be as follows :-

a) Upto 0.2KW : Single phase 240V AC / 3 phase 415V AC

b) Above 0.2KW and upto 200KW : 3 phase 415V AC

c) Above 200KW and upto 1500 KW: 3.3 kV

d) Above 1500 KW : 11 kV

Voltage rating for special purpose motors viz. screw compressors and those with VFD shall be as per manufacturer standard.

For CHP conveyor's motor above 160KW rating 3.3KV, three phase AC supply is to be used. However all the motors on the Stacker/ Reclaimer machine shall be on 415V AC only.

1.07.00 ~~Fault level shall be limited to 40kA RMS for 1 second for 11kV & 3.3 kV system~~ and 45 kA RMS 1 second for 415V system. 415V system shall be solidly grounded and 220 VDC system shall be isolated type.

1.08.00 Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.

1.09.00 The responsibility of coordination with electrical agencies and obtaining all necessary clearances shall be of the contractor.

1.10.00 Degree of Protection

Degree of protection for various enclosures as per IS:4691, IEC60034-05 shall be as follows :-

i)	Indoor motors	-	IP 54
ii)	Outdoor motors	-	IP 55
iii)	Cable box-indoor area	-	IP 54
iv)	Cable box-Outdoor area	-	IP 55

2.00.00 CODES AND STANDARDS

1)	Three phase induction motors	:	IS:325, IEC:60034
2)	Single phase AC motors	:	IS:996, IEC:60034
3)	Crane duty motors	:	IS:3177, IEC:60034
4)	DC motors/generators	:	IS:4722
5)	Energy Efficient motors	:	IS 12615

3.00.00 TYPE

3.01.00 **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 Energy Efficient motors, Efficiency class-Eff 1, conforming to IS 12615.

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

3.02.00 DC Motors Shunt wound.

4.00.00 RATING

(a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.

(b) Whenever the basis for motor ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings

shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.

(c) ~~For BFP motor the starting MVA shall be restricted to 58 MVA.~~

5.00.00 TEMPERATURE RISE

Air cooled motors

70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation.

Water cooled

80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.

41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class Y wet wound Boiler circulation pump motor.

6.00.00 OPERATIONAL REQUIREMENTS

6.01.00 **Starting Time**

6.01.01 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.

6.01.02 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.

6.01.03 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.

6.01.04 Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.

6.02.00 **Torque Requirements**

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

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

6.03.00 **Starting voltage requirement**

(a) 85% up to 1500KW (except for AOP motor which is 80%)

(b) 80% from 1501 KW to 4000KW

(c) 75% > 4000KW

7.00.00 DESIGN AND CONSTRUCTIONAL FEATURES

7.01.00 Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors , space heater terminals inside the main terminal box may be acceptable.

7.02.00 All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). CW motors can be screen protected drip proof (SPDP) type. Motors located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below

(a)	Fuel oil area	:	Group – IIB
(b)	Hydrogen generation plant area	:	Group - IIC (or Group-I, Div-II as per NEC)

7.03.00 Winding and Insulation

(a)	Type	:	Non-hygroscopic, oil resistant, flame resistant
(b)	Starting duty	:	Two hot starts in succession, with motor initially at normal running temperature. However the conveyor motor shall be suitable for 3 consecutive hot starts.
(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. The lightning 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

7.04.00 Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.

7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.
7.06.00	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.
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.
7.08.00	Motor body shall have two earthing points on opposite sides.
7.09.00	HT motors can be offered with either elastimould termination or dust tight phase separated double walled (metallic as well as insulated barrier) cable boxes. In case elastimould terminations are offered, then protective cover and trifurcating sleeves shall also be provided. In case cable box is offered, then Employer shall provide termination kit. 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 in case of cable boxes.
7.10.00	The spacing between gland plate & centre of terminal stud shall be as per Table-I.
7.11.00	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.
7.12.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.
7.13.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.
7.14.00	11kV and 3.3 kV motor Terminal Box shall be suitable for fault level of 750MVA for 0.12 sec and 250 MVA for 0.12 sec respectively. Elastimould termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.
8.00.00	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) Upto 110KW : 11.0 (For AOP motor it shall be 8.0) (b) Above 110KW & upto 1500KW : 10.0 (c) Above 1500KW & upto 4000KW : 9.0 (d) Above 4000KW : 6 to 6.5
9.00.00	~~CW Motor shall be desigined with minimum power factor of 0.8 at design point.~~
10.00.00	**TYPE TEST**
10.01.00	**HT MOTORS**
10.01.01	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 in the relevant schedule of Section - VII-(BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.
10.01.02	The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set–up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.
10.01.03	In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the owner 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 owner 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.
10.01.04	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 ten 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 ten 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 owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

10.01.05 **LIST OF TYPE TESTS TO BE CONDUCTED**

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

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

(b) Measurement of noise at no load.

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

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

(e) 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) Lightning Impulse withstand test on the sample coil shall be as per IEC-60034, part-15

(g) Surge-withstand test on interturn insulation shall be as per clause no. 5.1.2 of IEC 60034, part-15

10.01.06 **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

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

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

10.02.00 **LT Motors**

10.02.01 LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last *ten* 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.

10.02.02 However if the contractor is not able to submit report of the type test(s) conducted within last ten 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 owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

10.02.03 **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

1. Measurement of resistance of windings of stator and wound rotor.
2. No load test at rated voltage to determine input current power and speed
3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors)
4. Full load test to determine efficiency power factor and slip .
5. Temperature rise test .
6. Momentary excess torque test.
7. High voltage test .
8. Test for vibration severity of motor.
9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section)
10. Test for degree of protection and
11. Overspeed test.

10.03.00 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.

10.04.00 The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and “No design Change”. Minor changes if any shall be highlighted on the endorsement sheet.

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.~~

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

ELECTRICAL EQUIPMENT SPECIFICATION FOR FOR LUBE OIL TRF PUMP

DATA SHEET-A(ELECTRICAL PORTION)

SL.NO.	PARAMETERS	UNIT	UNCHAHAR
	MOTOR		
1	DESIGN AMBIENT TEMP	DEG. C	50
2	VOLTAGE SUPPLY AND VARIATION	VOLT	415V, ± 10%
3	FREQUENCY WITH VARIATION	Hz	50(+ 3% to - 5%)
4	COMBINED VOLTAGE & FREQUENCY VARIATION		10% (absolute)
5	MAX ACCEPTABLE RATING OF MOTOR AT 415 V	KW	(Upto) 200 KW
6	SYSTEM FAULT LEVEL AND ITS DUARTION	KA	45kA for 1sec
7	SUTABILITY OF TERMINAL BOX FOR FAULT LEVEL AND DURATION		45 KA, 0.2 sec
8	CLASS OF INSULATION & TEMP RISE LIMITED TO		THERMAL CLASS 130 B & 155 F INSULATION, TEMP REISE LIMITED TO CLASS B
9	MIN. STARTING VOLTAGE		85% up to 1500kW
10	MOTOR RATING FOR SINGLE PHASE SUPPLY		0.2 kW & Below
11	RATIO OF LOCKED ROTOR KVA at rared voltage to RATED KW		11 for BELOW 110kW & 10 for 110 kW to 1500kW
12	ACCEPTABLE NOISE LEVEL	DB	85dB(A)
13	TYPE OF STARTER PROVIDED IN MCC		DOL
14	DOP OF ENCLOSURE		IP-55 & IP-54 for outdoor & indoor resp as per IS 4691 & IEC 60034-05.
15	SPACE HEATER REQUIREMENT	>30kW	30KW & ABOVE
16	PAINT SHADE		RAL - 5012 (blue)
17	SPECIAL REQUIREMENT		TYPE TEST REPORTS MORE THAN 10 YEARS OLD FROM THE DATE OF BID OPENING ARE NOT ACCEPTABLE

TECHNICAL SPECIFICATIONS

FOR

LUBE OIL TRANSFER PUMPS

SECTION – D

(GENERAL TECHNICAL SPECIFICATION)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA

1.0 GENERAL

This specification covers the design material constructional features manufacture assembly inspection & testing at manufacturer's or his subcontractor's works, suitable painting & packing requirements of Lube Oil transfer pumps and drives along with all accessories as specified hereinafter.

2.0 CODES & STANDARDS

All equipment, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes in the locality where they will be installed. They shall comply with the latest editions of the codes and standards as given below.

a) American National Standards Institute (ANSI)

b) American Society of Testing & Materials (ASTM)

c) American society of Mechanical Engineers (ASME)

d) Hydraulic Institute Standards (HIS)

e) American Petroleum Institute (API)

f) American Gear Manufacturer's Association (AGMA)

g) National Electrical Manufacturer's Association (NEMA)

h) National Fire Protection Association (NFPA)

i) Indian Standards Institute (ISI)

Other International/National standards such as DIN, VDI, BS, IS etc. shall also be accepted subject to the owner's approval for which the bidder shall furnish along with the offer adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned above together with the complete word to word translation of the standard that are normally not published in English In the event of any conflict between the Codes and Standards and their requirements of this specification, the requirement of this specification shall govern.

All equipment covered by this specification shall comply with all applicable laws and regulations of the Republic of India.

In case of any change in code, standards and regulations between the date of purchase order and the date when vendors proceeds with fabrication the purchaser shall have the option to incorporate changed requirements without additional commercial implication. It shall be the responsibility of vendor to advice purchaser of the resulting effect.

3.0 DESIGN REQUIREMENTS & CONSTRUCTIONAL FEATURES

3.1 Casting

The pump shall be horizontal, positive displacement type, designed for oil service and suitable for occasional dry running. The casing shall also have end plates/pump cover which close the ends of the body to form the pumping chamber. The casing shall house rotating assembly. Gear type with a drive shaft.

3.2 Rotor

The rotor shall constitute of a shaft on which either Gear are mounted. The rotating assembly shall be encased in the casing and shall be properly sealed. Mechanical Seal could be offered for sealing purpose. The seal material shall have low coefficient of friction and shall be suitable for the fluid handled.

3.3 Bearing & Lubrication

Bearings of adequate design shall be provided for taking the entire pump load arising from all probable conditions for continuous operation throughout its range of operation. The bearing shall be designed on the basis of 20,000 working hours minimum for the load corresponding to the duty point. Proper Lubricating arrangement for the bearing shall be provided. Bearings shall be easily accessible without disturbing the pump assembly. The pump bearings shall be antifriction ball/ roller type of adequate size to carry both radial and axial loads. Any other type of bearing may be accepted subject to acceptance by customer.

3.4 Coupling

The pumps shall be directly coupled to their drives through a flexible coupling. Suitable coupling guards also shall be provided along with the coupling. The pump and its drive motor shall be mounted on machined base frame.

3.5 Base Frame

Common/individual base frame shall be provided for pump and motor. The base frame shall be fabricated/casted construction providing rigidity and stability and shall be capable of supporting the weight and reactions of the pump & motor. The base plate will have a drip pan with suitable draining arrangement and shall be suitably drilled for the anchor bolts. The material of construction shall be of tested quality structural steel as per IS-2062 or equivalent.

Anchor bolts, nuts, lock nuts, seating steel work as required shall be supplied with the equipment. Only hexagonal nuts shall be used for holding down the equipment.

3.6 Lifting Arrangement

Each pump shall incorporate suitable lifting attachments e.g. lifting lugs or eye bolts etc. to facilitate erection & maintenance.

3.7 **Rating Plates & Name Plate**

Each equipment shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturers name, equipment type or serial number.

4.0 OTHER TECHNICAL / DESIGN & GENERAL REQUIREMENTS

4.1 The data sheets for Pump and motors placed under **Vol-III of specification** forms part of specification. The "*" marked details are to be filled up by the bidder without altering the data already filled up.

4.2 The material of construction of Strainer body will be either ASTM A 106 Gr.B pipe or ASTM A216 WCB or fabricated from IS 2062 plates. However, the exact MOC is subject to acceptance by customer and there will be no additional commercial implication on account of above.

4.3 The driving motor power shall be selected based on highest viscosity of oil. The selection of pump motor rating shall be based on criterion given in the electrical portion of the specification.

4.4 VOID.

4.5 The pump shall be designed for the normal operating temperature specified in the data sheet. However, the pump should be able to perform without any malfunctioning at the maximum temperature also as indicated in the data sheet.

4.6 VOID.

4.7 VOID.

4.8 VOID.

4.9 Pumps shall be designed for smooth pulsation and noise free operation. Pump shall be designed to have maximum efficiency at the normal duty point.

4.10 The design of pump shall be so as to minimize the end thrust.

4.11 The pump shall have minimum vibration, noise and capacity reduction even when the viscosity of oil increases during winter season. The maximum permissible noise level of the pump set shall be 85 dBa measured at a distance of 1 metre horizontal and 1.5 metre vertical from the edge of pump motor set.

4.12 Material of construction for the vital parts shall be as shown in data sheet or elsewhere in the specification. The material of construction of the other parts of the pump shall be subject to Customer's approval during detail engineering and any changes therein as required by the customer shall be provided by the successful bidder without any commercial implication. All materials used for manufacture of the pump and its components shall be of tested quality. Relevant test certificates shall be made available to the purchaser before taking up fabrication work. In the absence of such certificates the vendor shall arrange to carry out necessary tests required by the code at his cost.

4.13 The revision made by successful bidder in any drawings and documents shall be highlighted by indicating the no. of revisions in a triangle without fail so that the minimum time is required by customer to review the drawings and documents.

4.14 If required by the customer during detail engineering, the successful bidder will submit separate drawing of various assembly / sub - assembly in addition to GA drawing without any commercial implication to the customer.

4.15 The recommended civil foundation drawing to be furnished by the bidder during detail engineering shall include the followings:-

a) Scope of work by BHEL and vendor shall be indicated with different legend or in the form of note.

b) Weight of moving parts, its frequency and its height from floor shall be furnished.

c) Recommended location of cable trench for feeding cable to machine along with the details of cable entry.

d) Civil loads per bolt / pocket (static and dynamic) in tabular form considering worst case.

4.16 The successful bidder will have to depute competent designer (s) at BHEL's office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL. However, the vendor will be informed in advance by minimum 7 days.

4.17 All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

4.18 All the drawings and documents including general arrangement drawing, data sheet, calculation etc. shall be furnished to the customer during detailed engineering stage and include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance and information etc.:-

a) All drawings and documents shall bear BHEL's title block and drawing / document number. However, BHEL's drawing / document-numbering scheme shall be furnished to the successful bidder after the placement of L.O.I.

b) All drawings and documents shall indicate the list of all reference drawings including general arrangement.

c) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view of all major self manufactured and bought out items shall be labelled and included in BOQ / BOM in tabular form.

d) Specification of painting shall be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade name.

e) Technical parameters of the equipment (capacity, pressure, fluid handled, vibration limit, noise level at a distance of 1.0 meter at a level of 1.5 meters above ground, details of coupling, details of motor, details of gears of pump, recommended capacity of hoist, weight of heaviest (single) part / component of the equipment and total weight etc.) in general arrangement drawing and these shall be indicated in the drawing with dimensions to the extent possible.

f) The supplier's drawings and data shall set forth overall and detailed dimensions; location and centre lines; pipe conduit and other connections schematic and wiring diagrams; clearance and load points; space required for withdrawal or removal of equipment or parts and such information as will be needed by Owner in order to provide adequate space for and connection to the equipment.

g) Details of cable entry for pump shall be shown in all the 3 views (plan, elevation and side view) indicating dimensions from a reference point.

4.19 All calculations which are required to be submitted shall be done manually and necessarily in SI units and the same shall be furnished along with the copy of authentic supporting literature e.g. Code, Hand book, National / international Standards etc.

5.0 TESTING & INSPECTION AT MANUFACTURE'S WORKS

5.1 VOID

5.2 The supplier shall provide inspection to establish and maintain quality of workmanship in his works and that of his subcontractors to ensure the mechanical accuracy of components, compliance with drawings, identity and acceptability of all materials, part and equipment. He shall conduct all tests required to ensure that the equipment and material furnished shall conform to the requirements of the applicable codes. All tests and test procedure proposed by the manufacturer shall be submitted to the purchaser for his prior approval. The purchaser shall be notified well in advance of the fabrication and major shop test of the equipment for the purpose of making general inspections and for the progress report. The purchaser's representative shall be given full access to the shop in which the equipment is being manufactured or tested and all test records shall be made available to him. A final inspection will be made by the purchaser's representative before the dispatch of the equipment. Final performance tests for the complete units shall be carried out in the presence of purchaser's representative.

All material used for manufacture of the equipment covered under this specification shall be of tested quality. Relevant test certificate shall be made available to the purchaser before the final shop inspection. In case the relevant correlating test certificates are not available, the supplier shall arrange to carry out the necessary tests required by code at his cost.

5.3 Steel forging used in pumps shall be tested for both physical properties and chemical composition.

5.4 The castings shall be sound, clean and free from porosity blowholes, hard duration and other harmful defect.

Areas, which in the opinion of the purchaser will create doubts about soundness to the castings, shall be subjected to dye-penetration test as per ASTM Specification A-165-95.

No welding or repairs shall be carried out without prior permission of the purchaser. The entire surface of the castings shall be subjected to Dye penetrant test as per ASTM A-165-95. Evaluation of indication shall be as per relevant standard.

5.5 Welding procedure, equipment, welders and operators shall be qualified, prior to taking up any welding. Liquid penetrant examination shall be carried out on the weldments in accordance with the requirement of ASME Code.

The welding procedures shall clearly state the type of material thickness joint details, preheat temperature maintained, post weld heat treatment given, welding current & voltage used during qualification of welding procedure. For all pressure parts and high-pressure weld joints, the latest applicable requirement of the code must be complied with. All records in line with the above shall be maintained and made available to the purchaser. The welding test shall be carried out on the following:

i) Root pass of single groove welded but joint.

ii) Finish surfaces of all fillet weld.

iii) Before weld repair after defect has been rouged out and grounded to ensure removal of defect.

iv) On impellers after any heat treatment.

v) Radiography of butt weld joints shall be carried out in accordance with the relevant code.

5.6 Heat treatment operations including stress relieving shall be performed in accordance with the applicable codes. Recording of temperature with thermocouples placed in direct contact with the job for recording the metal temperature during heat treatment shall be done.

5.7 Ultrasonic examination of pump shaft above 50 mm diameter as per the governing specifications. In absence of these, ultrasonic testing should conform to ASTM A 388 and evaluation of indications as per relevant standard.

5.8 All the impellers shall be statically and dynamically balanced at the operating speed as per the requirement of ISO 1940 G 6.3.

5.9 **Performance Tests**

Performance tests shall be conducted for each of the pump with unit motor at the manufacturer's works in the presence of the purchaser or his authorized agent in accordance with relevant Indian/ equivalent standards. At least 5 points, approximately equally spaced on the characteristic curve including relief valve set pressure, rated flow & pressure shall be tested and acceptance will be determined as per the relevant standard. These tests shall be conducted with actual drive motor being furnished. In general, performance tests shall include the following tests.

a) Establish flow and pressure characteristic

b) Establish flow and power characteristic

c) Establish flow and efficiency characteristic

Purchaser or their authorized representative shall have access to all the tests. Prior intimation shall be given allowing adequate time for preparation of the witness of the test. After the performance testing, the observations noted and the computation of results for rated performance shall be submitted to purchaser for approval. On approval the pump shall be undertaken for strip testing and its components shall be examined for visual and other tests before being taken for dispatch in the presence of purchaser or their authorized inspection agencies.

Test on each pump for vibration level in the transverse, horizontal and vertical directions shall be carried out. Noise level shall be measured at the rated speed. Measurement of oil leakage at seal/stuffing box shall be recorded if any.

5.10 **Test at Site**

The pumps will be tested at site to verify its mechanical performance and checking the vibration and noise level. If the pumps fail to operate smoothly then such deficiencies shall be rectified by the supplier by making suitable alterations in the pump set and additional tests required to show the effect of such alterations shall be performed by him. The change made in the pump shall be certified with technical back up information to the satisfaction of the purchaser.

5.11 **Performance Guarantee**

The vendor shall *guarantee* the material and workmanship of all equipment as well as the operation of the pump as per requirement of this specification.

The vendor shall also *guarantee* for each pump the discharge pressure at the specified rated capacity and also corresponding efficiency, brake horsepower and relief valve set pressure.

6.0 **CLEANING PROTECTION & PAINTING**

Before shipment of the equipment to be supplied under this specification, internal surfaces of all parts shall be cleaned to remove loose dirt, weld rod stubs and other foreign objects prior to final assembly of the equipment.

Liquid used for hydro testing or cleaning shall be drained from the parts. Excess oil and grease shall be removed by wiping. All openings shall be covered to guard against damage and entrance of foreign objects during shipment. Hydraulic tested parts shall not be packed till the inside surface becomes dry.

Particular care shall be taken to ensure that all foundry sand and loose material is properly removed by feting.

Ends shall be protected from external damage and sealed against the ingress of dirt.

A thin short steel circular blanking plate of a diameter 1/4" less than the bolt holes inner PCD shall be firmly fixed to the flange faces by the application of adhesive after first ensuring that the flange faces have been thoroughly degreased. A wooden blank should then be bolted to the flange using a minimum of four bolts.

All piping shall be closed after shop assembly by shot blasting or other means approved by owner. Lube oil piping or carbon steel piping shall be pickled.

The metal surface shall be painted with two (2) coats of approved anti-corrosive primer paint as per paint supplier's instruction. All machined surface shall have two (2) coats of water repellent grease after thorough cleaning. All exposed surfaces shall have two (2) coats of approved finish paint in addition to primer as per paint supplier's instruction.

All parts shall be properly boxed, crated or otherwise protected for transportation. All openings should be properly covered before crating/boxing to prevent ingress of dirt/dust/moisture and other undesirables. Spare parts shall be packed for long storage without injury.

For export jobs, seaworthy packing shall be used. Details of Seaworthy packing will be either project specific. In case there is no specification for seaworthy packing, the same shall be furnished by the bidder for BHEL's approval. However, there will not be any additional cost implication on account of the same.

7.0 DRAWINGS/DOCUMENTS AND DATA TO BE FURNISHED BY VENDOR AFTER AWARD OF THE CONTRACT.

After award of Contract, the vendor will give following drawings for all the configurations for Pump-Motor Set and Strainers leaving project specific details as blank which can be filled up depending upon project requirement.

i) Fully dimensional outline General Arrangement drawings along with foundation details of the pump with motor assembly unit.

ii) Fully dimensional outline General Arrangement and foundation arrangement drawings of the strainer unit.

iii) Cross sectional drawing of the equipment showing the details of assembly of components and their material of construction with standard applicable codes.

iv) Characteristic curves of pump at minimum, maximum and rated viscosity of oil showing the following:

a) Flow Vs. Pressure

b) Flow Vs. Power

c) Flow Vs. Efficiency

v) Duly filled up data sheet of Pump, Motor

vi) Calculation for selection of Motor Rating

vii) Pressure drop calculation across strainer

viii) Operation maintenance manual.

ix) Quality plans duly corrected in line with customer's comments, if any.

8.0 **MANUFACTURERS NAME AND TAG PLATES:**

Each pump shall have a permanently attached brass metal tag on the body indicating the following information both in Hindi and English:

a) Manufacturer's name and trade mark.

b) Capacity and Pressure.

c) Design Pressure.

d) Equipment tag no as furnished during the contract.

The equipment tag no will be indicated by the engineer on the drawing submitted for approval by the vendor.

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 of 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 of rotating electrical machnines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechnical 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 electric motor **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 elelctric motor 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 fro three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be sutable fro 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, mechnical 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 V 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 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 enclosed with this specification.

5.2 LV motors of type-tested design shall be provided. 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.

TECHNICAL SPECIFICATIONS

FOR

LUBE OIL TRANSFER PUMPS

QUALITY PLANS

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA

	MANUFACTURER'S NAME & ADDRESS BHEL APPROVED VENDOR	STANDARD QUALITY PLAN ITEM : LUBE OIL PUMPS SUB-SYSTEM: CLEAN/ DIRTY/ RETURN OIL PUMPS	QP NO. PE:QP: STD:567:A001 DATE 07/07/07 REV. 00 PAGE 1 of 4	PROJECT PACKAGE LUBE OIL PUMPS CONTRACT NO PO NO. CONTRACTOR BHARAT HEAVY ELECTRICALS LTD.

SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY** 10			REMARKS
1	2	3	4	5	6	7	8	9	D*	M	C	N	11
1.0	**RAW MATERIALS & BOUGHT OUTS CONTROL**												
1.1	PUMP CASING (Pump Body)	Physical Properties	Major	Physical Test	1/Cast	Appd Drg. /Data-sheet	Appd Drg. /Data-sheet	Lab Reports	D*	P	V	V	
		Chemical Properties	Major	Chemical Test	1/Cast	-do-	-do-	Lab Report	D*	P	V	V	
1.2	END COVERS	Physical Properties	Major	Physical Test	1/Cast	- do -	- do -	Lab Reports	D*	P	V	V	
		Chemical Properties	Major	Chemical Test	1/Cast	- do -	- do -	Lab Reports	D*	P	V	V	
1.3	SHAFTS	Physical Properties	Major	Physical Test	1/ Bar	- do -	- do -	Lab Reports	D*	P	V	V	
		Chemical Properties	Major	Chemical Test	1/Bar	- do -	- do -	Lab Reports	D*	P	V	V	
		Sub surface defects	Major	UT	100%	ASTM A 388 100% back wall echo	Fall in back wall echo 20% Max. Defect Echo 20% Max of B.W.E.	Inspection Report	D*	P	V	V	
		Hardness	Major	Hardness	100%	Appd Drg/ Datasheet	Appd Drg/ Datasheet	Lab Rprt.	D*	P	V	V	
1.4	GEARS (DRIVING AND DRIVEN)	Physical Properties	Major	Physical Test	1/ Bar	Appd Drg./ Datasheet	Appd Drg./ Datasheet	Lab Report	D*	P	V	V	
		Chemical Properties	Major	Chemical test	1/ Bar	Appd Drg./ Datasheet	Appd Drg./ Datasheet	Lab Report	D*	P	V	V	
				Heat Treatment	100%	-do-	-do-	HT Chart	D*	P	V	V	
		Sub surface defects	Major	UT	100%	ASTM A 388 100% back	Fall in back wall echo 20%	Inspection Report	D*	P	V	V	

		LEGEND :	FOR CUST/CONSUL USE	DOC.NO.:	
MANUFACTURER / SUBCONTRACTOR	CONTRACTOR	* RECORDS IDENTIFIED WITH "D" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION ** M: MANUFACTURER/SUB CONTRACTOR ,C: CONTRACTOR /NOMINATED INSPECTION AGENCY ,N: CUSTOMER/ CONSULTANT INDICATE 'P'-PERFORM, 'W'-WITNESS AND ,'V'-VERIFICATION AS APPROPRIATE, 'CHP' SHALL BE IDENTIFIED IN COLUMN "REMARKS" BY CUSTOMER/ CONSULTANT			
SIGNATURE			REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY	

	MANUFACTURER'S NAME & ADDRESS BHEL APPROVED VENDOR	STANDARD QUALITY PLAN		PROJECT	
		ITEM : LUBE OIL PUMPS SUB-SYSTEM: CLEAN/ DIRTY/ RETURN OIL PUMPS	QP NO. PE:QP: STD:567:A001 DATE 07/07/07 REV. 00 PAGE 2 of 4	PACKAGE LUBE OIL PUMPS CONTRACT NO PO NO. CONTRACTOR BHARAT HEAVY ELECTRICALS LTD.	

SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY** 10			REMARKS
1	2	3	4	5	6	7	8	9	D*	M	C	N	11
						wall echo	Max. Defect Echoe 20% Max of B.W.E.						
		Hardness Test	Major	Hardness	100%	Appd Dwg/ Data sheet	Appd Dwg/ Data sheet	Lab Rprt.	D*	P	V	V	
1.5	Relief Valve Body	Physical Properties	Major	Physical Test	1/Bar	Appd Drg/Data sheet	Appd Drg/Data sheet	Lab Reports	D*	P	V	V	
		Chemical Properties	Major	Chemical Test	1/Bar	-do-	-do-	Lab Reports	D*	P	V	V	
1.6	Flanges (Companion)	Physical Properties	Major	Physical Test	1/ Heat	-do-	-do-	Lab Reports	D*	P	V	V	
		Chemical Properties	Major	Chemical Test	1/Heat	-do-	-do-	Lab Reports	D*	P	V	V	
1.7	Bearings, Oil Seals, Mechanical Seals	Make, size, Bearing number, finish, fitment	Major	Visual, Fitment	100%	Manufacturing Drawing	Manufacturing drawing	Log book		P	V	-	
1.8	Electric Motors	Review of Routine test certificate	Major	Review	100%	IS 325/IEC –34 for export job	Appd Drg/Data sheet	Routine test report	D*	P	V	V	
2.0	**IN PROCESS CONTROL**												
2.1	All components	1. Workmanship & Finish 2. Dimensions	Major	Visual Measurement	100%	Mfg. Drawing	Mfg. Drawing	Log book		P	V	-	
2.2	Pump Casing, Covers, Relief Valve Housing &	Leak tightness	Critical	Hydro test at 2 x maximum allowable	100%	Data Sheets / Technical	No leakages, No defor-	Inspection Report.	D*	P	W	V	

		LEGEND :	FOR CUST/CONSUL USE	DOC.NO.:	
MANUFACTURER / SUBCONTRACTOR	CONTRACTOR	* RECORDS IDENTIFIED WITH "D" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION ** M: MANUFACTURER/SUB CONTRACTOR ,C: CONTRACTOR /NOMINATED INSPECTION AGENCY ,N: CUSTOMER/ CONSULTANT INDICATE 'P'-PERFORM, 'W'-WITNESS AND ,'V'-VERIFICATION AS APPROPRIATE, 'CHP' SHALL BE IDENTIFIED IN COLUMN "REMARKS" BY CUSTOMER/ CONSULTANT			
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		ITEM : LUBE OIL PUMPS SUB-SYSTEM: CLEAN/ DIRTY/ RETURN OIL PUMPS	QP NO. PE:QP: STD:567:A001 DATE 07/07/07 REV. 00 PAGE 3 of 4	PACKAGE LUBE OIL PUMPS CONTRACT NO PO NO. CONTRACTOR BHARAT HEAVY ELECTRICALS LTD.

SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY** 10			REMARKS
1	2	3	4	5	6	7	8	9	D*	M	C	N	11
	Curing of Pump Casing Gaskets			working pressure for 30 mins.		Specifications	mation						
2.3	Gears/ Screws & Shaft	Surface Defects	CR	PT	100%	ASME E 165	No surface defects	Inspection Report	D*	P	V	V	
2.4	Gears/ Screws – Induction Hardnening	Hardness	Major	Hardness Measurement	100%	Appd Dwg/ Data sheet	Appd Dwg/ Data sheet	Inspection Report	D*	P	V	V	
3.0	SUB ASSEMBLY / ASSEMBLY CONTROL FINAL INSPECTION AND TESTING												
3.1	Rotor Assembly	Static, residual dynamic balancing	CR	Static, dynamic Balancing	100%	ISO-1940	IS)-1940 G 6.3	Inspection Report	D*	P	V	V	
3.2	Pump Assembly	Completeness	Major	Visual, Measurement	100%	Manufacturing Drawing	Manufacturing Drawing	Check List/ Card	D*	P	V	V	
3.3	Complete Pump with Unit Motor	1. Performance for H v/s Q, H v/s P, H v/s Pump eff. 2. Vibration / Noise 3. Relief Valve set pressure 4. Leakage 5. Temp rise. 6. Over all dimensions 7. Orientation	CR Major Major	Performance Test Measurement Visual	100%	Hydraulic Institute Standards of USA. Tech Specn, Appd. Data sheets Approved GA Drgs.	Hydraulic Institute Standards of USA. Tech Specn, Appd. Data sheets Vibration Level = 50 Microns ,max. Noise Level = 85 dB max.	Test Report	D*	P	W	W	Pump to be tested with oil of viscosity closest to lube oil @ rated viscosity for Pressure, @ lowest viscosity for capacity , @ highest viscosity for power

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SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY** 10			REMARKS
1	2	3	4	5	6	7	8	9	D*	M	C	N	11
		8. Strip Test	Critical	Visual	100%	No visible damage	No visible damage						Strip test in case of abnormal noise only.
3.4	Cleaning, protection, painting & packing	Activity compliance	MI	Visual	100%	Tech / Mfg. Specn for packing; Appd dwg for clean-ing, protection & painting including shade	Tech / Mfg. Specn for packing; Appd dwg for clean-ing, protection & painting including shade	Inspection Report	D*	P	V	V	

LEGEND

MI: Minor Characteristics affecting appearance.
MA: Major characteristics affecting performance , redution in life , large down time etc.
CR: Critical Characteristics affecting safety of equipment & personnel.
P: Agency which performs the test inspection
W: Agency which witness the test inspection.
V: Agency which verifies test certificates, inspection reports and carries out audit check of component/operation.
M: Manufacturer/ Sub-Contractor.
C: Contractor nominated inspection agency / BHEL.
N: Customer/ Consultant
CHP: Customer/ consultant

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SIGNATURE				NAME & SIGN OF APPROVING AUTHORITY	

	MANUFACTURER'S NAME & ADDRESS BHEL APPROVED VENDOR	STANDARD QUALITY PLAN		PROJECT
		ITEM : BASKET (SIMPLEX/DUPLEX) OIL STRAINER SUB-SYSTEM: LUBE OIL	QP NO. PE:QP:STD:567:A0 012 DATE 07/07/07 REV. 00 PAGE 1 of 3	PACKAGE LUBE OIL PUMPS CONTRACT NO LOI No. CONTRACTOR BHARAT HEAVY ELECTRICALS LTD.

SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY** 10			REMARKS
1	2	3	4	5	6	7	8	9	D*	M	C	N	11
1.0	RAW MATERIALS & BOUGHT OUT CONTROL												
1.1	STRAINER BODY , FLANGE, BOTTOM PLATE, TOP COVER	Physical Properties	Major	Physical Test	1sample /Heat	Appd Drg. /Data-sheet	Appd Drg. /Data-sheet	Lab Reports	D*	P	V	-	
		Chemical Properties	Major	Chemical Test	1sample /Heat	-do-	-do-	Lab Report	D*	P	V	-	
1.2	3 WAY VALVE HOUSING CASTING, BACKING PLATE	Physical Properties	Major	Physical Test	1/Cast	- do -	- do -	Lab Reports	D*	P	V	-	FOR DUPLEX STRAINER ONLY
		Chemical Properties	Major	Chemical Test	1/Cast	- do -	- do -	Lab Reports	D*	P	V		
1.3	SCREEN	Chemical composition	Major	Chemical Test	1/Sample	- do -	- do -	Lab Reports	D*	P	V		
2.0	IN PROCESS CONTROL												
2.1	Welding Procedure	Correctness/ Welding parameters	Major	Review	100%	ASME, SEC-IX	ASME, SEC-IX	QW 482	D*	P	V	-	
2.2	PQR & Welders Qualification	Weld Soundness	Major	Physical test/ RT	100%	ASME, SEC-IX	ASME, SEC-IX	QW 483 & QW 484	D*	P	V	-	
2.3	Weld Fit ups	Dimension & Alignment	Major	Measurement/ Visual	100%	Appd WPS/ Appd dwg	Appd WPS	QW 482	D*	P	V	-	

		LEGEND :	FOR DVB/NTPC USE	DOC.NO.:	
MANUFACTURER / SUBCONTRACTOR	CONTRACTOR	* RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION ** M: MANUFACTURER/SUB CONTRACTOR ,C: CONTRACTOR /NOMINATED INSPECTION AGENCY ,N: DVB/NTPC INDICATE 'P'-PERFORM, 'W'-WITNESS AND ,'V'-VERIFICATION AS APPROPRIATE, 'CHP' SHALL BE IDENTIFIED IN COLUMN "REMARKS" BY DVB/NTPC			
SIGNATURE			REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY	

	MANUFACTURER'S NAME & ADDRESS BHEL APPROVED VENDOR	STANDARD QUALITY PLAN ITEM : BASKET (SIMPLEX/DUPLEX) OIL STRAINER SUB-SYSTEM: LUBE OIL	QP NO. PE:QP:STD:567:A0 012 DATE 07/07/07 REV. 00 PAGE 2 of 3	PROJECT PACKAGE LUBE OIL PUMPS CONTRACT NO LOI No. CONTRACTOR BHARAT HEAVY ELECTRICALS LTD.

SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY** 10			REMARKS
										M	C	N	
1	2	3	4	5	6	7	8	9	D*	M	C	N	11
		Orientation											
2.4	Weldments- Root & Final Run (As applicable)	Weld defects	Major	Penetrant test	100%	ASME- E 165	No defect	Mfr test reports	D*	P	V	-	
2.5	Assembly of internal basket	Orientation & fittings of internal	Major	Visual & Proper Fitment	100%	Appd Drawing/ Data Sheet	Appd dwgs & manufacturing standards	Inspection Report	D*	P	V	-	
3.0	FINAL INSPECTION AND TESTING												
3.1		Completeness Cleanliness Dimension of screen & other parts	Major	Visual Measurement	100%	Appd Dwg	Appd Dwg/ Data Sheet/ Mfr standard	Inspection Report	D*	P	V	V	
3.2		Leaktightness	Major	Hydrotest at 1.5 times the design pressure ; holding time 30 minutes	100%	Appd Drg & Data Sheet	Appd Dwg/ Data Sheet/ Mfr standard	Inspection Report	D*	P	V	V	
3.3		Flow v/s pressure drop test	Major	Measurement of pressure drop across strainer	One/type/ size	Appd Drg & Data Sheet	Appd Dwg/ Data Sheet/ Mfr standard	Inspection Report	D*	P	V	V	
3.4	Cleaning, protection, painting & packing	Activity compliance	MI	Visual	100%	Tech / Mfg. Specn for packing; Appd dwg	Tech / Mfg. Specn for packing; Appd dwg	Inspection Report	D*	P	V	V	

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		ITEM : BASKET (SIMPLEX/DUPLEX) OIL STRAINER SUB-SYSTEM: LUBE OIL	QP NO. PE:QP:STD:567:A0 012 DATE 07/07/07 REV. 00 PAGE 3 of 3	PACKAGE CONTRACT NO LOI No. CONTRACTOR	LUBE OIL PUMPS BHARAT HEAVY ELECTRICALS LTD.

SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY** 10			REMARKS
1	2	3	4	5	6	7	8	9		M	C	N	11
						for cleaning, protection & painting including shade	for cleaning, protection & painting including shade						

LEGEND

MI: Minor Characteristics affecting appearance.
MA: Major characteristics affecting performance , redution in life , large down time etc.
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P: Agency which performs the test inspection
W: Agency which witness the test inspection.
V: Agency which verifies test certificates, inspection reports and carries out audit check of component/operation.
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N: DVB/NTPC
CHP: DVB/NTPC

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SIGNATURE			REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY	

	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

VOLUME III

TECHNICAL SCHEDULES/DATASHEETS/FORMATS

LUBE OIL PUMPS

SPECIFICATION NO. PE- TS-STD-567-A001

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI,NOIDA- INDIA

PRE-BID CLARIFICATION SCHEDULE

S.No.	Section/Clause/ Page No.	Statement of the referred clause	Clarification required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE:_____

NAME : _____

DESIGNATION:_____

COMPANY: _____

DATE:_____

COMPANY SEAL

DEVIATION SHEET (COST OF WITHDRAWL)

PROJECT:- 1x500MW FGUTPP UNCHAHAR

PACKAGE:- LUBE OIL TRANSFER PUMPS

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	**DESIGNATIONS**	**SIGN & DATE**	

NOTES:

1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawl of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.
14. In case of descrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

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

1.00	**Project Information**	
1.01	Enquiry No.	*
1.02	Project	*
2.00	**Service Condition**	
2.01	Service	Clean Oil/ Dirty Oil/Drain Oil (*bidder to tick mark the applicable service)
2.02	No. of units	*
2.03	Location	Indoor
2.04	Duty	Intermittent
3.00	**Operating Condition**	
3.01	Liquid to be pumped	Turbine Lube Oil
3.02	Pumping Temperature	Ambient/70°C
3.03	Viscosity	
	a) Highest	140cSt @20°C
	b) Lowest	28cSt @50°C
	c) Normal	48cSt @37.8°C
3.04	Design Viscosity of oil (cSt)	28cSt for capacity , 140cSt for power consumption
3.05	Specific Gravity	0.9 gm/cc
3.06	Suction Conditions available	Flooded
3.07 i)	Rated capacity (LPM)	*
ii)	Pump Maximum flow (LPM) & corresponding head (kg/cm^2 (g))	*
3.08	Rated head – kg/cm^2 (g)	*
3.09	R..V.Press.Setting	*
4.00	**Pump**	
4.01	Manufacturer	*
4.02	Type	External gear with herringbone gears
4.03	Model No.	*
4.04 (i)	Design & Manufacturing Standard	API 676
4.04 (ii)	Testing Standard	HIS (ANSI/HI-3.6-2000 / VDMA 24284 , Accuracy Class-2, Group-II

(* Bidder to tick the standard adopted)

4.05	Rotation (Viewed from pump shaft end)	*
4.06	Shut off head, if applicable	Not applicable
4.07	Suction flange	Size 80 NB for pump capacity 5000 LPM and above, 50 NB for pump capacity 2880 and 2640 LPM Standard ANSI B 16.5 Rating 150 lb Facing RF Location (as viewed from drive end) -*(Bidder to tick the applicable) Top End Side
4.08	Discharge flange	Size 80 NB for pump capacity 5000 LPM and above, 50 NB for pump capacity 2880 and 2640 LPM Standard ANSI B 16.5 Rating 150 lb Facing RF Location (as viewed from drive end) -*(Bidder to tick the applicable)
4.09	Timing Gear	Not applicable for gear pumps
4.10	Relief Valve	Built-in
	a) Manufacturer	Pump manufacturer (OEM)
	b) Type	*
	c) Size (NB)	*
	d) Capacity, litre/min	110% of the pump max. flow
	e) Valve, setting pressure adjustable & range of adjustability, in case adjustable	Yes/No (* bidder to indicate the applicable) - *
	f) **Material**	
	g) Spring, Material	Spring Steel
	h) Relief valve cover-Material	Same as MOC of pump body
	i) Bonnet-Material	Same as MOC of pump body
4.11	Shaft Sealing	Mechanical seal
4.12	Bearing	
	a) Type	*
	b) Nos. Provided	*
	c) Method of lubrication	*
	d) Temperature rise over oil temperature	*

4.13	Type of Coupling	*
4.14	Type of Impeller	External gear- Herringbone profile
4.15	BHP consumed at Rated viscosity (at pump shaft)	*
4.16	BHP consumed at Max. viscosity (at pump shaft)	*
4.17	BHP consumed at Min. viscosity (at pump shaft)	*
4.18	BHP consumed at the R.V. Set Pressure (at pump shaft) @ 48 cSt at maximum value of set pressure range	*
4.19	Pump Efficiency at rated condition @ 48 cSt	
	a) Mechanical	*
	b) Volumetric	*
	c) Overall	*
4.20	Recommended motor rating at 50 ° C ambient (kw)	*
4.21	Motor RPM	*
4.22	Design pressure of the pump body and end covers - kg/cm^2 (g)- * (Should be at least 6 kg/cm^2 (g))	
5.00	**Material of Construction**	
5.01	Casing and End covers	ASTM A 216 WCB
5.02	VOID	
5.03	Rotor/Gear	EN-8 BS 970 Part-I Hardness- *
5.04	Shaft/Shaft Sleeve	SS 316
5.05	Seal	*
5.06	Gasket	GRAFOIL/ Any other asbestos free material subject to customer acceptance (* bidder to indicate)
5.07	Bearing	*
5.08	Relief Valve Components	*
5.09	Base Plate	MS to IS 2062
6.00	**Spares**	
6.01	Commissioning Spares	1 set of gaskets/1 no. gasket compound tube 1 No. mechanical seal
6.02	Essential Spares for Pump, if applicable	* (Project specific)

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

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

9.00 Accessories to be provided

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

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	

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	

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)

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)

Annexure-III

1.0 DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

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

Sl. No.	BHEL Drawing / Document No.	Title	Schedule Date	Purpose
	VENDOR GENERATED DOCUMENTS			
1	PE-V0-401-567-A101	Data sheet & GA of LOP	4 weeks from LOI	**A**
2	PE-V0-401-567-A102	Data sheet & GA of Strainer	4 weeks from LOI	**A**
3	PE-V0-401-567-A103	Data sheet & GA of lube oil pump motor	4 weeks from LOI	**A**
4	PE-V0-401-567-A104	QP of Lube oil pump and strainer	4 weeks from LOI	**A**

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

COMPANY SEAL

SIGNATURE :_____

NAME : _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate (every sheet) and furnish same with the offer.

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions other than those mentioned under “exclusion” in section C and those resolved as per ‘Schedule of Deviations’, if applicable, with regard to same.

b) There are no other deviations w.r.t. specifications other than those furnished in the ‘Schedule of Deviations’. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the ‘Schedule of Deviations’.

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.

d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified/ intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre - bid discussions, otherwise BHEL/ Customer’s decision shall be binding on the bidder whenever the deficiency is pointed out.

For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

f) The commissioning spares shall be supplied on ‘As Required Basis’ & prices for same included in the base price itself.

g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.

h) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities. This clause will apply in case during site commissioning additional requirements emerges due to customer and/ or consultant’s comments. No extra claims shall be put on this account.

i) The vendor shall guarantee the material and workmanship of all equipment as well as the operation of the pump as per requirement of the specification. The vendor shall also guarantee for each pump the discharge pressure at the specified rated capacity and also corresponding efficiency, brake horsepower and relief valve set pressure.

j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

k) As built drawings shall be submitted as and when required during the project execution.

l) Dwg/ Document shall be uploaded by the successful bidder on WRENCH /DMS.Procedure for the same will be informed after award of contract.

m) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

SIGNATURE:_____

NAME : _____

DESIGNATION:_____

COMPANY: _____

DATE:_____

COMPANY SEAL

1x500 MW NTPC FEROZ GANDHI TPP, UNCHAHAR - LUBE OIL TRANSFER PUMPS

SUGGESTIVE PRICE FORMAT

S.No	Details of Works or Equipment/System	QUANTITY	EX-WORKS DULY PACKED	EXCISE DUTY INCL. EDU. CESS	CST	FREIGHT	TOTAL FOR SITE
1	2	3	4	5	6	7	8=4+5+6+7
1.00	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for design, engineering, manufacturing, inspection and testing at manuffacturer's works,painting, supply/delivery duly packed at project site for Two(2) nos. each of following pump & motor set duly coupled and unitised on a common base frame with coupling guard, foundation bolts, flanges, companion flanges with nuts bolts and gaskets, drip pan with plugged draining arrangement with one set of commissioning spares comprising of one no. mechanical seal and one no. gasket compound tube/one set gasket for pump and strainer , as per specification no. PE-TS-401-567-A001						
a)	Rated Capacity 8250 LPH and rated discharge pressure as 2 kg/cm2 (g) to 3 kg/cm2 (g) , inlet/outlet size as 80 NB/80NB	2					
2.00	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for design, engineering, manufacturing, inspection and testing at manuffacturer's works,painting, supply/delivery duly packed at project site for Two (2) nos. each of following strainers complete with flanges,companion flanges with nuts bolts and gaskets, foundation bolts (if applicable) with nuts and washers , 15 NB vent and drain connections provided with CS ball valves, 15 NB vent & drain pipe each 5 ft long as per specification no. PE-TS-401-567-A001						
a)	Duplex Strainer - Rated Capacity 8250 LPH , inlet/outlet size as 80 NB/80NB	2					
3.00	TOTAL PRICE						

4.0.0 NOTES

4.0.1 Bidder to note that total price indicated above at 3.0.0 shall be considered for evaluation and hence should be complete in all respect for the full scope defined and

4.0.2 Any item not included in the price quoted above and shown separately will not be taken cognizance of and the offer shall be liable for rejection.

4.03 Bidder shall furnish the price of all the items as indicated in the price schedule. **Bidder's offer shall be liable to be rejected incase bidder does not furnish the same.**