

2X660 MW OPGCL IB BANHARPALLI TPP

TECHNICAL SPECIFICATION
FOR
LUBE OIL TRANSFER PUMPS

SPECIFICATION NO. : PE-TS-391-567-A001



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



**TECHNICAL SPECIFICATION FOR
LUBE OIL TRANSFER PUMPS
2X660 MW OPGCL IB BANHARPALLI TPP**

SPECIFICATION NO. PE-TS-391-567-A001

VOLUME II

SECTION A

REVISION 00

DATE: 05/02/2015

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SECTION – A

INTENT OF SPECIFICATION



**TECHNICAL SPECIFICATION FOR
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1.0 INTENT OF SPECIFICATION

- 1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's / sub vendor's works, Performance & Guarantee testing, painting, forwarding, proper packing, shipment & delivery at site including start up and commissioning spares of **Lube Oil Transfer Pumps** as per details in different sections of this specification for **2X660 MW OPGCL IB BANHARPALLI TPP**

The bidder's scope shall also include any other services, etc. if called for in the succeeding sections of the 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 them of the responsibility of providing such facilities to complete the supply **Lube oil pumps** within quoted price.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment / system 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 Items though not specifically mentioned but needed to make the system complete as stipulated under these specifications are also to be furnished unless otherwise specifically excluded.
- 1.6 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere are hereby made part of the tender specifications. The equipment / material and works covered by this specification is subject to compliance to all the attachments referred in the specification. The tenderer shall be responsible for adherence to all requirements stipulated herein.
- 1.7 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.



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- 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 Customer as interpreted by BHEL in the relevant context. Please refer GCC/SCC for better clarity.
- 1.11 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and dispatch release issued by BHEL/Customer.
- 1.12 BHEL's Customer's representative shall be given full access to the shop in which the equipment's are being manufactured or tested and all test records shall be made available to him.
- 1.13 Various codes and standards to be used shall be as indicated in various parts of the specification. In case bidder uses any standard other than those indicated in the specification, the onus of establishing equivalence of the same with the specified standards will rest with the bidder and acceptance of the same shall be sole prerogative of customer. The bidder will also arrange for BHEL a copy of the standards in ENGLISH language. The cost of such service will be deemed to have been included by the bidder in the total cost of the package. BHEL will not entertain any additional cost on account of the same.
- 1.14 All text/ numeric in the document / drawings to be generated by the successful bidder will be in English language only.
- 1.15 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.



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SECTION – B

PROJECT INFORMATION

	Odisha Power Generation Corporation Ltd.	Technical Specification for Main Plant Package	IB TPS – 2 X 660 MW Units 3 & 4, Jharsuguda, Odisha
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VOLUME : IIA

SECTION-III

PROJECT SYNOPSIS AND GENERAL INFORMATION

1.00.00 INTRODUCTION

The proposed Thermal Power Station comprising of 2 x 660 MW base unit size, Super-Critical Units would be set up by Odisha Power Generation Corporation Limited (OPGCL) in the Jharsuguda district of Odisha, India. OPGCL had already installed two units of 210 MW each adjacent to the proposed units under Phase-I of the project at IB Thermal Power Station and the units have been working for the last fifteen years.

Seller has acquainted himself by visiting to the site, with the conditions prevailing at site. The information given here in under is for general guidance and shall not be contractually binding on the Buyer. All relevant site data /information as may be necessary shall have to be obtained/ collected by the Seller.

2.00.00 APPROACH TO SITE

The project site is located at Banaharpalli in the Jharsuguda district of Odisha on the bank of Hiraikud Reservoir and about 20 km south of Belpahar railway station and 40 km south west of Jharsuguda. The main Howrah-Mumbai railway line passes 20 km north of the plant (at Belpahar). NH-200 (Chandikhole to Raipur) and SH-10 (Sambalpur to Sundergarh) pass through Jharsuguda town.

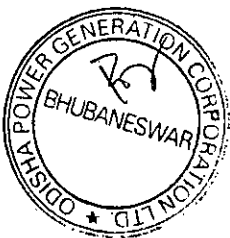
OPGCL has a private railway siding connecting the plant to the Indian Railways network at Lajkura Railway station.

Nearest Airport – Bhubaneswar.

Nearest Seaport – Paradeep/ Haldia.

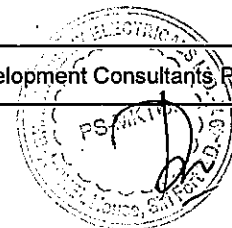
3.00.00 LAND


The total land proposed to be required (around 40 Ha) taking into account the locations of various facilities and plant auxiliaries for units 3 & 4 under IB Thermal Power Station 2 x 660 MW units 3 & 4 and also future 2 x 660 MW will be as per the Plot Plan enclosed in Volume II-L. Land for the proposed units have already been acquired and Power block area is fairly flat land sloping towards South to South -West with contour variation from RL 204.00 M to RL 199.00 M. The Seller shall accommodate equipment offered under this specification generally within the spaces allocated for such equipment in the Plot Plan. Specific approval from Consultant shall be taken by the Seller prior to any revision or relocation.



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	Odisha Power Generation Corporation Ltd.	Technical Specification for Main Plant Package	IB.TPS – 2 X 660 MW Units 3 &4, Jharsuguda, Odisha
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4.00.0 SOURCE OF COAL

Coal will be the primary fuel for the proposed project. OPGC has been allotted with two coal blocks (Manoharpur and Dip-side of Manoharpur) in IB valley area with an estimated total reserve of 531.68 Million Metric Tons for captive use of the projects. Manoharpur coal block has been explored fully and has net geological reserves of 181.68 Million Metric Tons and Dip side of Manoharpur (Regionally explored) has geological reserves of 350 Million Metric Tons approximately.

Manoharpur Coal Block is about 45 Km away from Sundargarh Town along Sundargarh – Hemgiri road which passes near the block. It is also connected by black top road with two important towns of Odisha viz. Rourkela (145 Km) and Jharshuguda (75 Km). The nearest Railway station is Hemgiri, lying on the Mumbai – Howrah main line and is about 20 Km away from Manoharpur Block. Coal from the mine to the power plant will be transported by dedicated merry-go-round rail system.

5.00.00 SOURCE OF WATER

Water is drawn from the Hirakud reservoir through a 5.45 Km intake channel. The reservoir has a catchment area of 83.395 sq.km. with a current gross storage capacity of 7189 lakhs m³. The project too will meet its water requirements from the Hirakud reservoir through the existing intake structure, which is sufficient to cater to the proposed project. The project had taken approval from the Water Resources Department of Odisha to draw 5400 m³/hr of water from the reservoir, which will cater the requirement of Phase-I (existing 2 x 210 MW) and the proposed units of 2x660 MW.

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

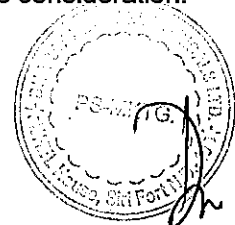
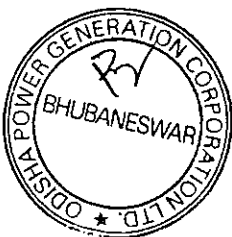
6.00.00 ASH DISPOSAL AREA

Not Used.

7.00.00 METEOROLOGICAL DATA


7.01.00 For the purpose of equipment design, the following Ambient Conditions / Meteorological data of site (Jharsuguda) shall be taken into consideration:-

Site elevation above MSL	:	199.5 M
Highest temp recorded	:	48.0 °C.
Lowest temp recorded	:	4.0 °C.
Monthly max. dry bulb temp	:	38.9 °C/28.0 °C/33.4 °C (Summer/winter/monsoon)



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	Odisha Power Generation Corporation Ltd.	Technical Specification for Main Plant Package	IB TPS – 2 X 660 MW Units 3 &4, Jharsuguda, Odisha
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Monthly min. dry bulb temp : 25.4 °C/16.7 °C/26.8 °C
(Summer/winter/monsoon)

Monthly max. wet bulb temp : 23.9 °C/17.8 °C/25.5 °C
(Summer/winter/monsoon)

Monthly min. wet bulb temp : 17.6 °C/13.4 °C/25.0 °C
(Summer/winter/monsoon)

Maximum Relative Humidity : 46% / 67% / 87%
(Summer/winter/monsoon)

Minimum Relative Humidity : 21% / 33% / 87%
(Summer/winter/monsoon)

Average relative Humidity : 65%

Average Annual Rainfall : 1460 mm.

Normal period of rain fall : June – September.

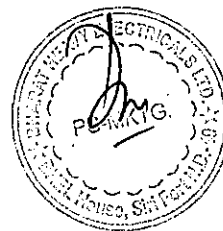
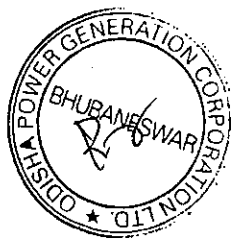
Heaviest rainfall in 24 hours : 257.8 mm

Wind direction : South West – North East.

Basic Wind Speed at 10 m Height : 44 m/sec as per IS:875 Part-3 (1987).

Seismic Zone : Zone III as per IS:1893 Part-1 (2002).

Geographical location : At
Latitude 21° 48' North and Longitude 83° 52' East.



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SPECIFIC TECHNICAL REQUIREMENTS**



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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 data sheet.

The scope of equipment (Quantity, Capacity, Head and the type of strainer) to be supplied shall be as per Data sheet-A indicated in Section C.

1.2 Mandatory spares: Not Applicable

2.0 TERMINAL POINT

- a) Strainer suction Counter flange
- b) Pump discharge 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 enclosed under section- C of specification.

3.0 EXCLUSIONS

- 3.1 Power Cable
- 3.2 Motor starter in MCC
- 3.3 Local Push Button Station
- 3.4 Supply feeder
- 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.
Primer Coat	One coat of epoxy based zinc phosphate primer of 50-75 micron.
Intermediate coat	One coat of epoxy based TiO ₂ pigmented paint.
Finish	Two coat epoxy based finish coat. Thus a total DFT of 210-235 micron shall be achieved. Paint shade shall be grey RAL 9002.

Note:

1. Any change in painting specification at later date needs to be complied by bidder without any commercial implication.
2. Make of paints shall be as per approved BHEL vendor list.



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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 SUB-VENDOR ITEMS

Sub-vendor items makes are subjected to acceptance by customer without any additional commercial implication to BHEL.

7.0 DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH THE BID

The drawings and documents to be submitted with the bid shall be as mentioned in vol. III, document to be submitted by the bidder with the bid

8.0 DRAWINGS AND DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

List of drawings / documents required during detail engineering along with submission Schedule is given in Volume III and data shall be as indicated in section –D under Clause No. 8.0

BHEL PEM	DATA SHEET FOR LUBE OIL PUMPS		DOC. NO. PE-DC-391-100-N300
	PROJECT TITLE : 2X660 MW OPGC BANHARPALLI TPS		SHEET NO. 01 OF 01
1.0	SERVICE IDENTIFICATION	CLEAN OIL PUMP	DIRTY OIL PUMP
2.0	DRAWING NO.	PE-DG-391-100-N108	PE-DG-391-100-N108
3.0	SYSTEM	CENTRAL LUBE OIL SYSTEM	CENTRAL LUBE OIL SYSTEM
4.0	TYPE	ROTARY POSITIVE DISPLACEMENT	ROTARY POSITIVE DISPLACEMENT
5.0	NUMBER REQUIRED	ONE (01) NO. (COMMON FOR THE STATION)	ONE (01) NO. (COMMON FOR THE STATION)
6.0	FLOW RATE (MAX.)	6600 LPH	6600 LPH
7.0	DISCHARGE PRESSURE	2.0 KG/CM ² (g)	2.0 KG/CM ² (g)
8.0	SUCTION CONDITION	FLOODED (MAX -4 MLC TO BE CONSIDERED)	FLOODED (MAX -4 MLC TO BE CONSIDERED)
9.0	LOCATION OF INSTALLATION	INDOOR	INDOOR
10.0	LIQUID PUMPED	TURBINE LUBE OIL (TURBINOL-46-HPC / SERVOPRIME 46-IOC)	TURBINE LUBE OIL (TURBINOL-46-HPC / SERVOPRIME 46-IOC)
11.0	PROPERTIES OF FLUID	DENSITY- 0.9 GM/CC AT 15°C FLASH POINT - 210 °C VISCOSITY -28 CST AT 50 °C / 48 CST AT 37.8°C / 140 CST AT 20°C	DENSITY- 0.9 GM/CC AT 15°C FLASH POINT - 210 °C VISCOSITY -28 CST AT 50 °C / 48 CST AT 37.8°C / 140 CST AT 20°C
12.0	TEMPERATURE NORMAL / MAX	AMBIENT / 70 ⁰ C	AMBIENT / 70 ⁰ C
13.0	SUCTION / DISCHARGE PIPING CONNECTION	OD 88.9 X 5.49 / OD 88.9 X 5.49	OD 88.9 X 5.49 / OD 88.9 X 5.49
14.0	RELIEF VALVE	BUILT-IN ON EACH PUMP	BUILT-IN ON EACH PUMP
15.0	SUCTION STRAINER	DUPLEX TYPE STRAINER WITH CHANGE-OVER VALVE, SS ELEMENT MESH SIZE 20 & BLOW DOWN VALVE	DUPLEX TYPE STRAINER WITH CHANGE-OVER VALVE, SS ELEMENT MESH SIZE 20 & BLOW DOWN VALVE
16.0	MATERIALS OF CONSTRUCTION CASING GEARS SHAFT	ASTM A216 GR WCB EN-8/9 EN-8/9	ASTM A216 GR WCB EN-8/9 EN-8/9
17.0	APPLICABLE CODES / STATUTORY REGULATIONS	AS APPLICABLE IS, BS, API STANDARDS	AS APPLICABLE IS, BS, API STANDARDS
18.0	DRIVE TYPE	INDUCTION MOTOR 415 V, 50 Hz	INDUCTION MOTOR 415 V, 50 Hz
19.0	INSTRUMENTS	1. PRESSURE GAUGE AT DISCHARGE ALONGWITH ROOT VALVE 2. DP SWITCH & DP GAUGE ACROSS STRAINER WITH ROOT VALVES	1. PRESSURE GAUGE AT DISCHARGE ALONGWITH ROOT VALVE 2. DP SWITCH & DP GAUGE ACROSS STRAINER WITH ROOT VALVES
NOTE : ALL OTHER GENERAL TECHNICAL REQUIREMENTS / ACCESSORIES & SPARES AS PER CUSTOMER TENDER SPECIFICATION.			



TITLE : ELECTRICAL EQUIPMENT SPECIFICATION FOR LUBE OIL PUMPS 2X660 MW IB VALLEY TPS, BANHARPALLI, OPGCL	SPECIFICATION NO.
	VOLUME NO. : II-B
	SECTION : C
	REV NO. : 00 DATE :
	SHEET : 1 OF 2

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

- a) Services and equipment as per “Electrical Scope between BHEL and Vendor”.
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
- c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
- d) Electrical load requirement for Lube Oil Pump
- e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer/BHEL approval without any commercial and delivery implications to BHEL
- g) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.
- h) Motor shall meet minimum requirement of motor specification.
- i) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.
- j) Cable BOQ worked out based on routing of cable listing provided by the vendor for “ both end equipment in vendor’s scope”shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

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

Refer “Electrical Scope between BHEL and Vendor”.

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- 3.1 The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification in the form of compliance certificate/No deviation certificate.
- 3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.



TITLE :
**ELECTRICAL EQUIPMENT SPECIFICATION
FOR
LUBE OIL PUMPS
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4.0 List of enclosures :

- a) Electrical scope between BHEL & vendor (Annexure –I)
- b) Technical specification for motors.
- c) Datasheets & quality plan for motors.
- d) Electrical Load data format (Annexure –II)

ANNEXURE – I TO SECTION – C: STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR
PACKAGE: LUBE OIL PUMPS

PROJECT: 2X660 MW IB VALLEY TPS, BANHARPALLI, OPGCL

<u>S.NO</u>	<u>DETAILS</u>	<u>SCOPE SUPPLY</u>	<u>SCOPE E&C</u>	<u>REMARKS</u>
1	415V MCC	BHEL	BHEL	DOL starters for motors and 415V supply feeders for the requirements like control panel will be provided by BHEL.
2	Local push button station (for motors)	BHEL	BHEL	Located near the motor
3	Power cables, ordinary control cables and screened control cables between equipments supplied by vendor.	BHEL	Vendor	
4.	Power cables, ordinary control cables and screened control cables between equipments supplied by vendor & BHEL.	BHEL	BHEL	1) Laying of cables by BHEL. 2) Termination at BHEL equipment by BHEL. 3) Termination at vendor equipment by vendor.
5	Any special type of cable like compensating. Co-axial, prefab, MICC and fibre optical	Vendor	Vendor	Refer C &I portion of specification for scope of fibre optical cables if used between PLC/microprocessor & DCS.
6	Illumination	BHEL	BHEL	
7	Cabling material (cable trays, accessories and cable tray-supporting system, conduits) for cabling between equipments supplied by vendor and BHEL.	BHEL	BHEL	
8	Conduits and conduit accessories for cabling between equipments by vendor	Vendor	Vendor	Cabling shall be through conduits. However, vendor can use the trunk routes available for laying of cables. Conduits shall be supplied by vendor.
9	Junction box for control & instrumentation cable	Vendor	Vendor	
10	Equipment earthing.	BHEL	BHEL	
11	Motors with Base frame and fixing hardware for motors.	Vendor	Vendor	1. Makes shall be subject to customer/BHEL approval at contract stage.
12	a) Input cable schedules (Control & screened control cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable (excluding power cables) in enclosed excel format shall be submitted by vendor during detailed engineering stage.
13	Equipment layout drawings.	Vendor	-	Layout details between vendor supplied equipment and installation drawings by vendor
14	Cable glands , lugs and bimetallic strip 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 & control cables.

Note- 1. All QPs shall be subject to approval of BHEL/ Customer after award of contract.

ANNEXURE – I TO SECTION – C: STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR
PACKAGE: LUBE OIL PUMPS

2. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.

DATA SHEET OF MOTOR

SPECIFIC ELECTRICAL REQUIREMENT FOR LUBE OIL PUMP

SL.NO.	PARAMETERS	UNIT	OPGCL
	MOTOR		
1	DESIGN AMBIENT TEMP	DEG. C	50
2	VOLTAGE SUPPLY AND VARIATION	VOLT	415V, \pm 10%
3	FREQUENCY WITH VARIATION	Hz	50 (+) 3% to (-) 5%
4	COMBINED VOLTAGE & FREQUENCY VARIATION		10%
5	MAX ACCEPTABLE RATING OF MOTOR AT 415 V	KW	Above 200W and upto 200 kW
6	SYSTEM FAULT LEVEL AND ITS DURATION	KA	50 KA, 1 Sec
7	SUTABILITY OF TERMINAL BOX FOR FAULT LEVEL AND DURATION		50 KA, 0.25 sec
8	CLASS OF INSULATION & TEMP RISE LIMITED TO		Class-F and temp rise limited to Class-B
9	MIN. STARTING VOLTAGE		80%
10	MOTOR RATING FOR SINGLE PHASE SUPPLY		Upto 200W
11	MAXIMUM LOCKED ROTOR CURRENT	% OF FLC	For LT motors of continuous duty (S1) type motors, starting current shall be as per IS: 12615.
12	ACCEPTABLE NOISE LEVEL	DB	85dB at 1.0m in line with IS 12065
13	TYPE OF STARTER PROVIDED IN MCC		DOL
14	DOP OF ENCLOSURE		IP:54 for Indore Motor, IP:55 for Outdoor. Motor for outdoor or semi outdoor service shall be of weather proof construction. DOP for terminal boxes shall be IP 55 as per IS 4691.
15	SPACE HEATER REQUIREMENT		30KW & ABOVE
16	PAINT SHADE		Shall be confirmed during detailed engineering
17	SPECIAL REQUIREMENT		Type test to be conducted on the identical motor in the last 5 years or after the last design change, which ever is earlier. Otherwise, the equipment shall have to be type tested, free of charge, to prove the design. All motors shall be subjected to routine tests as per IS: 325. The motors shall generally conform to IS 325/IEC-60034. LT motors of continuous duty (S1) shall be energy efficient IE2 conforming to IS-12615.

2x660 MW IB TPS (UNIT-3 & 4), BANHARPALLI

BASIC TECHNICAL FEATURE FOR HT / LT MOTORS (FOR BHEL-PEM SCOPE PACKAGES)

BHEL DOC. NO. PE-DC-391-565-E003

REVISION 02



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



2x660 MW IB TPS (UNIT-3 & 4)

BANHARPALLI

BASIC TECHNICAL FEATURES FOR HT / LT MOTORS (FOR BHEL-PEM SCOPE PACKAGES)

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1.0 This document covers the basic technical features of high tension (HT) and low tension (LT) squirrel cage induction AC motors employed for driving auxiliaries of BHEL-PEM scope packages in 2x660 MW IB TPS (UNIT-3 & 4) BANHARPALLI

2.0 CODES AND STANDARDS

The motors shall generally conform to IS 325/IEC-60034. LT motors of continuous duty (S1) shall be energy efficient IE2 conforming to IS-12615. For HT motors, efficiency (except for Mill motors and BCP) shall exceed 94% for all motors less than 2500HP (1865kW).

3.0 DESIGN REQUIREMENTS

3.1 General Requirements

The design ambient temperature shall be 50 deg C.

3.2 Supply system and rated voltage of motors

KW rating	Supply system	Rated voltage of motor
Above 1500 kW	11 KV	11 KV
Above 200 kW & upto 1500 kW	3.3 KV	3.3 KV
Above 200W and upto 200 kW	415 V	415 V
Upto 200W	240V	240V

3.2.1 Supply voltage & variations shall be as follows:-

Voltage variation (AC Supply) (+/-) 10%
Voltage variation (DC Supply) (+) 10% to (-) 15%
Frequency variation (+) 3% to (-) 5%
Combined V & F variation 10% (sum of absolute values)

3.2.2 Motors shall be capable of running continuously at rated output for each of the conditions specified.

3.3 Motor Rating

Motor ratings shall be adequate to meet the requirements of the drive equipment. Motors shall be continuously rated at the design ambient temperature of 50 deg C. Motor ratings shall have at least a 10% margin over the continuous maximum demand of the driven equipment at duty point or 10% margin over the continuous maximum demand of the driven equipment under entire operating range, whichever is higher.

3.4 Starting Requirements

3.4.1 Motor shall start smoothly and rapidly. 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.

3.4.2 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 (except Mill Motors) will successfully start and accelerate to rated speed with load shall be taken to be a constant value of 80 (eighty) percent rated voltage.

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3.4.3 The locked rotor current of the HT motors (except MDBFP motors & mill motors) shall not exceed six times full load current inclusive of tolerance as per IS:325. For LT motors of continuous duty (S1) type motors, starting current shall be as per IS: 12615.

3.4.4 The following frequency of starts shall apply

- i) Three cold starts in succession with the motor being initially at a temperature not exceeding the ambient temperature.
- ii) The motor shall be capable of two starts in succession with coasting to rest between starts and the motor initially at rated operating temperature.
- iii) 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)

3.4.5 Locked motor withstand time of hot motors at 110% rated voltage shall be as follows:

- a) For motors with starting time upto 20 sec.
- at least 2.5 sec. more than starting time.
- b) For motor with starting time above 20 secs
- at least 5.0 sec. more than starting time.

The starting time of the motor referred above is at minimum permissible voltage. For HT motors and in cases where the above requirements are not complied with, speed switches of approved make & type shall be provided to bypass the locked rotor protection for a pre-selected time during starting of motors. The speed switches shall have one NO & one NC contacts having maximum interrupting capacity of 5 Amps at 240V AC and 0.25 amps at 220 V DC.

3.5 Running Requirements

3.5.1 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.

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

3.6 Stress During bus Transfer

3.6.1 Motors shall withstand the voltage 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.

3.6.2 Motor windings shall be adequately braced to satisfactorily withstand the mech. Stresses during above condition.

3.6.3 Motors shall be capable of withstanding heavy in-rush transient current caused by bus transfer without damage.



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3.6.4 Motor and driven eqpt. Shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.7 Noise level

Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed 85 db(A) in line with IS 12065.

3.8 Vibration

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 Degree of Protection

4.1.1 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:4691 and shall be of weather-proof construction. The degree of protection for terminal boxes shall be IP 55 as per IS 4691.

4.1.2 The stator laminations shall be made from suitable silicon steel/magnetic steel sheet varnished on both sides and pressed to form a rigid core.

4.1.3 The rotor shall be of rigid cage construction with die cast aluminium / copper alloy / copper bars firmly wedged in bar slots and brazed to the end rings. The rotor cage shall be designed to operate satisfactorily under respective starting and load duty cycle.

4.2 Enclosure and Cooling

4.2.1 Motors shall generally have totally enclosed fan cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362. Alternatively, motors may have Closed Air circuit Air (CACA) method of cooling conforming to IC-0161 of IS: 6362 or shall be totally enclosed tube ventilated (TETV) .

4.2.2 Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.

4.2.3 Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.

4.3 Class of Insulation

HT/LT motors shall have class F insulation. The temperature rise of all motors shall be limited to the limits applicable to Class 'B' insulation. In case of continuous operation at extreme voltage limits, 10deg C rise above the temperature limits specified in IS: 325 shall be permissible.

4.4 Bearings

4.4.1 Horizontally mounted motors shall have grease lubricated ball/roller or sleeve bearings. For MV motors, the bearings shall be regreasable type and for LV motors, these bearings can be either sealed life lubricated type or regreasable type as per manufacturer's standard.

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- 4.4.2 The vertical motors shall have a combined thrust and guide bearing on top and guide bearing at bottom. If the ball or roller bearings can take vertical thrust, thrust and guide bearing need not be provided.
- 4.4.3 After taking all motor driven eqpt. loads and thrust(if any) into account , the bearings shall be suitable for min. 20,000 working hours. Re-greasable bearings shall be provided with grease nipples and relief holes for on-line re-greasing and shall be suitable for 8000 working hours without changing of the grease.
- 4.4.4 The bearings of solidly coupled motors shall be of the same type as those of the driven equipment.
- 4.4.5 For motors upto 2 kW, double sealed type bearings shall be provided.
- 4.4.6 HT motors shall be provided with insulated end shield on non-driving end to prevent flow of shaft current.
- 4.5 Terminals and Terminal Boxes
- 4.5.1 Motors of rating 100 kW and above will be controlled by circuit breaker. For all motors below 50 kW by MCCB and for motors between 50 KW to 100 KW MCCB with E/F protection shall be used. The terminal box of motors shall be designed for the fault current of 44 kA, 0.25 secs and 50 kA, 0.25 secs for HT & LT motors respectively.
- 4.5.2 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.
- 4.5.3 For MV motors, the main terminal box shall be of phase-segregated type with clamping arrangement for the terminals.
- 4.5.4 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 & U respectively.
- 4.5.5 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.
- 4.5.6 Motor terminals and terminal leads shall be fully insulated with no bar live parts.
- 4.5.7 Separate terminal boxes shall be provided for space heaters and temp. Indicators. If this is not possible in case of LT motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression tinned brass glands shall be provided in terminal boxes.
- 4.5.8 Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 180.
- 4.5.9 Cable glands and cable lugs as per selected cable sizes shall be provided in line with cable erection philosophy. For single core cable termination, gland plates shall be of non-magnetic material.
- 4.6 Grounding



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Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.

4.7 General

4.7.1 Motors provided for similar drives shall be interchangeable.

4.7.2 An arrow block shall be screwed on the body of the motors on the non-driving end to indicate the direction of rotation of the motors.

4.7.3 Motors for Fuel oil unloading and drain oil pumps located in hazardous areas shall be with flame-proof enclosures in accordance with IS 2148 / IEC 60079.

5.0 ACCESSORIES

5.1 SPACE HEATERS

All motors rated 30KW and above shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.

The leads from space heaters of each motor shall be brought out to a separate terminal Box. Space heaters shall be mounted inside the motor in accessible places so that their removal and replacement is simple.

5.2 RESISTANCE TEMPERATURE DETECTORS (RTDs)

5.2.1 HT motors stator windings shall be provided with 12 nos. (4 per phase) Simplex 3 wire Platinum RTDs with 100 ohms resistance at 0 deg C for remote monitoring of winding temperature. The leads from RTDs of each motor shall be brought out to a separate terminal Box.

5.2.2 For HT motors, each bearing shall be provided with 1 no. Duplex 3 wire Platinum RTDs with 100 ohms resistance at 0 deg C for remote monitoring of bearing temperature. The leads from these RTDs shall be brought out to a separate terminal Box or the terminal box same as for winding RTDs.

5.3 DIAL TYPE TEMP. INDICATORS

5.3.1 For HT motors, each bearing shall be provided with 1 no. Mercury-in-steel Dial type temperature indicator for local indication of bearing temperature. The indicators shall have 2 nos. NO contacts rated for 5A, 240 V AC and 0.5 A, 220 V DC for alarm/trip purpose.

5.4 Vibration monitoring pads

5.4.1 Provision shall be made in all HT motors for mounting vibration detectors.

6.0 NAME PLATE

Motors shall have stainless steel name plate with all particulars as per IS: 325. In addition, the following information shall be shown on motor rating plates:

i) Temperature rise in deg.C under rated condition and method of measurement

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- ii) Degree of protection (IP No.)
- iii) Bearing identification number and recommended lubricant.
- iv) Location of insulated bearings.

7.0 PAINTING

The paint shall be epoxy based. The colour of finish shall be light grey to Shade No. 631 as per IS: 5 for motors.

8.0 TESTING**8.1 Type Tests**

For HT motors, type test as per IS: 325 shall be conducted on one motor of each type and rating.

For LT Motors, type test certificates for tests carried out earlier on similar ratings, frame size and make shall be submitted for type tests as per IS:325. However, if such reports are not available, one motor of each type and rating shall be subjected to type tests as per IS: 325.

For DOP test, test certificates for tests carried out earlier on similar equipment shall be submitted.

8.2 Routine Tests

All motors shall be subjected to routine tests as per IS: 325.



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SUB-VENDOR LIST FOR LUBE OIL TRANSFER PUMPS

S.NO	CATEGORY OF INSPECTION	ITEM	SUB-VENDORS	PLACE
1	II	LUBE OIL TRANSFER PUMPS	UT PUMPS & SYSTEMS LTD.	FARIDABAD
	II		MATZ PUMPS PVT. LTD.	AHMEDABAD
	II		TUSHACO PUMPS PVT.LTD.	NEW DELHI
2	II	DUPLEX STRAINERS	JAYPEE INDUSTRIES PVT. LTD.	NEW DELHI
	II		MULTITEX FILTRATION ENGINEERS LIMITED,	NEW DELHI
	II		OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI
	II		TUSHACO PUMPS PVT LIMITED	NEW DELHI
	II		RELIABLE ENGINEERS	
	II		SUNGOV ENGINEERING PVT. LTD.	CHENNAI
3	III	MOTORS	CROMPTON GREAVES LIMITED	AHMEDNAGAR
	III		KIRLOSKAR ELECTRIC COMPANY	BANGALORE / HUBLI
	III		SIEMENS	MUMBAI
	III		ABB	BANGALORE / FARADABAD
	III		BHARAT BIJLEE	MUMBAI
	III		JYOTI	VADODARA
	III		MARATHON	KOLKATA
	III		NGEF	BANGALORE

NOTES

1. CAT I :INSPECTION BY OWNER, BHEL/BHEL NOMINATED TPIA & VENDOR .MDCC WILL BE ISSUED BASED ON INSPECTION REPORT IN LINE ITH APPROVED QAP.

2. CAT II: INSPECTION BY BHEL/BHEL NOMINATED TPIA & VENDOR. MDCC WILL BE ISSUED BASED ON INSPECTION REPORT IN LINE ITH APPROVED QAP.

3. CAT III: MDCC WILL BE ISSUED BASED COC & MTC ISSUSD BY VENDOR AND VERIFICATION BY BHEL / OWNER IN LINE WITH APPROVED QAP/CHECK LIST

4. SUB-VENDOR LIST ABOVE IS SUBJECT TO CUSTOMER APPROVAL. BIDDER TO PREPARE SUB-VENDOR LIST WITH INSPECTION CATEGORIZATION AS THE ATTACHED LIST AND SUBMIT TO CUSTOMER. AS PER APPROVED LIST ONLY, MATERAIL TO BE SOURCED. NO COMMERCIAL IMPLICATION WILL BE ACCEPTED ON ACCOUNT OF DELETION OF ANY OF THE ABOVE VENDOR.



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TECHNICAL SPECIFICATION OF EQUIPMENT



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1.0 GENERAL

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

2.0 CODES & STANDARDS

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

- a) American National Standards Institute (ANSI)
- b) American Society of Testing & Materials (ASTM)
- c) American society of Mechanical Engineers (ASME)
- d) Hydraulic Institute Standards (HIS)
- e) American Petroleum Institute (API)
- f) American Gear Manufacturer's Association (AGMA)
- g) National Electrical Manufacturer's Association (NEMA)
- h) National Fire Protection Association (NFPA)
- i) Indian Standards Institute (ISI)

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

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

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



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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 hour's 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.



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- 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 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.
- 4.5 Pumps shall be designed for smooth pulsation and noise free operation. Pump shall be designed to have maximum efficiency at the normal duty point.
- 4.6 The design of pump shall be so as to minimize the end thrust.
- 4.7 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 dB measured at a distance of 1 metre horizontal and 1.5 metre vertical from the edge of pump motor set.
- 4.8 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.
- 4.9 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.
- 4.10 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.
- 4.11 The recommended civil foundation drawing to be furnished by the bidder during detail engineering shall include the followings:-
- i) Scope of work by BHEL and vendor shall be indicated with different legend or in the form of note.
 - ii) Weight of moving parts, its frequency and its height from floor shall be furnished.
 - iii) Recommended location of cable trench for feeding cable to machine along with the details of cable entry.
 - iv) Civil loads per bolt / pocket (static and dynamic) in tabular form considering worst case.



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- 4.12 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.
- 4.13 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.
- 4.14 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.
- 4.15 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.



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5.0 TESTING & INSPECTION AT MANUFACTURE'S WORKS

- 5.1 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.

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

- 5.4 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.



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5.5 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.

5.6 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.

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

5.8 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.

- i) Establish flow and pressure characteristic
- ii) Establish flow and power characteristic
- iii) 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.

5.9 Tests 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.



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5.10 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 fretting.

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.



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7.0 DRAWINGS/DOCUMENTS TO BE SUBMITTED WITH THE BID:

As per details given under Vol. III.

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

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

- i) Fully dimensional outline General Arrangement drawings along with foundation details of the pump with motor assembly unit.
- ii) Fully dimensional outline General Arrangement and foundation arrangement drawings of the strainer unit.
- iii) Cross sectional drawing of the equipment showing the details of assembly of components and their material of construction with standard applicable codes.

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

- i) Flow Vs. Pressure
- ii) Flow Vs. Power
- iii) Flow Vs. Efficiency
- iv) Duly filled up data sheet of Pump, Motor
- v) Calculation for selection of Motor Rating
- vi) Pressure drop calculation across strainer
- vii) Operation maintenance manual.
- viii) Quality plans duly corrected in line with customer's comments, if any.

9.0 MANUFACTURERS NAME AND TAG PLATES:

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

- i) Manufacturer's name and trade mark.
- ii) Capacity and Pressure.
- iii) Design Pressure.
- iv) 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.

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GENERAL TECHNICAL REQUIREMENTS
FOR
LV MOTORS

SPECIFICATION NO.
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GENERAL TECHNICAL REQUIREMENTS

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LV MOTORS

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GENERAL TECHNICAL REQUIREMENTS

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LV MOTORS

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1.0 INTENT OF SPECIFICATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer's work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0 CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement for rotating electrical machines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibration of rotating electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0 DESIGN REQUIREMENTS

3.1 Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2 Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3 Starting Requirements

3.3.1 Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.3.2 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.



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The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.

3.3.3 The following frequency of starts shall apply

- i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.
- ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)
- iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor

3.4 **Running Requirements**

3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.

3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.

3.5 **Stress During bus Transfer**

3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.

3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.

3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.

4.0 **CONSTRUCTIONAL FEATURES**

4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and 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.



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- 4.4. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.
- 4.5 Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.
- 4.6 In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation.
In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.
- 4.7 **Terminals and Terminal Boxes**
- 4.7.1 Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.

Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".
- 4.7.2 unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.
- 4.7.3 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W & V respectively.
- 4.7.4 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.
- 4.7.5 Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.
- 4.7.6 Degree of protection for terminal boxes shall be IP 55 as per IS 4691.
- 4.7.7 Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.
- 4.7.8. Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.
- 4.7.9 Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.
- 4.8 Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.



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- 4.9.1 Motors provided for similar drives shall be interchangeable.
- 4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.
- 4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.
- 4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.
- 4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.
- 4.9.6 Name plate with all particulars as per IS: 325 shall be provided
- 4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.

5.0 INSPECTION AND TESTING

- 5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.
- 5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.
- 5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.
- 5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.


6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT

- a) OGA drawing showing the position of terminal boxes, earthing connections etc.
- b) Arrangement drawing of terminal boxes.
- c) Characteristic curves:
(To be given for motor above 55 kW unless otherwise specified in Data Sheet).
 - i) Current vs. time at rated voltage and minimum starting voltage.
 - ii) Speed vs. time at rated voltage and minimum starting voltage.
 - iii) Torque vs. speed at rated voltage and minimum voltage.
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.
 - iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.

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SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY**	REMARKS				
1	2	3	4	5	6	7	8	9	D*	M	C	N	11	
1.0	RAW MATERIALS & BOUGHT OUT 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		
1.2	END COVERS	Chemical Properties	Major	Chemical Test	1/Cast	-do-	-do-	Lab Report	D*	P	V	V		
1.3	SHAFTS	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		
		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		
		Sub surface defects	Major	Heat Treatment UT	100% 100%	-do- ASTM A 388 100% back	-do- Fall in back wall echo 20%	HT Chart Inspection Report	D* D*	P P	V V	V V		

		LEGEND : <small>* RECORDS IDENTIFIED WITH "TICK" 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</small>	FOR CUST/CONSUL USE	DOC.NO.:
MANUFACTURER / SUBCONTRACTOR	CONTRACTOR			
SIGNATURE			REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY

	MANUFACTURER'S NAME & ADDRESS BHEL APPROVED VENDOR	STANDARD QUALITY PLAN						PROJECT- 2X660 MW OPGCL IB BANHARPALLI TPP PACKAGE LUBE OIL PUMPS CONTRACT NO PO NO. CONTRACTOR BHARAT HEAVY ELECTRICALS LTD.			
		ITEM : LUBE OIL PUMPS SUB-SYSTEM: CLEAN/ DIRTY/ RETURN OIL PUMPS			QP NO. DATE REV. PAGE	PE:QP: STD:567:A001 07/07/07 00 2 of 5					

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								9	D*	M	C	N	
1.5	Relief Valve Body	Hardness Test Physical Properties	Major Major	Hardness Physical Test	100% 1/Bar	wall echo Appd Dwg/ Data sheet	Max. Defect Echoe 20% Max of B.W.E. Appd Dwg/ Data sheet	Lab Rprt.	D*	P	V	V	
1.6	Flanges (Companion)	Chemical Properties Physical Properties	Major Major	Chemical Test Physical Test	1/Bar 1/ Heat	-do- -do-	-do- -do-	Lab Reports Lab Reports	D* D*	P P	V V	V V	
1.7	Bearings, Oil Seals, Mechanical Seals	Chemical Properties Make, size, Bearing number, finish, fitment	Major Major	Chemical Test Visual, Fitment	1/Heat 100%	-do- Manufacturing Drawing	-do- Manufacturing drawing	Lab Reports Log book	D* P	P P	V V	V -	
1.8	Electric Motors	Review of Routine test certificate Review of Type test reports duly approved	Major Critical	Review Review	100% 100%	IS 325/IEC -34 for export job IS 325/IEC-34 for export job	Appd Drg/Data sheet Appd Drg/Data sheet	Approved Approved	D* D*	P P	V V	V V	Any previous report for similar frame size not older than 2 yrs as on PO date
2.0	IN PROCESS CONTROL												
2.1	All components	1. Workmanship & Finish	Major	Visual Measurement	100%	Mfg. Drawing	Mfg. Drawing	Log book		P	W	-	

		LEGEND :	FOR CUST/CONSUL USE	DOC.NO.:
MANUFACTURER / SUBCONTRACTOR	CONTRACTOR	<small>* RECORDS IDENTIFIED WITH "TICK" 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</small>		
SIGNATURE			REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY

	MANUFACTURER'S NAME & ADDRESS BHEL APPROVED VENDOR		STANDARD QUALITY PLAN					PROJECT- 2X660 MW OPGCL IB BANHARPALLI TPP PACKAGE LUBE OIL PUMPS CONTRACT NO PO NO. CONTRACTOR BHARAT HEAVY ELECTRICALS LTD.				
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SR. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY**				REMARKS
									D*	10				
1	2	3	4	5	6	7	8	9	D*	M	C	N	11	
2.2	Pump Casing, Covers, Relief Valve Housing & Curing of Pump Casing Gaskets	2. Dimensions Leak tightness	Critical	Hydro test at 2 x maximum allowable working pressure for 30 mins.	100%	Data Sheets / Technical Specifications	No leakages, No deformation	Inspection Report.	D*	P	W	V		
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 Hardening	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.	CR	Performance Test Measurement	100%	Hydraulic Institute Standards of USA. Tech Specn, Appd. Data sheets	Hydraulic Institute Standards of USA. Tech Specn, Appd. Data sheets Vibration Level = 50 Mi-	Test Report	D*	P	W	V	Pump to be tested with oil of viscosity closest to lube oil @ rated viscosity for Pressure, @ lowest viscosity for capacity , @ highest viscosity for power	


		LEGEND :	FOR CUST/CONSUL USE	DOC.NO.:
MANUFACTURER / SUBCONTRACTOR	CONTRACTOR	<small>* RECORDS IDENTIFIED WITH "TICK" 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</small>		
SIGNATURE			REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY

SR. NO.		COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY**			REMARKS	
1	2	3	4	5	6	7	8	9	D*	M	C	N	11	
3.4	Cleaning, protection, painting & packing	Activity compliance	6. Over all dimensions 7. Orientation 8. Strip Test	Major Major Critical MI	Visual Visual Visual	100% 100%	Approved GA Drgs. No visible damage Tech / Mfg. Specn for packing; Appd dwg for cleaning, protection & painting including shade	crons ,max. Noise Level = 85 dB max. Approved GA Drgs. No visible damage Tech / Mfg. Specn for packing; Appd dwg for cleaning, 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.

		LEGEND :	FOR CUST/CONSUL 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: 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- 2X660 MW OPGCL IB BANHARPALLI TPP					
			ITEM : LUBE OIL PUMPS SUB-SYSTEM: CLEAN/ DIRTY/ RETURN OIL PUMPS			QP NO.	PE:QP: STD:567:A001	PACKAGE LUBE OIL PUMPS		CONTRACT NO		CONTRACTOR BHARAT HEAVY ELECTRICALS LTD.	
						DATE 07/07/07 REV. 00 PAGE 5 of 5			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**			REMARKS
1	2	3	4	5	6	7	8	9	D*	M	C	N	11


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

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

	MANUFACTURER'S NAME & ADDRESS BHEL APPROVED VENDOR		STANDARD QUALITY PLAN					PROJECT				
			ITEM : BASKET (SIMPLEX/DUPLEX) OIL STRAINER SUB-SYSTEM: LUBE OIL			QP NO. DATE REV. PAGE	PE:QP:STD:567:A0 012 07/07/07 00 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**			REMARKS	
								D*	M	C	N			
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	-	FOR DUPLEX STRAINER ONLY	
		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	-		
		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	<small>* 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</small>		
SIGNATURE			REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY

	MANUFACTURER'S NAME & ADDRESS		STANDARD QUALITY PLAN					PROJECT				
	BHEL APPROVED VENDOR		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	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				REMARKS	
								D*	M	C	N		
1	2	3	4	5	6	7	8	9				11	
2.4	Weldments- Root & Final Run (As applicable)	Orientation 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 & manufacturin g 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	

		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					PROJECT						
			ITEM : BASKET (SIMPLEX/DUPLEX) OIL STRAINER SUB-SYSTEM: LUBE OIL			QP NO. PE:QP:STD:567:A0 DATE 07/07/07 REV. 00 PAGE 3 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**			REMARKS	
1	2	3	4	5	6	7	8	9	D*	M	C	N	11	
						for cleaning, protection & painting including shade	for cleaning, protection & painting including shade							

LEGEND

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- 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:** DVB/NTPC
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		LEGEND : <small>* 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</small>	FOR DVB/NTPC USE	DOC.NO.:
MANUFACTURER / SUBCONTRACTOR	CONTRACTOR		REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY
SIGNATURE				



QUALITY PLAN

SHEET 1 OF 9

CUSTOMER :

BIDDER/ VENDOR :

SYSTEM

PROJECT

TITLE

QUALITY PLAN

NUMBER PED-506-00-Q-007, REV-03

ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)

SPECIFICATION :

NUMBER :


SPECIFICATION :


TITLE

SECTION

VOLUME III


SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0	RAW MATERIAL & BOUGHT OUT CONTROL											
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	1.SURFACE CONDITION	MA	VISUAL	100%	-	FREE FROM BLINKS, CRACKS, WAVINESS ETC	LOG BOOK	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	-DO-	3	-	-	
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	-DO-	-DO-	-DO-	INSPEC. REPORT	3	-	2	
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, UN-EVENNESS ETC.	-DO-	3	-	-	
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	MANFR'S DRG./SPEC BOOK	RELEVENT IS/SPEC.	SUPPLIERS TC & LOG	3	-	2	PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK	3	-	2	
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	MANFR'S DRG./SPEC	RELEVENT IS/	SUPPLIER'S TC	3	-	2	HEAT NO. SHALL BE VERIFIED
		3.DIMENSIONS	MA	MEASUREMENT	100%	MANUFR'S DRG.	MANUFR'S DRG.	LOG BOOK	3	-	2	
1.4	PAINT & VARNISH	1.MAKE, SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	LOG BOOK	3	-	2	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN			CUSTOMER :			PROJECT			SPECIFICATION :		
					BIDDER/ VENDOR			TITLE			NUMBER :		
SHEET 2 OF 9		SYSTEM			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			SECTION VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED	
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	MFG. DRG. SPEC.	RELEVANT IS	SUPPLIER'S TC	3	-	2		
		3. DIMENSIONS	MA	MEASUREMENT	100%	-DO-	MANUFR'S DRG.	LOG BOOK	3	-	2		
		4. INTERNAL FLAWS	CR	UT	-DO-	ASTM-A388	MANUFR'S SPEC. BHEL SPEC.	-DO-	3	2	1		FOR DIA OF 55 MM & ABOVE
1.6	SPACE HEATERS, CONNECTORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	-DO-	MANUFR'S DRG. SPEC.	MANUFR'S DRG. SPEC.	-DO-	3	-	2		
		2. PHYSICAL COND.	MA	-DO-	-DO-	-	NO PHYS. DAMAGE, NO ELECTRICAL DISCONTINUITY	-DO-	3	-	2		
		3. DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG./ SPEC.	MANUFR'S DRG. / SPEC.	-DO-	3	-	2		
		4. PERFORMANCE/ CALIBRATION	MA	TEST	100%	-DO-	-DO-	INSP. REPORT	3	-	2		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				

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



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

		QUALITY PLAN SHEET 5 OF 9			CUSTOMER :		PROJECT			SPECIFICATION :			
					BIDDER/ VENDOR :		TITLE			NUMBER :			
SYSTEM		QUALITY PLAN			NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION :					
ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)		SECTION			VOLUME III			TITLE					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
2.0	IN PROCESS												
2.1	STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1.WORKMANSHIP & CLEANNESS	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	3/2	2	-		
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-		
2.2	MACHINING	1.FINISH	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	2	-	-		
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-		
		3.SHAFT SURFACE FLOWS	MA	PT	-DO-	RELEVANT SPEC./ ASTM-E165	MANUF'S SPEC./ BHEL SPEC./	-DO-	2	-	1		
2.3	PAINING	1.SURFACE PREPARATION	MA	VISUAL	100%	MANFR'S SPEC/BHEL SPEC./ RELEVANT STAND	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-		
		2.PAINT THICKNESS (BOTH PRIMER & FINISH COAT)	MA	MEASUREMENT BY ELCOMETER	SAMPLE	-DO-	-DO-	-DO-	2	-	-		
		3.SHADE	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-		
		4.ADHESION	MA	CROSS CUTTING & TAPE TEST	-DO-	-DO-	-DO-	Log Book	2	-	-		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				



QUALITY PLAN

SHEET 6 OF 9

CUSTOMER :

PROJECT TITLE

SPECIFICATION : NUMBER :

BIDDER/ VENDOR SYSTEM

QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03
ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)

SPECIFICATION : TITLE SECTION VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	MANUFR'S SPEC.	MANUFR'S SPEC.	Log Book	2	-	-	(FOR MOTORS OF 2MW AND ABOVE) * ON 10% RANDOM SAMPLE	
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-DO-	-DO-	Log Book	2	-	-		
		3.CORE LOSS & HOTSPOT	MA	ELECT.TEST	-DO-	-DO-	-DO-	Log Book	2	1*	1		
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	MANUFR'S SPEC./BHEL SPEC.	MANUFR'S SPEC./BHEL SPEC.	Log Book	2	-	-		
		2.CLEANLINESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-		
		3.IR-HV-IR	CR	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	2	-	1		
		4.RESISTANCE	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1		
		5.INTERTURN INSULATION	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-		
2.6	IMPREGNATION	6.SURGE WITH STAND AND TAN. DELTA TEST	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1		FOR MV MOTOR
		1.VISCOSITY	MA	PHY. TEST	AT STARTING	-DO-	-DO-	Log Book	2	-	-		
		2.TEMP. PRESSURE VACCUM	MA	PROCESS CHECK	CONTINUOUS	-DO-	-DO-	Log Book	2	-	-		
		3.NO. OF DIPS	MA	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	THREE DIPS TO BE GIVEN	
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				



QUALITY PLAN

SHEET 7 OF 9

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

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.7	COMPLETE STATOR ASSEMBLY	4.DURATION 1.COMPACTNESS & CLEANLINESS	MA MA	-DO- VISUAL	-DO- 100%	-DO- -DO-	-DO- -DO-	Log Book Log Book	2 2	- -	1 -	
2.8	BRAZING/COMPRESSION JOINT	1.COMPLETENESS 2.SOUNDNESS	CR CR	-DO- MALLETT TEST & UT	-DO- -DO-	-DO- -DO-	-DO- -DO-	Log Book Log Book	2 2	- -	- 1	
2.9	COMPLETE ROTOR ASSEMBLY	3.HV 1.RESIDUAL UNBALANCE	MA CR	ELECT. TEST DYN. BALANCE	-DO- -DO-	-DO- MFG SPEC./ ISO 1940	-DO- MFG. DWG.	Log Book Log Book	2 2	- -	1 1	VERIFICATION FOR MV MOTOR ONLY
2.10	ASSEMBLY	2.SOUNDNESS OF DIE CASTING 1.ALIGNMENT 2.WORKMANSHIP 3.AXIAL PLAY 4.DIMENSIONS 5.CORRECTNESS, COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE 6. RTD, BTD & SPACE HEATER MOUNTING.	CR MA MA MA MA MA MA	ELECT. (GROWLER TEST) MEAS. VISUAL MEAS. -DO- VISUAL	-DO- -DO- -DO- -DO- 100%	-DO- -DO- -DO- MFG.DRG./ MFG SPEC. MFG SPEC. RELEVANT IS	-DO- -DO- -DO- MFG. DRG/ RELEVANT IS MFG SPEC. RELEVANT IS	Log Book Log Book Log Book Log Book Log Book Log Book	2 2 2 2 2 2	- - - - -	- - 1 - -	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE									
									BIDDER'S/VENDORS COMPANY SEAL			



QUALITY PLAN

SHEET 8 OF 9

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

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS AS PER BHEL SPEC.	MA	ELECT.TEST	1/TYPE/SIZE	IS-325/ BHEL SPEC./ DATA SHEET	IS-325/ BHEL SPEC./ DATA SHEET	TEST REPORT	2	1*	1	* NOTE - 1
		2.ROUTINE TESTS INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^{\$}	1	^{\$} NOTE - 2
		3.VIBRATION & NOISE LEVEL	MA	-DO-	100%	IS-12075 & IS-12065	IS-12075 & IS-12065	-DO-	2	1 ^{\$}	1	^{\$} NOTE - 2
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPC. REPORT	2	1	-	
		5.DEGREE OF PROTECTION	MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	RELEVANT IS	BHEL SPEC. AND DATA SHEET	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		6. MEASUREMENT OF RESISTANCE OF RTD & BTD	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^{\$}	1	^{\$} NOTE - 2
		7. MEASUREMENT OF RESISTANCE, IR OF SPACE HEATER	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^{\$}	1	^{\$} NOTE - 2
		8. NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPC. REPORT	2	1 ^{\$}	1	^{\$} NOTE - 2
		9.EXPLOSION FLAME PROOF NESS (IF SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	1/TYPE	IS-3682 IS-8239 IS-8240	IS-3682 IS-8239 IS-8240	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		10. PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	BHEL SPEC. & DATA SHEET	BHEL SPEC. & DATA SHEET	TC	2	1 ^{\$}	1	SAMPLING PLAN TO BE DECIDED BY INSPECTION AGENCY ^{\$} NOTE - 2

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



QUALITY PLAN

SHEET 9 OF 9

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

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

NOTES:


- 1 DEPENDING UPON THE SIZE AND CRITICALLY, WITNESSING BY BHEL SHALL BE DECIDED.
- 2 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON.
- 3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THESE TEST MAY NOT BE REPEATED.
- 4 WHEREVER CUSTOMER IS INVOLVED IN INSPECTION, AGENCY (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.


Legends for Inspection agency

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

- P. PERFORM
W. WITNESS
V. VERIFY

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

		QUALITY PLAN	CUSTOMER :			PROJECT			SPECIFICATION :			
			BIDDER/ VENDOR :			TITLE			NUMBER :			
SHEET 1 OF 2		SYSTEM			QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION TITLE				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION VOLUME III			
1	2	3	4	5	6	7	8	9	P	W	V	REMARKS
1.0	ASSEMBLY	1.WORKMANSHIP 2.DIMENSIONS 3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA MA MA	VISUAL -DO- VISUAL	100% -DO- 100%	MANUF'S SPEC MFG. DRG./ MFG. SPEC. MFG.SPEC./ RELEVANT IS	MANUF'S SPEC MFG. DRG./ MFG. SPEC. MFG.SPEC. RELEVANT IS	-DO- -DO- -DO-	2 2 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. 2.OVERALL DIMENSIONS & ORIENTATION	MA MA	-DO- MEASUREMENT & VISUAL	100% 100%	IS-325/ BHEL SPEC./ DATA SHEET APPROVED DRG/DATA SHEET	SAME AS COL.7 APPROVED DRG/DATA SHEET & RELEVANT IS	TEST REPORT INSPN. REPORT	2 2	1 1	- -	NOTE -1 & NOTE-3 NOTE -1 & NOTE-3
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									

	QUALITY PLAN		CUSTOMER :			PROJECT			SPECIFICATION :			
	SHEET 2 OF 2		BIDDER/ :			TITLE			NUMBER :			
			VENDOR			QUALITY PLAN			SPECIFICATION :			
		SYSTEM			NUMBER PED-506-00-Q-006, REV-01			TITLE :				
					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			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	
<p>NOTES:</p> <p>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</p> <p>2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.</p> <p>3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.</p> <p><u>Legends for Inspection agency</u></p> <p>1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)</p> <p>P. PERFORM W. WITNESS V. VERIFY</p>												
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			



**TECHNICAL SPECIFICATION FOR
LUBE OIL TRANSFER PUMPS
2X660 MW OPGCL IB BANHARPALLI TPP**

SPECIFICATION NO. PE-TS-391-567-A001

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SECTION - D

TECHNICAL SCHEDULES / DATA SHEETS



**TECHNICAL SPECIFICATION FOR
LUBE OIL TRANSFER PUMPS
2X660 MW OPGCL IB BANHARPALLI TPP**

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DOCUMENT TO BE SUBMITTED BY THE BIDDER WITH THE BID

S. No.	ITEM DESCRIPTION	YES/NO
01	Compliance cum Confirmation Certificate	
02	Signed and Stamped copy of Pre-bid clarification (if any released before bid submission else write - NIL and submit)	
03	Signed and Stamped copy of Deviation schedule writing “NO DEVIATION TO SPECIFICATION”	
04	Signed and Stamped copy of Electrical Load Data as a token of acceptance.	
05	Un-priced bid clearly indicating “Quoted” or “Not Quoted” against each row & column.	

Note: The bidder must submit the above mentioned documents along with their bid so as to enable BHEL to evaluate their offer. In the absence of any documents mentioned above, bidder’s offer is liable to be rejected.

Further any documents submitted by bidder other than above shall not be taken cognizance of and these shall not form part of contract.

The bidder hereby certifies that above mentioned document are enclosed with the bid.

SIGNATURE : _____

NAME : _____

DESIGNATION : _____

COMPANY : _____

DATE : _____

COMPANY SEAL



**TECHNICAL SPECIFICATION FOR
LUBE OIL TRANSFER PUMPS
2X660 MW OPGCL IB BANHARPALLI TPP**

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DRAWINGS DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

S. NO	DOCUMENT NO.	DOCUMENT TITLE	SCH. DATE OF SUB. FROM LOI (IN WEEKS)	PURPOSE
1	PE-V0-391-567-A001	DATA SHEET & GA OF LUBE OIL TRANSFER PUMPS	4	APPROVAL
2	PE-V0-391-567-A002	DATA SHEET & GA OF STRAINER FOR LUBE OIL PUMPS	4	APPROVAL
3	PE-V0-391-567-A003	DATA SHEET & GA OF LUBE OIL PUMP MOTOR	4	APPROVAL
4	PE-V0-391-567-A004	QAP OF LUBE OIL TRANSFER PUMP AND STRAINER	4	APPROVAL
5	PE-V0-391-567-A005	O&M Manual for Lube Oil Transfer Pumps	8	APPROVAL

NOTE:

1. Non-submission of the document as per attached schedule will attract LD.
2. Drawing / Document shall be uploaded by the successful bidder on WRENCH /DMS. Procedure for the same will be informed after award of contract.
3. On approval of above documents, bidder will be entitled for 5% payment against basic engineering completion.

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY _____

DATE: _____

COMPANY SEAL



**TECHNICAL SPECIFICATION FOR
LUBE OIL TRANSFER PUMPS
2X660 MW OPGCL IB BANHARPALLI TPP**

SPECIFICATION NO. PE-TS-391-567-A001

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Other points to be considered while preparing drawings:

- a) Data sheets of various items shall be prepared by the bidder and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.
- b) GA drawing covering all details shown in data sheets like design data, dimensions, material of construction, lists of specifications, details of paints, standards & codes, general notes including details of test to be conducted to be covered.
- c) Quality assurance plan / check list shall be prepared by the bidder for Pumps, strainer, motor shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.
- d) All possible efforts shall be made by the bidder to get the approval of drawings and documents from BHEL / customer / consultant at the earliest and the documents prepared / generated by them or their sub-vendors shall be checked by their competent authority before submission to BHEL.
- e) Revision made by the 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 BHEL to review the drawings and documents.
- f) Any other drawings and documents in addition to the list of drawings and documents indicated in the NIT specification as required by BHEL for the execution of the project shall be furnished by them during detailed engineering stage and no commercial implication shall be entertained by BHEL for the same.
- g) Civil works will be done by BHEL based on civil inputs furnished by the bidder during detail engineering. In case of any changes in the civil input drawing after civil work is completed. Necessary prices on account of modification of the civil work shall be deducted from bidder's account.
- h) Bidder to furnish the civil foundation drawing of pumps, motor and strainer along with the loading data for approval during detailed engineering stage showing / indicating the followings:-
 - Scope of work by BHEL and bidder shall be indicated with different legend or in the form of note.
 - Recommended locations of earthing pads.
 - Details of pockets as required for anchor / foundation bolts.
- i) All drawings and documents including general arrangement drawing, data sheet, calculation etc. shall be furnished to BHEL during detailed engineering stage and shall include / indicate the following details for clarity w.r.t. inspection, construction, erection and maintenance etc.:-
 - 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.
 - All drawings and documents shall indicate the list of all reference drawings including general arrangement.
 - All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view etc. All major self-manufactured and bought out items shall be labelled and included in BOQ / BOM in tabular form indicating all components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.
 - Specification / schedule of painting shall be made as a part of general arrangement drawing of each item indicating at least 3 make.
- j) All text/ numeric in the document / drawings to be generated by the successful bidder will be in English language only.



**TECHNICAL SPECIFICATION FOR
LUBE OIL TRANSFER PUMPS
2X660 MW OPGCL IB BANHARPALLI TPP
(COMPLIANCE CUM CONFIRMATION CERTIFICATE)**

SPECIFICATION NO. PE-TS-391-567-A001

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COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificates (every sheet) and furnishes 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.
- f) 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.
- g) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.
- h) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price 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.



**TECHNICAL SPECIFICATION FOR
LUBE OIL TRANSFER PUMPS
2X660 MW OPGCL IB BANHARPALLI TPP
(COMPLIANCE CUM CONFIRMATION CERTIFICATE)**

SPECIFICATION NO. PE-TS-391-567-A001

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- j) 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.
- k) 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.
- l) As built drawings shall be submitted as and when required during the project execution.
- m) Drawing / Document shall be uploaded by the successful bidder on WRENCH / DMS. Procedure for the same will be informed after award of contract.
- n) 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

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
Clean Oil Transfer Pump	3.7KW		S	1	0	D	U	-	I	-	Indoor							
Dirty Oil Transfer Pump	3.7KW		S	1	0	D	U	-	I	-	Indoor							

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)

	LOAD DATA (ELECTRICAL)	JOB NO.	391	ORIGINATING AGENCY	PEM (ELECTRICAL)		
		PROJECT TITLE	2X660 MW OPGCL IB BANHARPALLI TPP	NAME		DATA FILLED UP ON	
		SYSTEM / S	LUBE OIL PUMPS	SIGN.		DATA ENTERED ON	
		DEPTT. / SECTION	MAX	SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE	



**TECHNICAL SPECIFICATION FOR
LUBE OIL TRANSFER PUMPS
2X660 MW OPGCL IB BANHARPALLI TPP
(DATASHEET OF LUBE OIL PUMP)**

SPECIFICATION NO. PE-TS-391-567-A001

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“*” 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	Design & Manufacturing Standard	API 676
(i)		
4.04	Testing Standard	HIS (ANSI/HI-3.6-2000 / VDMA 24284 , Accuracy Class-2, Group-II (* Bidder to tick the standard adopted)
(ii)		
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 : Top / End / Side



**TECHNICAL SPECIFICATION FOR
LUBE OIL TRANSFER PUMPS
2X660 MW OPGCL IB BANHARPALLI TPP
(DATASHEET OF LUBE OIL PUMP)**

SPECIFICATION NO. PE-TS-391-567-A001

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		(as viewed from drive end) -*(Bidder to tick the applicable)
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)
		Top End Side
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
) 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	*
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	*
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	



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5.01	Casing and End covers	ASTM A 216 WCB
5.02	Rotor/Gear	EN-8 BS 970 Part-I, Hardness- *
5.03	Shaft/Shaft Sleeve	SS 316
5.04	Seal	*
5.05	Gasket	GRAFOIL/ Any other asbestos free material subject to customer acceptance (* bidder to indicate)
5.06	Bearing	*
5.07	Relief Valve Components	*
5.08	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	*
7.00	Weight of	
7.01	Pump	*
7.01	Motor	*
7.01	Base plate	*
7.01	Other Accessories (Please specify)	*
8.00	Strainer/Filter	
8.01	Manufacturer	*
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/cm ²)	
	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



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		indicate)
8.11	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	
9.01	Common base plate	Yes- MS fabricated from IS 2062 plate common for pump & motor
9.02	Coupling & Coupling Guard	Yes
9.03	Foundation bolts & nuts	Yes
9.04	Flanges & Companion flanges	Yes, Class 150 lb, RF to ANSI B 16.5
9.05	Nuts, bolts & gaskets	Yes
9.06	Lifting lugs, Eye bolts etc	Yes
9.07	Name plate for all the equipment	Yes

	TITLE	SPECIFICATION NO.
	MOTOR DATA SHEET - C	VOLUME II B
		SECTION D
		REV NO. 00 DATE
		SHEET 1 OF 2

S. No.	Description	Data to be filled by successful bidder
A.	General	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
B.	Design and Performance Data	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a) Voltage	
6	b) Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB)	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE	SPECIFICATION NO.
	MOTOR DATA SHEET - C	VOLUME II B
		SECTION D
		REV NO. 00 DATE
		SHEET 2 OF 2

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 $\geq 55KW$)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



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DEVIATION SCHEDULE

PACKAGE:- MISCELLANEOUS TANKS

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATI ON / TENDER DOCUMENT	COMPLETE DESCRIPTIO N OF DEVIATION	COST OF WITHDRAW L 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
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TECHNICAL DEVIATIONS

COMMERCIAL DEVIATIONS

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATIONS	SIGN & DATE

NOTES:

- For self-manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
- For directly dispatch able items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.
- All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
- Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
- Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
- Bidder shall furnish price copy of above format along with price bid.
- The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
- Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
- 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 withdrawal 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 withdrawal of deviation shall be taken as NIL.
- Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
- 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.
- Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
- In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
- In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.



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SCHEDULE OF WEIGHTS & DIMENSIONS

- () From general terms and conditions of contract and special condition of contract (Vol. I)
- () From technical specifications (Vol. II B)
- () From general terms and conditions of contract for erection (vol. I)
- () From general technical conditions (Vol. IIC)

**Particulars of Bidders / Authorized Representative
(NAME/ DESIGNATION/ SIGN/ DATE)**

COMPANY SEAL

