

**DB POWER (MADHYA PRADESH) LIMITED (DBP (MP)L)
SINGARENI COLLIERIES COMPANY LIMITED (SCCL)**

**DBP(MP)L - 2 x 660 MW SINGRAULI STPP
SCCL - 2 x 600 MW ADILABAD TPP**


VOLUME -IIB

**TECHNICAL SPECIFICATION
FOR
MISCELLANEOUS PUMPS**

Specification No. : PE-TS-380/381-100-N001 (REV. 0)



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI BUILDING, SECTOR 16 A
NOIDA - 201301**

	PREAMBLE		SPECN. NO.: PE-TS-380/381-100-N001	
			REV. NO. 0	DATE: 16.04.2012

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

1.1 Volume I - CONDITIONS OF CONTRACT

This consists of four parts as below:

Volume - I A : This part contains instructions to bidders for making bids to BHEL.

Volume - I B : This part contains general commercial conditions of the tender and includes provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume - I C : This part contains special conditions of contract.

Volume - I D : This part contains commercial conditions for erection and commissioning site work, as applicable.

1.2 Volume II - TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume II which comprises of:

Volume - II A : General Technical Conditions

Volume - II B : Technical specification including drawings, if any

1.2.1 Volume - II B :

This volume is sub-divided into following sections:

Section - A : This section outlines the scope of enquiry.

Section - B : This section provides "Project Information"

Section - C : This section indicates technical requirements specific to the contract, not covered in Section-D.

Section - D : This section comprises of technical specifications of equipments complete with data sheet A, B & C.

Data sheet - A specifies data and other requirements pertaining to the equipment.


Data sheet - B specifies data to be filled by the bidder (Data Sheet B is contained in Volume - III)

Data sheet - C indicates data documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).

1.2.2 Volume - III TECHNICAL SCHEDULES

This volume contains technical schedules and Data Sheets - B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per checklist, sec B7 in vol III.

2.0 The requirements mentioned in Section C/Data Sheets-A of Section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section - D.

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TECHNICAL SPECIFICATIONS

SPECN. NO.:

PE-TS-380/381-100-N001

MISCELLANEOUS PUMPS

VOLUME:

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SECTION A

SCOPE OF INQUIRY

	TECHNICAL SPECIFICATIONS		SPECN. NO.:		PE-TS-380/381-100-N001	
	MISCELLANEOUS PUMPS SCOPE OF ENQUIRY		VOLUME:	IIB	SECTION:	A
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1.0 SCOPE

1.1 This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works, proper packing for delivery and installation checks and replacement of gland packing with Mechanical Seal arrangement (if applicable) at site for Miscellaneous Pumps along with mandatory spares complete with all accessories as per the requirements specified in this specification for following projects.

a) DBP(MP)L - 2 x 660 MW SINGRAULI STPP
b) SCCL - 2 x 600 MW ADILABAD 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 miscellaneous pumps covered under this specification for all projects shall be Horizontal pumps.

NOTE:-
The Pumps for various projects may be combined together for bid evaluation, if stated in NIT.
The bidder shall include complete supplies for the Project as above in his scope. Part supplies offered for the Project shall disqualify the bidders offer for that Project(as applicable).

1.3 The pumps erected by the purchaser shall be checked by the bidder for correctness of their installation, alignment, etc. at site prior to their commissioning. Replacement of gland packing with Mechanical Seal (If applicable) as per Cl. No. 2.0 of Section C1 of this volume. The charges for these shall be included by bidder in his base price, itself.

1.4 The miscellaneous pumps and drives covered under this specification for various projects are as per Annexure I. HT drives, wherever applicable and irrespective of motor ratings, shall be issued free of cost by BHEL. The details of pumps with HT drives shall be as per Annexure II.


The Capacity, Head, Materials of construction, Mandatory spares and other particulars of these pumps, are detailed in Data Sheet-A annexed with Section-D of the specification.


1.5 For detailed scope of supply & services refer clause 3.00.00 of Standard technical Specification for Horizontal Centrifugal pumps specified under Section-D of this volume.

1.6 Electrical scope between BHEL and Vendor for Miscellaneous pumps and drives of this specification shall be as per annexure I of section C-2 of this volume.

2.0 GENERAL TECHNICAL INSTRUCTIONS

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

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<p>2.2 The omission of specific reference to any component/accessory necessary for the proper performance of Miscellaneous Pumps and drives shall not relieve the bidder of the responsibility of providing such facilities to complete the supply of equipment at quoted prices.</p> <p>2.3 BHEL's / Customer's representative shall be given full access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.</p> <p>2.4 The equipments covered under this specification shall not be despatched unless the same have been finally inspected, accepted and shipping release issued by BHEL/Customer.</p> <p>2.5 <i>In case of any deviation from this technical specification (Vol.IIB) and General Technical Conditions (Vol.II A), the same shall be indicated in the schedule of deviations enclosed in Vol.III. In the absence of duly filled schedules it will be assumed that the bid strictly conforms to the specification.</i></p> <p>2.6 Unpriced copy of the price bid shall be furnished alongwith the technical bid.</p>				

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Annexure I


List of Miscellaneous Pumps and drives for various projects:

1. DBP(MP)L - 2 x 660 MW SINGRAULI STPP

Sl. No.	Pump Description	Total Qty.	Type of Pumps
	Horizontal Pumps		
1	DMCW Pumps For TG Aux.	6 nos.	Horizontal
2	DMCW Pumps For SG Aux.	4 nos.	
3	DMCW Pumps For Station Aux.	2 nos.	
4	ACW Pumps	6 nos.	


2.0 SCCL - 2 x 600 MW ADILABAD TPP

Sl. No.	Pump Description	Total Qty.	Type of Pumps
	Horizontal Pumps		
1	DMCW Pumps (For TG Aux.)	6 nos.	Horizontal
2	DMCW Pumps (For SG Aux.)	4 nos.	
3	ACW pumps	6 nos.	

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SECTION B

PROJECT INFORMATION

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<p>SECTION B1</p> <p>PROJECT INFORMATION</p> <p>DBP(MP)L - 2 x 660 MW SINGRAULI STPP</p>			


	PROJECT INFORMATION	SECTION-G2
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GENERAL INFORMATION

1.00.00 PROJECT INFORMATION DATA

PROJECT INFORMATION

I.	Owner	DB POWER (MADHYA PRADESH) LIMITED
II.	Project	2 X 660 MW Supercritical Thermal Power Plant
III.	Location	Village Gorgi, Tehsil Deosar, District Singrauli, Madhya Pradesh State
IV.	Coordinates	Latitude 24°07'01.9" N Longitude 81°55'18.5" E
V.	Average Altitude	350 m above MSL
VI.	Nearest Domestic Airport	Allahabad (U.P)- 110 Km
VII.	Nearest Town	Sidhi 35 Km
VIII.	Ambient Temperature,	Extreme High: 47.80C Low: 3.50C
IX.	Seismic Zone	Zone III (IS 1893:2000)
X.	Maximum Wind Velocity	39m/s
XI.	Ambient temperature for Design of equipment	50 Deg C


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<p>SECTION B2</p> <p>PROJECT INFORMATION</p> <p>SCCL - 2 x 600 MW ADILABAD TPP</p>			

CLAUSE NO.	PROJECT INFORMATION				
1.00.00	<p>BACKGROUND</p> <p>The Singareni Collieries Company Limited is a government coal mining companies jointly owned by the Government of Andhra Pradesh and Government of India on a 51:49 equity basis</p> <p>The present proposal is for setting up of a coal based Singareni Thermal Power Project (2x600 MW) to be owned by The Singareni Collieries Company Limited, which is A Government Company.</p>				
1.01.00	<p>LOCATION AND APPROACH</p> <p>The Singareni TPP is located near Pegadapalli village, Jaipur Mandal, District Adilabad of Andhra Pradesh. The latitude and longitude of Site are 18° 48' 30" to 18° 50' 35" and 79° 34' 00" to 79° 35' 30" respectively. The Site is 14.6 Km from nearest town Mancherla and 4.6 Km from State Highway. Distance from NH-16 (Nirmal-Chinnur section) is 500M.</p> <p>Nearest railway station is Mancherla railway station on Nagpur-Kazipet main rail line of South Central Railway, located at a distance of about 14.6 kms.</p> <p>Nearest airport is Shamshabad Airport, Hyderabad at a distance of about 250KM.</p> <p>Vicinity Plan of the project is placed at Annexure-I</p>				
1.02.00	<p>LAND REQUIREMENT</p> <p>About 490 hectares of land has been identified for the plant, CHP, water reservoir, Staff colony, ash dump area, Coal conveyor corridors, water pipelines and Green belts.</p>				
1.03.00	<p>WATER</p> <p>Water requirement has been assessed as 3700 cum/hr.</p> <p>Irrigation & CAD Deptt., Govt. of Andhra Pradesh has allocated 1.0 TMC of water per annum from Pranahita Chevella Lift Irrigation Scheme vide Memo No. 17556/Maj.Irr.VIII(1)/08 dated 02.07.2008 (Annexure-2.1).</p> <p>During the no-flow period in the river, Govt. of Andhra Pradesh, Ground Water Department vide their letter No. 157/T/2008 dated 07.08.2008 addressed to SCCL have accorded approval for drawal of 18 MGD (3409 cum/hr) water through infiltration galleries in River Godavari at Shetpally Village for the project.</p>				
<table><tr><td>SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE</td><td>TECHNICAL SPECIFICATION SECTION - VI PART-A</td><td>SUB-SECTION-I PROJECT INFORMATION</td><td>PAGE 1 OF 4</td></tr></table>		SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-A	SUB-SECTION-I PROJECT INFORMATION	PAGE 1 OF 4
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CLAUSE NO.	PROJECT INFORMATION				
	<p>SCCL has approached Govt. of Andhra Pradesh vide letter dated 29.08.09 to get allocation of 2 TMC of water from Sripada-Yellempalli Project including already allocated 1 TMC of water for the Power Project.</p> <p>Suitable intake system will be developed at a location as may be suggested by Ground Water Deptt., Govt. of Andhra Pradesh.</p>				
1.04.00	COAL AVAILABILITY AND TRANSPORTATION				
1.04.01	Coal Availability <p>Coal requirement for 1200 MW capacity has been assessed as 4.784 mtpa.</p> <p>Coal will be sourced mainly from Srirampur OCM of SCCL and nearby coalmines of SCCL.</p>				
1.04.02	Coal Transportation <p>Coal will be linked from Srirampur OCM & nearby coalmines of SCCL. (-) 200 mm size Coal will be transported by Rail / MGR system from mines to plant site</p> <p>As a standby arrangement coal shall also be transported by road and the arrangement shall be made in Plant CHP to receive the coal through trucks by designing suitable ground hopper.</p>				
1.04.03	Coal Quality Parameters and Fuel Oil Characteristics				
1.05.00	<p>The tentative Coal quality parameters and Fuel Oil Characteristics are enclosed as Annexures-II-1 and II-2 to this subsection.</p> CAPACITY & POWER EVACUATION <p>Power generated is proposed to be stepped upto 400 kV by generator transformer and will be evacuated through the double circuit overhead transmission system.</p>				
1.06.00	METEOROLOGICAL DATA <p>Important meteorological data from nearest observatory at Ramagundam is placed at Annexure - III.</p>				
1.07.00	PLANT WATER SCHEME <p>The Plant water scheme is described below.</p>				
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1.07.01	<p>Condenser Cooling (CW) Water System</p> <p>It is proposed to adopt re-circulating type CW system with induced draft cooling towers for the project.</p>				
1.07.02	<p>Equipment Cooling Water (ECW) System (Unit Auxiliaries)</p> <p>The plant auxiliaries of Steam Generator shall be cooled by Démineralised water (DM) in a closed circuit. The primary circuit DM water shall be cooled through heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the induced draft cooling towers and shall be returned back to the system.</p>				
1.07.03	<p>Station Auxiliaries Cooling Water System</p> <p>The station auxiliaries such as Air compressors, compressors of ash handling plant, Cooling water circuit of Air Conditioning systems of Main Plant and Service Building, compressor of mill reject system etc. shall be cooled by separate cooling water system using separate set of pumps and cooling towers.</p>				
1.07.04	<p>Ash Water System</p> <p>(a) It is proposed to operate ash water system in a closed circuit. The ash water from the ash dyke shall be recirculated. During re-circulation mode, the make up to the ash water system (to compensate for the ash water blow down and evaporation loss in ash dyke) shall be supplied from CW blow down.</p> <p>(b) During initial stage when decanted ash water is not available, the ash water system shall be operated in once through mode and make up water to ash water system shall be given from CW blowdown as well as raw water system.</p> <p>(c) Considering total ash handling plant water requirement of 1100 Cu.M/hr. (excluding the water required for cooling of air compressors and vacuum pumps but inclusive of seal water of ash slurry pumps during re-circulation mode operation, it is expected that about 930 M³/hr of decanted ash water shall return to the ash handling system after accounting for evaporation loss.</p>				
1.07.05	<p>Other Miscellaneous Water Systems</p> <p>(a) CW system blow down water shall be used for meeting the Fly ash and bottom ash system requirement. Clarified water shall be used for service water system. The service (wash water) water collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc.</p>				
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CLAUSE NO.	PROJECT INFORMATION
	<p>as per requirement and treated water from liquid effluent treatment plant shall be recycled back to the service water system for re-use.</p> <p>(b) The drinking water requirement of the plant shall be provided from water treatment plant.</p> <p>(c) Steam Cycle make-up water, makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water and makeup to the hydrogen generation plant shall be provided from existing Demineralising plant.</p> <p>(d) The quality of Raw water and Clarified water is enclosed with this sub-section.-</p>
1.08.00	<p>Criteria for Wind Resistant Design of Structures and Equipment</p> <p>All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given in Sub-Section- D-01, Part-B, Section-VI, i.e. Technical Specification for Civil and Structural Works.</p>
1.09.00	<p>Criteria for Earthquake Resistant Design of Structures and Equipment</p> <p>All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Sub-Section- D-01, Part-B, Section-VI, i.e. Technical Specification for Civil and Structural Works.</p>


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SECTION C

SPECIFIC TECHNICAL REQUIREMENTS

C1: SPECIFIC TECHNICAL REQUIREMENTS FOR PUMPS

C2: SPECIFIC TECHNICAL REQUIREMENTS FOR MOTORS

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<p>SECTION C1</p> <p>SPECIFIC TECHNICAL REQUIREMENTS FOR PUMPS</p>				

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1.0 SPECIFIC TECHNICAL REQUIREMENTS:

DELIVERY:
 Delivery of miscellaneous pumps from date of LOI, for various projects shall be as per NIT requirement.

The delivery periods shall be as per NIT requirements, considering 6 weeks cumulative approval time taken by BHEL & Customer for the project. The cumulative approval time shall be the time for all the submitted revisions put together.

The drawings to be submitted by bidder in the event of order for each project shall be :

- **Pumps :**
 - Technical Data Sheets and Performance Curves,
 - GA and Cross Sectional drawings
 - Quality Plan
- **Motors :**
 - Technical Data Sheets, curves along with other motor documents
 - Motor GA drawing, terminal details, etc.
 - Quality Plan

Drawings submission schedule shall be as follows :

1st submission of drawings from date of LOI* shall be within 25 days.

Every revised submission incorporating comments – Within 10 days.

*For pumps where HT motor is to be free issue by BHEL, HT motor GA will only affect the GA drawing preparation from vendor. Vendor to furnish tentative GA drawing for pump within specified time schedule. Vendor to furnish final GA drawing within 2 weeks of receipt of Motor GA drawing from BHEL. Bidders to note that HT motors inputs viz. Load Torque vs. speed curves of the pumps, selected motor ratings, rpm, GD2 value of driven equipment furnished along with offer shall be considered final and BHEL may proceed with final motor designs as per same.


Drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non submission with delays to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL for across the table discussions/ finalisations/ submissions of drawings.

2.0 Horizontal Pumps with Mechanical seal shall be supplied with gland packing arrangement to site and gland packing arrangement shall be replaced by vendor with mechanical seal arrangement at site after commissioning of the pumps with gland packing. However Mechanical seal shall be despatched along with main supply for this purpose.

3.0 100% PMI (Process Material Identification) inspection for material grade of pump casing, shaft and impeller shall be done by vendor & certification shall be submitted for review of BHEL. Further BHEL reserves the right to conduct random & independent PMI inspection on pump casing, shaft and impeller to ascertain the grade of material during inspection at vendor works..

4.0 Inspection of Mandatory/ Recommended spares shall be inline with approved QP for Main Pumps supply.

5.0 Vibration norms for testing shall be as per American National Standard for Rotodynamic Pump for Vibration Measurement and allowable values, Doc. ANSI/ HIS 9.6.4 2009. The applicable vibration limits for each pump, shall be indicated in the Technical datasheet to be furnished by the successful bidder after award of LOI/ PO.

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6.0 Hydraulic testing : of pump casing shall be done as per clause 10.00.00 of section-D of this volume, with time duration not less than 30 minutes instead of 1 hour indicated, other requirement as specified in clause 10.00.00 shall remain same.

7.0 Bid evaluation : shall be done as per clause 4.00.00 of section-D of this volume, with only change that for LT motor driven pumps, the aux power at inlet to motors as per clause 4.01.00 to be indicated by the bidders shall be compared with Benchmark aux power calculated by using formulae as per clause 4.01.00 considering Bid evaluation efficiencies for pump and motor as indicated in datasheet-A of section-D of volume-IIB, other requirement of clause 4.00.00 and bid evaluation for HT motor driven pump shall remain same.



TECHNICAL SPECIFICATION FOR
MISC PUMPS
(ELECTRICAL PORTION)

SPECIFICATION NO.
VOLUME II B
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SPECIFIC TECHNICAL REQUIREMENTS: ELECTRICAL

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER/ PURCHASER

- 1.1 Scope for supply, and erection & commissioning of various equipment forming part of electrical system for this package shall be as per Annexure-I to Section - C [Scope of Work (Electrical)].
- 1.2 Make of various equipment/ items in the scope of bidder shall be to approval of owner during detailed engineering stage without any commercial implications.
- 1.3 Bidder shall furnish all AC as well as DC loads required for the system at different voltage levels (e.g. 415V AC, 240 V AC, 220 V DC etc.) of all types, such as motor feeders, supply feeders in PEM format along with the offer.
- 1.4 All electrical equipment shall be suitable for the power supplies, fault levels and climatic conditions indicated in project information enclosed with the specification.
- 1.5 All drawings, data sheets, Quality Plan, calculations, test reports, test certificates, etc. shall be submitted during detailed engineering stage as per formats enclosed. The same shall be subject to approval without any commercial implications.
- 1.6 Technical requirements shall be as per specifications listed in Clause 4.1, 4.2 & 4.3 below.

3.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS : Refer "Electrical scope between BHEL and Vendor"

4.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- 4.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated. In line with this, the bidder as technical offer shall furnish two signed and stamped copies of the following:
- a) A copy of this sheet "Electrical Equipment Specification for MISC PUMPS" and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
 - b) List of Erection and Commissioning spares.
 - c) List of Erection & Maintenance tools & tackles.
 - d) Electrical load requirement in the load data format.
 - e) Motor data sheets A & C
 - f) QPs
- 4.2 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.

5 LIST OF ENCLOSURES

- 5.2 Electrical scope between BHEL & vendor (Annexure-I of this section i.e Section C2).
- 5.3 Technical specification no. PE-SS-999-506-E101, Data Sheets (A & C) for 415V Electric Motors.(attached at section D2 of this vol.)
- 5.4 Data Sheets A for 415V Electric Motors (attached at section C2 of this vol.)
- 5.5 Customer specific requirements for motors (11 pages) for 2x660 MW Singrauli STPP (attached as Annexure II of this section i.e Section C2)
Customer specific requirements for motors (9 pages) for 2x600 MW Adilabad TTP (attached as Annexure III of this section i.e Section C2)
- 5.6 Data Sheets C for 415V Electric Motors. (attached at section B2 of vol. III)
- 5.7 Quality Plan for motors. (attached at section D2 of this vol.)
- 5.8 Load data format (attached at section B3 of vol. III)

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PROJECT: 2X660MW DB POWER (MADHYA PRADESH) LIMITED- SINGRAULI STPP

PACKAGE: MISC. PUMPS

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	DBPL	DBPL	DOL starters for motors and 415V supply feeders for the requirements like control panel will be provided by DBPL
2	Local push button station (for motors)	DBPL	DBPL	Located near the motor
3	Power cables, ordinary control cables and screened control cables between equipments supplied by vendor.	Vendor	BHEL	Vendor shall furnish size and quantity of cables required at contract stage.
4	Power cables, ordinary control cables and screened control cables between equipments supplied by vendor & BHEL	DBPL	DBPL	
5	Any special type of cable like compensating, Co-axial, prefab, MICC and fibre optical	Vendor	BHEL	
6	Illumination	DBPL	DBPL	
7	Cabling material (cable trays, accessories and cable tray-supporting system, conduits, M Boxes/J Boxes) for cabling between equipments supplied by vendor and BHEL.	DBPL	DBPL	
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.
9	Equipment earthing.	BHEL	BHEL	
10	Motors with Base frame and fixing hardware for motors.	Vendor	BHEL	1. Makes shall be subject to customer/BHEL approval at contract stage.
11	Cable glands and lugs for equipment supplied by vendor	Vendor	BHEL	1. Ni plated brass glands, Double compression heavy duty type complete with necessary armour clamp & tapered washer. 2. Solder less crimping type heavy-duty tinned copper lugs for power & control cables.

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

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR**PROJECT: 2x800 MW SCCL ADILABAD TPP****PACKAGE: MISC. PUMPS**

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
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	Vendor shall furnish size and quantity of cables required at contract stage.
4.	Power cables, ordinary control cables and screened control cables between equipments supplied by vendor & BHEL	BHEL	BHEL	
5	Any special type of cable like compensating. Co-axial, prefab, MICC and fibre optical	Vendor	BHEL	
6	Illumination	BHEL	BHEL	
7	Cabling material (cable trays, accessories and cable tray supporting system, conduits, M Boxes/J Boxes) for cabling between equipments supplied by vendor and BHEL.	BHEL	BHEL	
8	Conduits and conduit accessories for cabling between equipments by vendor	BHEL	BHEL	Cabling shall be through conduits. However, vendor can use the trunk routes available for laying of cables.
9	Equipment earthing.	BHEL	BHEL	
10	Motors with Base frame and fixing hardware for motors.	Vendor	BHEL	1. Makes shall be subject to customer/BHEL approval at contract stage.
11	Cable glands and lugs for equipment supplied by vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass glands. 2. Solder less crimping type heavy-duty tinned copper lugs for power cables. 3. Heavy duty tinned copper lugs for control cables.

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

DATASHEET - A

Vol-II B, Sec-C2

SPECIFIC ELECTRICAL REQUIREMENT FOR MISC PUMPS

SL.NO.	PARAMETERS	UNIT	SCCL-ADILABAD	SINGRAULI
	MOTOR			
1	DESIGN AMBIENT TEMP	DEG. C	50	50
2	VOLTAGE SUPPLY AND VARIATION	VOLT	415± 10%	415± 10%
3	FREQUENCY WITH VARIATION	Hz	50 (+3% to -5%)	50 (+5% to -5%)
4	COMBINED VOLTAGE & FREQUENCY VARIATION (sum of absolute values)		10%	10%
5	MAX ACCEPTABLE RATING OF MOTOR AT 415 V	KW	200 KW & below	Upto 150 KW
6	SYSTEM FAULT LEVEL AND ITS DUARTION	KA	50kA, 1sec	50kA, 1sec
7	SUTABILITY OF TERMINAL BOX FOR FAULT LEVEL AND DURATION		50 KA, 0.25 sec	50 KA, 0.25 sec
8	CLASS OF INSULATION & TEMP RISE LIMITED TO		Class-F and temp rise limited to Class-B	Class-F and temp rise limited to Class-B
9	MIN. STARTING VOLTAGE		85%	80%
10	MOTOR RATING FOR SINGLE PHASE SUPPLY		0.2 kW & Below	0.2 kW & Below
11	MAXIMUM LOCKED ROTOR CURRENT	% OF FLC	600% subject to IS tol.	600% subject to IS tol.
12	ACCEPTABLE NOISE LEVEL	DB	85db (A)	As per IS-325 / IEC-60034
13	TYPE OF STARTER PROVIDED IN MCC		DOL	DOL
14	DOP OF ENCLOSURE		Indoor motor: IP 54; Outdoor motor: IP 55; Cable Box- Indoor Area: IP54; Cable box- Outdoor area: IP 55	IP-55, But motor for outdoor or semioutdoor shall be weather-proof type
15	SPACE HEATER REQUIREMENT	KW	30KW & ABOVE	30KW & ABOVE
16	PAINT SHADE		RAL 5012 (Blue)	RAL 7032 (Siemens grey)
17	SPECIAL REQUIREMENT		MOTORS ARE ENERGY EFFICIENT (TYPE EFF 1) AS PER IS :12615-2004	The above requirement for SINGRAULI Project is to be read in conjunction with DB power ltd, technical specification section-II, part-B, general specifications Book 2 of 4, chapter-E11 Electric motor.

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DB POWER(MP) LTD- 2X660MW SINGRAULI STPP

ELECTRIC MOTORS

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CHAPTER-E11
ELECTRIC MOTORS

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CHAPTER-E11

1.00.0 DESIGN CRITERIA

1.01.00 General

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

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

1.01.02 The motors will be installed in hot, humid and tropical atmosphere, highly polluted with coal dust. Canopy to be provided to all outdoor installed motors.

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

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

1.02.00 A.C. Motors

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

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

1.02.03 The motor name-plate rating shall have at least 15% margin over the input power requirement of the driven equipment at rated duty point.

1.02.04 The motor characteristics shall match the requirements of the driven equipment so that adequate starting, accelerating, pull up, break down and full load torques are available for the intended service.

1.02.05 Motors located in hazardous area shall be flame-proof type.

1.03.00 D.C. Motors

1.03.01 D.C. motor provided for emergency service shall be shunt/compound wound type.

1.03.02 Motor shall be sized for operation with fixed resistance starter for maximum reliability.

1.03.03 D.C. Motors shall be similar to A.C. Motors with respect to other features like

SPECIFICATION FOR BTG PACKAGE PART-B	DB POWER (Madhya Pradesh) LIMITED 2 X 660 MW Supercritical Thermal Power Plant	Page 3 of 11
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enclosure type, cooling and class of insulation.

2.00.00 SPECIFIC REQUIREMENTS

2.01.00 Running Requirements

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

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

2.02.0 Starting Requirements

2.02.01 Motor shall be designed for direct on line starting at full voltage. Starting current shall not exceed 6 times full load current for all HT auxiliaries, except B.F.P Motor.

In case of BFP motors it shall be 4.5 times only.

No further tolerances are applicable on starting current specified above for H.T motors.

For LT motor the applicable starting current shall be 6 times full load current subject to IS tolerance.

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

2.02.03 Motor shall start with rated load and accelerate to full speed with 80% rated voltage at motor terminals except BFP motor. In case of BFP motor it shall be 75% rated voltage.

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

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

2.03.0 Stress During Bus Transfer

2.03.01 The motor may be subjected to sudden application of 150% rated voltage during bus transfer, due to the phase difference between the incoming voltage and motor residual voltage.

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

2.04.00 Locked Rotor Withstand Time

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2.04.01 The locked rotor withstand time under hot condition at 110% rated voltage shall be more than motor starting time by at least 2.5 seconds for motors upto 20 seconds starting time and by 5 seconds for motor with more than 20 seconds starting time.

2.04.02 Starting time mentioned above is at minimum permissible voltage of 80% rated voltage.

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

2.05.00 Enclosure

2.05.01 All motor enclosures shall conform to the degree of protection IP-55 unless otherwise specified. Motor for outdoor or semi-outdoor service shall be of weather-proof construction.

2.05.02 Motors of large output ratings, located indoor and not directly exposed to dust shall have degree of protection class IPW 55.

2.05.03 For hazardous area approved type of increased safety enclosure shall be furnished.

2.06.00 Cooling

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

2.06.02 For large capacity motors, totally enclosed tube ventilation (TETV) shall be considered.

2.07.00 Winding and Insulation

2.07.01 All insulated winding shall be of copper.

2.07.02 All Motors shall have class F insulation but, limited to class B temperature rise.

2.07.03 Windings shall be impregnated to make them non-hygroscopic and oil resistant.

2.08.00 Tropical Protection

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

2.08.02 All fittings and hardwares shall be corrosion resistant.

2.09.00 Bearings

2.09.01 Motor shall be provided with antifriction bearings, unless sleeve

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bearings are required by the motor application.

2.09.02 Vertical shaft motors shall be provided with thrust and guide bearings. Thrust bearing of tilting pad type are preferred.

2.09.03 Bearings shall be provided with seals to prevent leakage of lubricant or entrance of foreign matters like dirt, water etc. into the bearing area.

2.09.04 Sleeve bearings shall be split type, ring oiled, with permanently aligned, close running shaft sleeves.

2.09.05 Grease lubricated bearings shall be prelubricated and shall have provisions for in-service positive lubrication with drains to guard against over lubrication.

2.09.06 Oiled bearing shall have an integral self cooled oil reservoir with oil ring inspection ports, oil sight glass with oil level marked for standstill and running conditions and oil fill and drain plugs.

2.09.07 Forced lubricated or water cooled bearing shall not be used without prior approval of Owner.

2.09.08 Lubricant shall not deteriorate under all service conditions. The lubricant shall be limited to normally available types with IOC equivalent.

2.09.09 Bearings shall be insulated as required to prevent shaft current and resultant bearing damage.

2.10.00 **Noise & Vibration**

2.10.01 The noise level shall be as per IS/IEC.

2.10.02 The peak amplitude of the vibration shall be within I.S/IEC. specified limits.

2.11.00 **Motor Terminal Box**

2.11.01 Motor terminal box shall be detachable type and located in accordance with Indian Standards clearing the motor base-plate/foundation

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

2.11.03 The terminal box shall be split type with removable cover with access to connections and shall have the same degree of protection as motor.

2.11.04 The terminal box shall have sufficient space inside for termination/connection of XLPE (11kV)/ XLPE (3.3kV)/ XLPE (415V) insulated armoured aluminium cables.

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

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

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

2.11.08 For 11kV motor, the terminal box shall be phase segregated type. The neutral leads shall be brought out in a separate terminal box (not necessarily phase segregated type) with shorting links for star connection.

2.11.09 Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands.

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

2.11.11 In case of motor terminal box being not suitable for specified cable size/number, suitable adopter box/extension box shall be provided.

2.12.00 **Grounding**

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

2.12.02 The cable terminal box shall have a separate grounding pad for termination of grounding conductor.

2.13.00 **Rating Plate**

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

- a) Temperature rise in °C under rated condition and method of measurement.
- b) Degree of protection.
- (c) Bearing identification no. and recommended lubricant.
- d) Location of insulated bearings.

2.14.00 **Accessories**

2.14.01 **General**

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

2.14.02 **Space Heater**

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- a) Motor of rating 30 KW and above shall be provided with space heaters, suitably located for easy removal or replacement.
- b) The space heater shall be rated 240 V, 1 phase, 50 Hz and sized to maintain the motor internal temperature above dew point when the motor is idle.

2.14.03 Temperature Detectors

- a) All 11kV motors shall be provided with six (6) duplex or twelve (12) simplex winding temperature detectors, two (2)/ four (4) per phase.
- b) 11kV motor bearing shall be provided with duplex type temperature detectors.
- c) The temperature detector mentioned above shall be resistance type, 3 wire, platinum wound, 100 Ohms at 0 °C.
- d) Five numbers of temperature detectors/thermistors shall be provided for LT motors above 90 kW (3 nos winding temps, 2 nos bearing temp.)

2.14.04 Indicator/Switch

- a) Dial type local indicator with alarm contacts shall be provided for the following: -
 - i) 11kV motor bearing temperature.
 - ii) Hot and cold air temperature of the closed air circuit for CACA and CACW motor.
- b) Flow switches shall be provided for monitoring cooling water flow of CACW motor and oil flow of forced lubrication bearing, if used.
- c) Alarm switch contact rating shall be minimum 0.5 A at 220V D.C. and 2A at 240V A.C.

2.14.05 Current Transformer for Differential Protection

- a) Motor above 1000 KW shall be provided with three differential current transformers mounted over the neutral leads within the enclosure. Loose 3 nos. CT for mounting on switchgear side shall be in bidder's scope.
- b) The arrangement shall be such as to permit easy access for C.T. testing and replacement. Current transformer characteristics shall match Purchaser's requirements to be intimated to the successful Bidder.

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2.14.06 Accessory Terminal Box

- a) All accessory equipment such as space heater, temperature detector, etc., shall be wired to and terminated in terminal boxes, separate from motor (power) terminal box.
- b) Accessory terminal box shall be completed with double compression brass glands and pressure type terminals.

2.14.07 Drain Plug

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

2.14.08 Lifting Provisions

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

2.14.09 Dowel Pins

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

2.14.10 Painting

Motor including fan shall be painted with corrosion proof paints of colour shade Siemens grey (RAL-7032).

3.00.00 TESTS

Routine and Type Tests are to be conducted in presence of customer's representative as per IS:325 and required copies of test certificates are to be furnished for approval. In addition, following tests shall have to be carried out on the motors in presence of MEGL representative.

- a. Impulse test by 1.2/50 micro-sec. On sample coil of stator winding insulation as type test as per draft IEC-671 July 1985 test voltages as under:
Voltage rating of motor Impulse Test Voltage
3.3 kV 36 kV peak 11 kV 49 kV peak
- b. Tan delta, charging current and dielectric loss measurements on each phase of motor stator winding as routine test.
- c. Polarization Index Test as per IS: 7816 as routine test.
- d. Test for suitability of IPW - 55 as per IS 4691 as type test. Type test certificate for first numeral shall be acceptable in lieu to test, provided the test motor is identical to motor being

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supplied. Second numeral test shall be carried out on the motors as routine test.

- e. Fault Withstand Test for main terminal box as type test. Type test certificate shall be acceptable, if the test is conducted on exactly identical terminal box.
- f. Test for noise level as routine test.
- g. Test for vibrations as routine test.
- h. Tan delta measurement on coils.
- i. Surge withstand test for inter turn insulation.
- j. Test to diagnose rotor bar failure during manufacture.

Tests indicated at (h), (i), (j) shall be carried out during manufacture of the coils and shall be furnished for verification.

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ANNEXURE-A

DESIGN DATA

1.0 AUXILIARY POWER SUPPLY

Supply	Description	Consumer
L.T. Supply	415V, 3 Phase, 4W, 50 Hz, effectively earthed.	Motors upto 150KW
H.T. Supply	11 kV, 3 Phase, 3W, 50 Hz, Non-effectively earthed.	Motors above 150 kW
D.C Supply	220 V, 2W, unearthed	

2.0 RANGE OF VARIATION

Supply	Description	Consumer
A.C. Supply		
Voltage	±10 %	
Frequency	± 5%	
Combined Voltage and Frequency	10% (absolute sum)	
D.C. Supply		
Voltage	+10 % to (-) 15 %	

SCCL- 2x600 MW ADILABAD TPP

MOTORS

CLAUSE NO.	TECHNICAL REQUIREMENTS
1.00.00	GENERAL REQUIREMENTS
1.01.00	For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.
1.02.00	All equipments shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.
1.03.00	Contractor shall provide fully compatible electrical system, equipments, accessories and services.
1.04.00	All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.
1.05.00	The auxiliary AC voltage supply arrangement shall have 11kV, 3.3 kV and 415V systems. It shall be designed to limit voltage variations as given below under worst operating condition : <div style="display: flex; justify-content: space-between;"> (a) 11kV, 3.3 kV +/- 6% </div> <div style="display: flex; justify-content: space-between;"> (b) 415/240V +/- 10% </div>
1.06.00	The voltage level for motors shall be as follows :- <div style="display: flex; justify-content: space-between;"> a) Upto 0.2KW : Single phase 240V AC / 3 phase 415V AC </div> <div style="display: flex; justify-content: space-between;"> b) Above 0.2KW and upto 200KW : 3 phase 415V AC </div> <div style="display: flex; justify-content: space-between;"> c) Above 200KW and upto 1500 KW: 3.3 kV </div> <div style="display: flex; justify-content: space-between;"> d) Above 1500 KW : 11 kV </div> <p>Voltage rating for special purpose motors viz. screw compressors and those with VFD shall be as per manufacturer standard.</p> <p>For CHP conveyor's motor above 160KW rating 3.3KV, three phase AC supply is to be used. However all the motors on the Stacker/ Reclaimer machine shall be on 415V AC only.</p>
1.07.00	Fault level shall be limited to 40kA RMS for 1 second for 11kV & 3.3 kV system and 45 kA RMS 1 second for 415V system. 415V system shall be solidly grounded and 220 VDC system shall be isolated type.
1.08.00	Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.

CLAUSE NO.	TECHNICAL REQUIREMENTS		
1.09.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances shall be of the contractor.		
1.10.00	Degree of Protection Degree of protection for various enclosures as per IS:4691, IEC60034-05 shall be as follows :- i) Indoor motors - IP 54 ii) Outdoor motors - IP 55 iii) Cable box-indoor area - IP 54 iv) Cable box-Outdoor area - IP 55		
2.00.00	CODES AND STANDARDS 1) Three phase induction motors : IS:325, IEC:60034 2) Single phase AC motors : IS:996, IEC:60034 3) Crane duty motors : IS:3177, IEC:60034 4) DC motors/generators : IS:4722 5) Energy Efficient motors : IS 12615		
3.00.00	TYPE		
3.01.00	AC Motors: a) Squirrel cage induction motor suitable for direct-on-line starting. b) Continuous duty LT motors upto 160 KW Output rating (at 50 deg.C ambient temperature), shall be Energy Efficient motors, Efficiency class-Eff 1, conforming to IS 12615. c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.		
3.02.00	DC Motors Shunt wound.		
4.00.00	RATING (a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor. (b) Whenever the basis for motor ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings		
SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION - VI PART-B	SUB-SECTION-B-08 MOTORS	PAGE 2 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS
5.00.00	<p>shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.</p> <p>(c) For BFP motor the starting MVA shall be restricted to 80 MVA.</p> <p>TEMPERATURE RISE</p> <p>Air cooled motors</p> <p>70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation.</p> <p>Water cooled</p> <p>80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.</p>
6.00.00	<p>41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class Y wet wound Boiler circulation pump motor.</p> <p>OPERATIONAL REQUIREMENTS</p>
6.01.00	<p>Starting Time</p>
6.01.01	<p>For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.</p>
6.01.02	<p>For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.</p>
6.01.03	<p>For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.</p>
6.01.04	<p>Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.</p>
6.02.00	<p>Torque Requirements</p>
6.02.01	<p>Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.</p>
6.02.02	<p>Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.</p>
<p>SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION - VI PART-B</p>
<p>SUB-SECTION-B-08 MOTORS</p>	<p>PAGE 3 OF 9</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS				
6.03.00	<p>Starting voltage requirement</p> <p>(a) 85% up to 1500KW (except for AOP motor which is 80%)</p> <p>(b) 80% from 1501 KW to 4000KW</p> <p>(c) 75% > 4000KW</p>				
7.00.00	<p>DESIGN AND CONSTRUCTIONAL FEATURES</p>				
7.01.00	<p>Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors , space heater terminals inside the main terminal box may be acceptable.</p>				
7.02.00	<p>All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). CW motors can be screen protected drip proof (SPDP) type. Motors located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below</p> <p>(a) Fuel oil area : Group – IIB</p> <p>(b) Hydrogen generation plant area : Group - IIC (or Group-I, Div-II as per NEC)</p>				
7.03.00	<p>Winding and Insulation</p> <p>(a) Type : Non-hygroscopic, oil resistant, flame resistant</p> <p>(b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature. However the conveyor motor shall be suitable for 3 consecutive hot starts.</p> <p>(c) 11kV & 3.3 kV AC motors : Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Presure Impregnated i.e resin poor method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15</p> <p>(d) 240VAC, 415V AC & 220V DC motors : Thermal Class(B) or better</p>				
7.04.00	<p>Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.</p>				
<table><tr><td>SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE</td><td>TECHNICAL SPECIFICATIONS SECTION - VI PART-B</td><td>SUB-SECTION-B-08 MOTORS</td><td>PAGE 4 OF 9</td></tr></table>		SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION - VI PART-B	SUB-SECTION-B-08 MOTORS	PAGE 4 OF 9
SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION - VI PART-B	SUB-SECTION-B-08 MOTORS	PAGE 4 OF 9		


CLAUSE NO.	TECHNICAL REQUIREMENTS
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.
7.06.00	Noise level for all the motors shall be limited to 85dB(A) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-14. Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.
7.08.00	Motor body shall have two earthing points on opposite sides.
7.09.00	HT motors can be offered with either elastimould termination or dust tight phase separated double walled (metallic as well as insulated barrier) cable boxes. In case elastimould terminations are offered, then protective cover and trifurcating sleeves shall also be provided. In case cable box is offered, then Bidder shall provide termination kit. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided in case of cable boxes.
7.10.00	The spacing between gland plate & centre of terminal stud shall be as per Table-I.
7.11.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.
7.12.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.
7.13.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.
7.14.00	11kV and 3.3 kV motor Terminal Box shall be suitable for fault level of 750MVA for 0.12 sec and 250 MVA for 0.12 sec respectively. Elastimould termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.
8.00.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP Motor.
SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	
TECHNICAL SPECIFICATIONS SECTION - VI PART-B	
SUB-SECTION-B-08 MOTORS	
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	<p>(a) Upto 110KW : 11.0 (For AOP motor it shall be 8.0)</p> <p>(b) Above 110KW & upto 1500KW : 10.0</p> <p>(c) Above 1500KW & upto 4000KW : 9.0</p> <p>(d) Above 4000KW : 6 to 6.5</p>		
9.00.00	CW Motor shall be designed with minimum power factor of 0.8 at design point.		
10.00.00	TYPE TEST		
10.01.00	HT MOTORS		
10.01.01	The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.		
10.01.02	The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.		
10.01.03	In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the owner for waiver of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The owner reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.		
10.01.04	Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this		
SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATIONS SECTION - VI PART-B	SUB-SECTION-B-08 MOTORS
			PAGE 6 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS
10.01.05	<p>contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.</p> <p>LIST OF TYPE TESTS TO BE CONDUCTED</p> <p>The following type tests shall be conducted on each type and rating of HT motor</p> <p>(a) No load saturation and loss curves upto approximately 115% of rated voltage</p> <p>(b) Measurement of noise at no load</p>
	<p>(c) Momentary excess torque test (subject to test bed constraint).</p> <p>(d) Full load test(subject to test bed constraint)</p> <p>(e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.</p>
10.01.06	<p>(f) Lightning Impulse withstand test on the sample coil shall be as per IEC-60034, part-15</p> <p>(g) Surge-withstand test on interturn insulation shall be as per clause no. 5.1.2 of IEC 60034, part-15</p> <p>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</p> <p>The following type test reports shall be submitted for each type and rating of HT motor</p> <p>(a) Degree of protection test for the enclosure followed by IR, HV and no load run test.</p> <p>(b) Terminal box-fault level withstand test for each type of terminal box of HT motors only.</p>
10.02.00	LT Motors
10.02.01	<p>LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening.</p>
SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION - VI PART-B
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CLAUSE NO.	TECHNICAL REQUIREMENTS				
	<p>These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p>				
10.02.02	<p>However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.</p>				
10.02.03	<p>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</p> <p>The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only</p> <ol style="list-style-type: none">1. Measurement of resistance of windings of stator and wound rotor.2. No load test at rated voltage to determine input current power and speed3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors)4. Full load test to determine efficiency power factor and slip .5. Temperature rise test .6. Momentary excess torque test.				
	<ol style="list-style-type: none">7. High voltage test .8. Test for vibration severity of motor.9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section)10. Test for degree of protection and11. Overspeed test.				
10.03.00	<p>All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.</p>				
10.04.00	<p>The type test reports once approved for any projects shall be treated as reference. For subsequent projects of SCCL, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.</p>				
<table><tr><td>SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE</td><td>TECHNICAL SPECIFICATIONS SECTION - VI PART-B</td><td>SUB-SECTION-B-08 MOTORS</td><td>PAGE 8 OF 9</td></tr></table>		SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION - VI PART-B	SUB-SECTION-B-08 MOTORS	PAGE 8 OF 9
SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION - VI PART-B	SUB-SECTION-B-08 MOTORS	PAGE 8 OF 9		

CLAUSE NO.	TECHNICAL REQUIREMENTS																					
	<p style="text-align: center;">TABLE - I</p> <p style="text-align: center;">DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS</p> <table><tr><th>Motor MCR in KW</th><th>Minimum distance between centre of stud and gland plate in mm As per manufacturer's practice.</th></tr><tr><td>UP to 3 KW</td><td></td></tr><tr><td>Above 3 KW - upto 7 KW</td><td>85</td></tr><tr><td>Above 7 KW - upto 13 KW</td><td>115</td></tr><tr><td>Above 13 KW - upto 24 KW</td><td>167</td></tr><tr><td>Above 24 KW - upto 37 KW</td><td>196</td></tr><tr><td>Above 37 KW - upto 55 KW</td><td>249</td></tr><tr><td>Above 55 KW - upto 90 KW</td><td>277</td></tr><tr><td>Above 90 KW - upto 125 KW</td><td>331</td></tr><tr><td>Above 125 KW-upto 200 KW</td><td>203</td></tr></table> <p>For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.</p>		Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm As per manufacturer's practice.	UP to 3 KW		Above 3 KW - upto 7 KW	85	Above 7 KW - upto 13 KW	115	Above 13 KW - upto 24 KW	167	Above 24 KW - upto 37 KW	196	Above 37 KW - upto 55 KW	249	Above 55 KW - upto 90 KW	277	Above 90 KW - upto 125 KW	331	Above 125 KW-upto 200 KW	203
Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm As per manufacturer's practice.																					
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Above 125 KW-upto 200 KW	203																					
	<p>PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:</p> <p>NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:</p> <table><tr><th>Motor MCR in KW</th><th>Clearance</th></tr><tr><td>UP to 110 KW</td><td>10mm</td></tr><tr><td>Above 110 KW and upto 150 KW</td><td>12.5mm</td></tr><tr><td>Above 150 KW</td><td>19mm</td></tr></table>		Motor MCR in KW	Clearance	UP to 110 KW	10mm	Above 110 KW and upto 150 KW	12.5mm	Above 150 KW	19mm												
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SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION - VI PART-B	SUB-SECTION-B-08 MOTORS																				
		PAGE 9 OF 9																				

	TECHNICAL SPECIFICATIONS		SPECN. NO.:	PE-TS-380/381-100-N001	
	MISCELLANEOUS PUMPS		VOLUME:	IIB	SECTION: D
			REV. NO.	0	DATE: 16.04.2012

SECTION D

STANDARD TECHNICAL SPECIFICATIONS

D1: STANDARD TECHNICAL SPECIFICATIONS FOR PUMPS

D2: STANDARD TECHNICAL SPECIFICATIONS FOR MOTORS



TECHNICAL SPECIFICATIONS	SPECN. NO.:	PE-TS-380/381-100-N001	
MISCELLANEOUS PUMPS	VOLUME:	IIB	SECTION: D1
	REV. NO.	0	DATE: 16.04.2012

SECTION D1

STANDARD TECHNICAL SPECIFICATIONS FOR HORIZONTAL PUMPS NO. PE TS-179-06

DATA SHEET A FOR VARIOUS PROJECTS ALONGWITH LIST OF MANDATORY SPARES & WATER ANALYSIS

DATA SHEET C

QUALITY PLAN



TITLE:

**STANDARD TECHNICAL SPECIFICATION
HORIZONTAL CENTRIFUGAL PUMPS**

SPECIFICATION NO. PES-179-06

VOLUME: II B

SECTION: D

REV. NO. 02

DATE: 28.09.2007

SHEET 1 of 12

1.00.00 GENERAL INFORMATION

1.01.00 The general guidelines as illustrated in the subsequent clauses of this section shall be applicable for horizontal centrifugal pumps to be procured under the scope of this package.

2.00.00 CODES AND STANDARDS

2.01.00 In addition to the requirements spelt out elsewhere in the specification, the equipment to be provided under this section shall specifically conform to the following codes, standards, specifications and regulations, as applicable, including all the latest amendments subsequent to the year of publication as mentioned below.

2.01.01 IS-1520/1980: Horizontal Centrifugal pumps for clear, cold and fresh water.

2.01.02 IS-5120/1977: Technical requirements for Rotodynamic special Purpose pumps.

2.01.03 IS-5639/1970: Pumps for handling chemicals & corrosive liquids.

2.01.04 IS-5659/1970: Pumps for process water.

2.01.05 IS-6536/1972: Pumps for handling volatile liquids.

2.01.06 IS-9137/1978: Code for acceptance tests for centrifugal, mixed flow and axial flow pumps- Class 'C'.

2.01.07 ISO 3555/1977: Acceptance test for centrifugal, mixed flow
BS 5316/1977 and axial flow pumps - Class 'B' tests.
Part 2

2.01.08 ISO 2548/1973: - Do - Class 'C' tests.
BS 5316/1976
Part 1

2.01.09 API-610/1989: Centrifugal pumps for general refinery services.

2.01.10 Standards of the Hydraulic Institute of USA (1983).

2.01.11 PTC 8.2/1965: Power Test Codes - Centrifugal pumps.

2.02.00 In case of any contradiction with the above standards and annexure, the stipulations in the annexure shall prevail and shall be binding on the bidder.



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3.00.00 SCOPE OF SUPPLY & SERVICES:

3.01.00 The miscellaneous pumps and drives scope shall be as specified in Data Sheet A /Section A

3.02.00 The Capacity, Head, Materials of construction and other particulars of pumps are detailed in Data Sheet A of the specification.

3.03.00 Accessories:

~~All the pumps under this specification shall be complete with following standard/special accessories.~~

3.03.01 Standard accessories:

- a) LT Electric drives/motors
(The bare HT drive motors wherever required supplied as free issue by BHEL refer CL 5.08.00).
- b) Pump motor coupling along with coupling guard.
- c) Common base plate for pumps and motor.
- d) Self contained lubrication system along with all internal piping, valves, fittings, specialties etc. as required.
- e) Counter flanges for suction/ discharge nozzles along with fixing nuts, bolts and gaskets.
- f) Anchor bolts, nuts, seating steel works, etc. as necessary for mounting the pump-motor unit on Civil foundations.
- g) Suitable vent (with valves)/ lifting/ handling attachments for the pump/ motor/ accessories.
- h) Suitable drain connections with isolating valves as applicable.
- i) Supply of first fill of lubricants with topping requirements for one year of operation after commissioning and handing over of equipment.
- j) Set of "Special" Tools & Tackles for Pumps and motors, if any.
- k) Erection and commissioning spares, "on as required" basis.
- l) Bidder shall provide various drawings, data, calculations, test reports/ certificates, operation and maintenance manuals, As-built drawings, etc. as specified and as necessary.



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m) Mandatory spares as specified in respective Data Sheet-A.

3.04.00 Services included in Bidder's Scope:

3.04.01 The pumps shall be guaranteed to meet the performance requirements specified vide Data Sheet -A and also for trouble free operation after commissioning. Schedule of performance guarantees (enclosed in Volume-III) duly filled and signed shall be furnished with the bid.

3.04.02 After commissioning of pumps at site, site performance test for Noise, vibration and parallel running of pumps of all pumps for each unit/project will be conducted by BHEL at project site to ensure that the pumps meet the specified requirements. In case of any deficiency, the vendor shall rectify the same at site at no additional cost to BHEL.

3.04.03 Performance Guarantees for pumps shall stand valid till the satisfactory completion of performance testing by BHEL and its acceptance by purchaser / customer.

3.05.00 Works excluded from Bidder's Scope:

- a) HT motors
- b) Civil foundation
- c) Suction/ discharge pipe works
- d) MCC/ Switchgear/Power supply
- e) Power and Control Cables, unless specifically specified in Electrical/ Systems portion of the specification.
- f) Erection of equipments.

4.00.00 BID EVALUATION CRITERIA & LIQUIDATED DAMAGES FOR SHORTFALL:

4.01.00 The bids received shall be evaluated for power consumption at inlet to the motors, in respect of pumps specified in Data Sheet-A (working pump only viz. not the standby), for the purpose of price comparisons as briefed below:

The bid evaluation shall be done at the rate as specified in Data Sheet A per one (1) KW Power consumption, per working pump as follows.

$$\text{KW} = \frac{Q \times H}{P \times M \times 367.2}$$

Where Q = Rated capacity M³/hr
H = Rated TDH, MWC
P = Pump Efficiency
M = Motor Efficiency.

4.02.00 The maximum permissible efficiencies for pumps and motors for Bid Evaluation shall be as indicated in Data Sheet A for various pumps.

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No advantage shall be given to bidder for efficiencies quoted higher than the maximum permissible values. However the bids shall be evaluated as above if the efficiencies quoted are lower than these values.

NOTE:

1. HT motors efficiencies for bid evaluation purpose shall be taken based on the maximum value as furnished in Data Sheet A.
2. During contract stage the Guaranteed power consumption of Pumps with HT drives for successful bidder shall be reworked by BHEL as below:

~~Revised guarantee power consumption shall be as per KW calculation formula at Cl.~~

~~4.01.00 above, where P = pump efficiency guaranteed by bidder and M = motor efficiency as per appd datasheet of the supplied HT motor.~~

4.03.00**Liquidated damages for shortfall in Guaranteed KW**

The above guaranteed power consumption shall be demonstrated by the successful bidder during performance testing at works/ site.

For pumps with HT drives, the power consumption shall be compared with the reworked guarantee power consumption, defined as per note no. 2 of Cl. 4.02.00 above for the purpose of shortfall.

~~The liquidated damages @ twice the bid evaluation rate as above per KW per working pump shall be levied in the event of failure of bidder to demonstrate the guaranteed power consumption.~~

5.00.00**TECHNICAL REQUIREMENTS:****5.01.00**

The pumps shall meet the technical requirements of section "D" as well as Data Sheet - A. Wherever there is contradiction between Section D and Data Sheet-A, the latter shall prevail. In the event of any contradiction with Section-C, the Section-C will prevail.

5.02.00

The pumps shall be Electric motor driven.

5.03.00

The Pumps shall conform to HIS.

5.04.00

The horizontal pumps shall be Horizontal split casing type with speeds not exceeding 1500 RPM.

5.05.00

No negative tolerance shall be permitted in rated capacity & TDH.

5.06.00

No negative tolerance shall be permitted in efficiency at rated capacity.

5.07.00

The shut off head of pumps shall be at least 115% of pump rated TDH.



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5.08.00 All HT motors (bare motors only) shall be supplied as free issue by BHEL through BHEL - Bhopal, based on ratings and torque - speed curve selected by the bidders. The responsibility for satisfactory operation for combined performance of pumps & motors shall rest with the bidder only as if, the HT Motors has been supplied by the bidder.

Couplings, base plate, foundation bolts, any other fittings, etc. as required shall be supplied by the bidders only. BHEL - Bhopal shall supply one number of each type of HT motor for shop testing of pumps with job motors. All other motors shall be dispatched by BHEL - Bhopal directly to project sites.

5.09.00 ~~For all HT motor driven pumps, BHEL has envisaged vibration monitoring system in their own scope. The bidder shall make provisions for mounting following on the pump/ pump shaft:~~

- Purchaser's probes in both DE/NDE bearings of pumps
- Key slots on pump shaft with dimensions as specified in Data Sheet A.
- Other components as finalized during detailing.
- For mounting of above on the HT motors, same shall be taken care by BHEL - Bhopal.

5.10.00 The pumps shall be capable of developing the required total head at rated capacity for continuous operation. The pumps shall operate satisfactorily at any point on the Q-H characteristic curve over a range of 0% to 130% capacity and shall be suitable for continuous operation between 30% to 130% capacity.

5.11.00 Selection of the pumps shall be such that the design point shall be met even with negative manufacturing tolerance.

5.12.00 The total head capacity curve shall be continuously rising towards the shut off, the pumps shall preferably be non-overloading type and stable.

5.13.00 The pumps shall be capable of running over the entire range of NPSH conditions required without any noise, vibration or cavitations.

The prevailing suction pressures for various pumps are indicated in Data Sheet-A for suitable mechanical design of pumps.

5.14.00 The pumps shall be of stiff shaft design. The minimum internal clearances should be sufficiently more than the max. static deflection of the shaft. Shaft size selected must take into consideration the critical speed as specified in API-610.

5.15.00 Pumps and motors shall run smooth without undue noise and vibration. The vibration shall be within 75 microns for pump - motor set. The noise level shall be limited to 85 dB at distance of 1.0M.

5.16.00 Pumps of a particular category shall be identical and shall be suitable for parallel operation with equal load division. Components of identical pumps shall be interchangeable.



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5.17.00 After installation, the guaranteed values of noise, vibration and parallel operation of pumps shall be tested and verified. If the site performance is found not meeting the requirements in any respect as specified, then the equipment shall be rectified or replaced by the vendor, at his own cost.

5.18.00 High reliability of the pumps is an essential requirement and therefore it gets weightage over its efficiency. It is therefore essential that the bidder choose a standard proven model from the range of pumps manufactured.

5.19.00 The offered pumps shall be of proven design meeting the experience-qualifying requirement of their operation at two sites for a minimum period of two years. Any deviation to this criterion shall be suitably highlighted in the deviations schedule.

5.20.00 The bearings shall be self-water lubricated, no external water supply shall be available. The cooling/ lubrication water for bearings, etc. shall be tapped from the pump discharge and supplied thru' bidder's integral pipe work.

If water handled by pump is dirty/ not suitable for lubrication/ cooling, the bidder shall provide requisite strainer/ filters, tanks, motorized valves, etc. after the tap off for the required service, the arrangement provided shall be subject to Purchaser's approval.

6.00.00 MANDATORY SPARES:

6.01.00 Bidder to provide the Mandatory spares listed vide Data Sheet-A. Unit price of mandatory spares shall be furnished in price Schedule.

6.02.00 Bidder shall include the cost of Mandatory Spares in the base price of the pump.

7.00.00 OTHER REQUIREMENTS:

7.01.00 The quality of water handled by various pumps shall be as per Data Sheet-A.

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

7.03.00 The makes of various bought out items of bidder (i.e. motor, etc.) shall be subject to purchaser's approval in the event of order.

7.04.00 Painting for Pumps

a) The surface of SS, Gun metal, brass, bronze and non-metallic component shall not be applied with any painting.

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b) The Steel surface to be applied with painting shall be thoroughly cleaned before applying painting by brushing, shop blasting etc. as per the agreed procedure.

c) For all the steel surfaces inside the (indoor installation) building, a coat of red oxide primes of min. thickness of 50 microns followed up with under coat of Synthetic Enamel paint of min. thickness of 50 microns shall be applied. the top coat shall consist of two coats each of min. thickness of 50 microns of synthetic enamel paint and thus total thickness shall be min. 200 microns.

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

8.00.00 PERFORMANCE REQUIREMENTS

8.01.00 Performance requirements for the pumps shall be as guided in Data sheet - A enclosed with this section.

8.02.00 Pumps shall preferably be designed to have the best efficiency at the specified duty point. The pumps shall be suitable for continuous operation at any point within the "Range of Operation" as stipulated in the Data Sheet - A attached with this section.

8.03.00 Pump shall preferably have a continuously rising head-capacity characteristics from the specified duty point towards shut-off point, the maximum being at shut-off to enable parallel operation.

Under all circumstances, the 'range of operation' of the pumps shall exclude any unstable operating zone of the head-capacity curve.

8.04.00 Wherever specified in the Data Sheet - A attached to this section, pumps of each category shall be suitable for parallel operation. The head vs. capacity, the BHP vs. capacity characteristics etc. shall be identical to ensure equal load sharing and trouble-free operation of any pump when the other pump(s) working in parallel with it trip.

8.05.00 The pump set along with drive motor shall run smooth without undue noise and vibration. Acceptable peak to peak vibration limits shall be generally guided by the Hydraulic Standards of USA.

9.00.00 DESIGN AND CONSTRUCTION

9.01.00 Pump Casing



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**STANDARD TECHNICAL SPECIFICATION
HORIZONTAL CENTRIFUGAL PUMPS**

SPECIFICATION NO. PES-179-06

VOLUME: II B

SECTION: D

REV. NO. 02

DATE: 28.09.2007

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- 9.01.01 Pump casing shall be provided with adequate number of vents and priming connections with valves unless the pump is made self-venting and priming. Casing drain, as required, shall be provided complete with drain valves.
- 9.01.02 Pump design must ensure that the nozzles are capable of withstanding external reactions not less than those specified in API-610.
- 9.01.03 In case where an expansion joint is located at pump discharge, the pump assembly will be subjected to an additional thrust which will be transmitted to the foundation. This additional thrust shall be taken into the consideration of pump design.
- 9.02.00 **Impeller**
- 9.02.01 The Impeller assembly shall be dynamically balanced and designed with critical speed substantially above the operating speed.
- 9.03.00 **Wearing Rings**
- 9.03.01 Replaceable type wearing rings shall be furnished to prevent damage to impeller and casing.
- 9.04.00 **Shaft**
- 9.04.01 Shaft size shall be selected considering that the critical speed shall be away from the operating speed as recommended in applicable Code/Standard. The critical speed shall also be at least 10% away from runaway speed.
- 9.05.00 **Shaft Sleeves**
- 9.05.01 Renewable type fine finished shaft sleeves shall be provided at the stuffing boxes/mechanical seals. Length of the shaft sleeves must extend beyond the other faces of gland packing or seal end plate so as to distinguish between the leakage past Shaft and shaft sleeve and that past the seals/glands.
- 9.05.02 Shaft sleeves shall be properly fastened to the shaft to prevent any leakage or loosening. Shaft sleeve assembly should ensure concentric rotation.
- 9.06.00 **Bearings**
- 9.06.01 Bearings shall be easily accessible without disturbing the pump assembly. A drain shall be provided at the bottom of each bearing housing.
- 9.06.02 Heavy-duty sleeve/ball/roller type bearings shall be provided to take care of the radial loads.



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- 9.06.03 In case of sleeve type radial, axial thrust shall be absorbed in suitable hydraulic devices and/or thrust bearings.
- 9.06.04 Bearings and hydraulic devices (if provided for balancing axial thrust) shall be of adequate design for taking the entire pump load arising from all probable conditions of continuous operation, as specified in the annexure. Life of the bearings shall be guided by the design standard of the pump or as specified in annexure. Thrust bearing shall be capable of running continuously at maximum load.
- 9.06.05 The bearing shall be oil/grease lubricated. Suitable lubricating arrangement for the bearings shall be furnished with the pump complete with all accessories like pump, filters, piping, fittings, valves, interlocking and supervising instruments etc. as necessary and specified in the Annexure. The design shall be such that the bearing lubricant does not contaminate the liquid being pumped.
- 9.07.00 **Stuffing Boxes**
- 9.07.01 Stuffing box design shall permit replacement of packing without removing any part other than the gland.
- 9.07.02 Stuffing boxes shall be sealed/cooled by the fluid being pumped/external clear water, as specified in the Annexure. All necessary pumps, piping, fittings, valves, instruments etc. as required for safe and trouble-free operation of the pumps and as specified in the Annexure shall be included in the scope of supply.
- 9.08.00 **Mechanical Seals**
- 9.08.01 Mechanical seals shall be provided if specified in the Annexure. The pump supplier shall co-ordinate with the seal maker in establishing the direct circulation rate for maintaining a stable film at the seal in the chamber. The seal piping system shall form an integral part of the pump assembly.
- 9.08.02 When handling liquids near boiling point, suitable arrangement for external cooling shall be provided so as to prevent flashing at the seal faces.
- 9.08.03 For the seals under vacuum service, the seal design must ensure sealing against atmospheric pressure, even when the pumps are not operating.
- 9.09.00 **Drive Unit**
- 9.09.01 The pumps shall be driven by electric motor directly coupled as specified in the Annexure. A heavy duty coupling along with coupling guard shall be provided between the pump and drive unit.
- 9.09.02 Unless otherwise specified in Annexure, drive unit power rating shall be the maximum of the following requirements.



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- a) 15% margin over the pump shaft input power at the rated duty point.
- b) 5% margin over the maximum pump shaft input power required within the 'Range of Operation'.
- c) Pump shaft input power required considering the overloading of the pump assuming single pump operation in the event of tripping of one or more of the pumps operating in parallel.

10.00.00 INSPECTION AND TESTING

10.01.00 The Quality Plans enclosed in the specification are for bidder's guidance only. The bidder shall comply with these and other minimum requirements specified in the specification and shall furnish his own quality plan in the event of order based on the guidance given as above, for approval by BHEL/Customer.

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

a) Identification and Testing

i) All materials used for pump construction shall be of tested quality. Material shall be tested as per the relevant standard and test certificates shall be made available to the Owner.

ii) Tests for each pump included under this section shall include but not be limited to the following:

- The entire surface of the impeller / casing / diffuser castings shall be subjected to Dye Penetration Test as per ASTM Specification no.:E165-65.
- Shaft coupling & other active components shall be subjected to Dye Penetration and Ultrasonic Tests.
- Wearing rings, shaft sleeves shall be subjected to Dye Penetration Test.
- Fabricated components of pumps shall be subjected to Dye Penetration test on weld.
- Verification of material, witnessing of pouring, casting and inspection of finished fabricated/castings.
- Inspection of finished castings for impeller and verification of materials.
- Inspection of pump shaft and verification of material.



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- Witnessing of NDT/review of NDT reports.
- Static balancing test for impeller and dynamic balancing of complete rotating parts as per ISO- 1940 to grade 6.3 or better.
- Complete Inspection of assembled pump.

b) Hydraulic Testing

The pump casing shall be hydrostatically tested at 2 times the discharge pressure at rated capacity or 150% of the shut-off pressure. Pressure shall be maintained for a period of not less than one hour. While arriving at above values, maximum suction pressure shall be taken into account. During testing there should not be any pressure drop & leakage.

c) Performance Test at Shop

- i) Each pump shall have to be tested to determine the performance curves of the pumps. These tests are to be conducted in presence of Owner's representative as per the requirements of the Standards of Hydraulic Institute of USA (ASME-Power Test Code PTC 8.2/BS-599) or any other equivalent standard.
- ii) Performance tests are to be conducted to cover the entire range of operation of the pumps at rated speed. These shall be carried out to span 130% of rated capacity up to pump shut-off condition. A minimum of five combinations of head and capacity are to be achieved during testing to establish the performance curves, including the design capacity point, shut-off point and the two extremities of the range of operation as specified in the annexure. After completion of performance test, all pumps shall be stripped down for inspection of internals.
- iii) Tests shall be conducted with actual drive motors being furnished.
- iv) NPSH tests are to be conducted on one pump of each type at 3% head drop conditions, if specified in the pump Annexure
- v) Mechanical run test shall be carried out on all pumps to determine the vibration levels, noise levels etc. This test shall be conducted at site also. However, test value at site shall be used for the acceptance of the equipment.

11.00.00 DRAWINGS/ DOCUMENTS DISTRIBUTION SCHEDULE

- 11.01.00 After award of LOI, the successful bidder shall submit drawings/documents as per Data Sheet-C.
- 11.02.00 The no. of drawings/documents to be submitted shall be as per Annexure to Data Sheet-C.

**TITLE:****STANDARD TECHNICAL SPECIFICATION
HORIZONTAL CENTRIFUGAL PUMPS****SPECIFICATION NO.** PES-179-06**VOLUME:** II B**SECTION:** D**REV. NO.** 02**DATE:** 28.09.2007**SHEET** 12 of 12

12.00.00 The various Sections-C's & D's along with Data Sheets attached in this specification together with the specification for Miscellaneous Pumps shall be complied with by the bidders.

13.00.00 Bidder to submit all drawing/ documents in soft as well as hard copy within 2 weeks from placement of LOI's in the event of order.

Within one (1) week of receipt of BHEL comments a technical representative from Bidder's works shall come for meeting with BHEL along with revised documents to resolve all issues and incorporate all comments in the soft copy here only for further submission to customer.

Further on receipt of customer's comments on the documents a technical representative from Bidder's works shall come for meeting with Customer to resolve all issues and incorporate all comments in the soft copy here only and further resubmission of same to Customer. The representative shall be available here till category I approval of all the drawings and documents.

14.00.00 Guarantee for all pumps shall at least remain valid for 18 months from the Unit commissioning date.

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

- a) Compliance certificate duly signed and stamped (enclosed at Vol. III of specn.).
- b) GA drawings of pumps and motors with following: (shall be only for reference purpose, same shall not be reviewed/commented by purchaser at this stage and shall be subject to approval only during contract).
 - Civil static & dynamic loads.
- c) Guarantee Schedule duly signed and stamped (enclosed at Vol. III of specn.).
- d) Technical deviation schedule (if reqd.) (enclosed at Vol. III of specn.).
- e) HT Motor data(as applicable): Load torque speed curves of the pumps, selected motor rating, rpm, GD² of driven equipment.

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

DATA SHEET - A		SPECIFICATION NO.: PE-TS-380/381-100-N001			
MISCELLANEOUS PUMPS		REV. NO.: 0		DATE : 16.04.12	
DB POWER(MP)L - 2 x 660 MW SINGRAULI STPP		VOLUME : II B		SECTION : D	
Sl. No.	DESCRIPTION	ACW PUMPS	DMCW PUMPS FOR TG AUX	DMCW PUMPS FOR SG AUX	DMCW PUMPS FOR STATION AUX
HORIZONTAL PUMPS (GROUP-I)					
1.0	SERVICE				
1.1	Total no. of pumps for Project	6	6	4	2
1.2	No. of working & standby pumps	(2W+1S) per unit	(2W+1S) per unit	(1W+1S) per unit	(1W+1S) per unit
1.3	Liquid Handled (ref. water analysis enclosed herein)	CLARIFIED WATER	PH corrected DM Water	PH corrected DM Water	PH corrected DM Water
1.3.1	Specific gravity	1	1	1	1
1.4	Location	TG Building	TG Building	TG Building	TG Building
1.4.1	Indoor / Outdoor	Indoor	Indoor	Indoor	Indoor
1.5	Duty	Continuous	Continuous	Continuous	Continuous
1.6	No. of pumps working in parallel	2	2	-	-
1.7	System design pressure (Kg/sq. cm (g))	7.5	10	12	12
2.0	DESIGN PARAMETERS				
2.1	Design capacity each, M ³ /hr	2000	1060	425	880
2.2	Total dynamic head (MWC) (Excluding Pumps Internal Losses for Vertical Pumps)	20	40	60	50
2.3	• Suction Pressure(MWC)	14	32	32	32
	• Floor Level- for Pump Mounting	NA	NA	NA	NA
	• Min. W.L	NA	NA	NA	NA
	• Max. W.L	NA	NA	NA	NA
	• Sump Invert Level	NA	NA	NA	NA
	• Crane Hook Level	NA	NA	NA	NA
	• Crane Capacity Available	NA	NA	NA	NA
2.4	Design Temperature (°C)	60	60	60	50
2.5	Maximum permissible speed of pump (RPM)	1500	1500	1500	1500
2.6	Max. limit on shut off head Corresponding to pump TDH (MWC) at 51.5 Hz	Not to exceed 45 MWC	Not to exceed 60 MWC	Not to exceed 80 MWC	Not to exceed 80 MWC
2.7	Pump Discharge - above floor / below floor				
2.8	Operating range	40-120% of design duty point			
2.9	Motor rating	Continuous motor rating (at 50 deg C ambient) for all pumps shall be (Whichever is higher) : (a) 10% above the max. power requirement at any condition of the entire characteristic curve of the pump (b) 15% above the duty point requirement.			
2.10	Permissible tolerance in rated capacity & TDH	no negative tolerance			
2.11	Permissible tolerance in efficiency at rated capacity(%)	no negative tolerance			
2.12	Performance/Design Standard	HIS			
3.0	CONSTRUCTION FEATURES				
3.1	Pump type	Horizontal centrifugal type	Horizontal centrifugal type	Horizontal centrifugal type	Horizontal centrifugal type
3.2	Impeller type	Closed	Closed	Closed	Closed
3.3	Casing type	Axial split type	Axial split type	Axial split type	Axial split type
3.4	Coupling type	Spacer type	Spacer type	Spacer type	Spacer type
3.5	Sealing arrangement	Gland packing	Gland packing Initially & Mech Seal later	Gland packing Initially & Mech Seal later	Gland packing Initially & Mech Seal later
3.6	Type of Lubrication	Oil/ Grease/ Self Liquid	Oil/ Grease/ Self Liquid	Oil/ Grease/ Self Liquid	Oil/ Grease/ Self Water
3.7	Pump characteristics	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable	Non Overloading type & stable
3.8	Drain Plugs, vent, lifting lugs, etc.	Required			
4.0	MATERIALS OF CONSTRUCTION				
4.1	Casing	CI & IS 210 Gr FG 260	ASTM-A351 CF8M	ASTM-A351 CF8M	ASTM-A351 CF8M
4.2	Column Pipe (Only in Case of Vertical Pump)	N/A	N/A	N/A	N/A
4.3	Minimum column pipe thickness, mm	N/A	N/A	N/A	N/A
4.4	Impeller	ASTM-A351 CF8M	ASTM-A351 CF8M	ASTM-A351 CF8M	ASTM-A351 CF8M
4.5	Shaft	SS316	SS316	SS316	SS316
4.6	Shaft Sleeves	SS-410	SS-410	SS-410	SS-410
4.7	Wearing rings	SS-316	SS-316	SS-316	SS-316
4.8	Welded fasteners	SS	SS	SS	SS
4.9	Fasteners (others)	SS	SS	SS	SS
4.10	Gland/seal plate	SS-316	SS-316	SS-316	SS-316
4.11	Lantern Ring	SS-316	SS-316	SS-316	SS-316
4.12	Mech. seal	N/A	Manufacturer standard	Manufacturer standard	Manufacturer standard
4.13	Gland Packing	PTFE	PTFE	PTFE	PTFE
4.14	Base Plate	MS fabricated IS-2062 Gr B (min. thk.-10 mm)	MS fabricated IS-2062 Gr B (min. thk.-10 mm)	MS fabricated IS-2062 Gr B (min. thk.-10 mm)	MS fabricated IS-2062 Gr B (min. thk.-10 mm)
4.15	Connecting Pipe material	Piping 200 NB and above shall be Carbon Steel (IS:2062), rolled and welded conforming to IS:3589.			

BHEL	DATA SHEET - A			SPECIFICATION NO.: PE-TS-360/381-100-N001	
	MISCELLANEOUS PUMPS			REV. NO.: 0	DATE : 16.04.12
	DB POWER(MP)L - 2 x 660 MW SINGRAULI STPP			VOLUME : II B	SECTION : D
Sl. No.	DESCRIPTION	ACW PUMPS	DMCW PUMPS FOR TG AUX	DMCW PUMPS FOR SG AUX	DMCW PUMPS FOR STATION AUX
5.0	MANDATORY SPARES (Quantities mentioned are per unit, same quantities are to be considered for second unit)				
5.1	Impeller	1no	1no	1no	1no
5.2	Shaft	1no	1no	1no	1no
5.3	Shaft Sleeves	2nos	2nos	2nos	2nos
5.4	Impeller locking nuts & bolts	1set	1set	1set	1set
5.5	Impeller wearing and Casing Wearing	6 nos each	6 nos each	6 nos each	6 nos each
5.6	Bearing at impeller end and coupling end	1 set each	1 set each	1 set each	1 set each
5.7	Deflector	2nos	2nos	2nos	2nos
5.8	Driving and non driving end bearing of each type of motor	1set	1set	1set	1set
5.9	oil seals, oil deflector, oil rings and lantern	6 nos each	6 nos each	6 nos each	6 nos each
5.10	Gland Packing	4 sets	4 sets	4 sets	4 sets
5.11	stationary/carbon packing and "O" ring for mechanical seal	5 sets	5 sets	5 sets	5 sets
5.12	oil level guage	5 nos	5 nos	5 nos	5 nos
5.13	Mechanical seal assembly	2nos	2nos	2nos	2nos
5.14	Coupling complete including rubber bushes	3 nos each	3 nos each	3 nos each	3 nos each
5.15	"O" rings	3 sets	3 sets	3 sets	3 sets
6.0	Bid Evaluation				
6.1	Bid evaluation rate	Rs. 1.65 Lacs/KW	Rs. 1.65 Lacs/KW	Rs. 1.65 Lacs/KW	Rs. 1.65 Lacs/KW
6.2	Maximum permissible efficiency for Bid evaluation				
6.2.1	Pump Efficiency	86	86	85	86
6.2.2	Motor Efficiency	93	93	92	93
Notes :					
Notes :					
1	Material of construction for other components not specified above shall be similarly selected in line with the above for the duty intended and subject to approval.				
2	For HT motor driven pumps , bidder shall provide key slots of dimensions 30mm L x 15 mm W x 3mm D on each pump shaft or some other suitable location which shall be confirmed during detail engineering by BHEL.				
3	Wherever SS material is coming in contact with non SS material, suitable isolation (rubber etc.) shall be provided to avoid galvanic corrosion.				

DM WATER ANALYSIS - APPLICABLE FOR ALL PROJECTS

ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER

S.No.	Characteristics	Value
i)	Silica (Max.) -	0.02 ppm as SiO ₂
ii)	Iron as Fe -	Nil
iii)	Total hardness -	Nil
iv)	pH value -	6.8 to 7.2
v)	Conductivity excluding the effects of free CO ₂ -	Not more than 0.1

NOTE : FOR PASSIVATED DM WATER pH IS 8.5 - 9.5

CLARIFIED WATER ANALYSIS SINGRAULI STPP


- Turbidity ≤ 50 ppm
- Chloride ≤ 20 ppm
- ph value : 7.5 to 8.5
- Total dissolved solids (TDS) ≤ 200 ppm

DATA SHEET - A		SPECIFICATION NO.: PE-TS-380/381-100-N001		
MISCELLANEOUS PUMPS		REV. NO.: 00		DATE: 17.04.12
2X600 MW SCCL, ADILABAD TPP (BTG)		VOLUME: HB		SECTION: D
Sl. No.	Description	DMCW PUMPS-TG AUX.	DMCW Pump-SG AUX.	ACW PUMPS
HORIZONTAL PUMPS (GROUP-I)				
1.0	SERVICE			
1.1	Total no. of pumps for Project	6	4	6
1.2	No. of working & standby pumps	(2W+1S) per unit	(1W+1S) per unit	(2W+1S) per unit
1.3	Liquid Handled (ref. water analysis enclosed herein)	Passivated DM water (pH 8.5 to 9.5)		Clarified Water
1.4	Location	TG Building		
1.4.1	Indoor / Outdoor	Indoor		
1.5	Duty	Continuous	Continuous	Continuous
1.6	No. of pumps working in parallel	2 (Two)	1 (One)	2 (Two)
2.0	DESIGN PARAMETERS			
2.1	Design capacity each M ³ /hr	1070	480	1410
2.2	Total dynamic head (MWC) (Excluding Pumps Internal Losses for Vertical Pumps)	40	68	20
2.3	Suction Pressure(MWC)	32	32	18
2.4	Floor Level- for Pump Mounting	-	-	-
2.5	Min. W.L.	-	-	-
2.6	Max. W.L.	-	-	-
2.7	Sump Invert Level	-	-	-
2.8	Crane Hook Level	-	-	-
2.9	Crane Capacity Available	-	-	-
2.10	Design Temperature (°C)	60°C	60°C	60°C
2.11	Maximum permissible speed of pump (RPM)	1500	1500	1500
2.12	Max. limit on shut off head Corresponding to pump TDH (MWC) at 51.5 Hz	Not to exceed 60 MWC	Not to exceed 80 MWC	Not to exceed 45 MWC
2.13	Pump Discharge- above floor / below floor	-	-	-
2.14	Suction pipe (ODXTHK),(mmxmm)	-	-	-
2.15	Discharge pipe (ODXTHK),(mmxmm)	-	-	-
2.16	Operating range	30%-130% of Design capacity		
2.17	Motor rating	Continuous motor rating (at 50 °C ambient) for all purps shall be at least 10% above the max. power requirement at any condition of the entire characteristic curve of the pump.		
2.18	Permissible tolerance in rated capacity & TDH	No Negative Tolerance		
2.19	Permissible tolerance in efficiency at rated capacity(%)	No Negative Tolerance		
2.20	Performance/Design Standard	HIS		
3.0	CONSTRUCTION FEATURES			
3.1	Pump type	Horizontal Centrifugal	Horizontal Centrifugal	Horizontal Centrifugal
3.2	Impeller type	Closed	Closed	Closed
3.3	Casing type	Horizontal axial split	Horizontal axial split	Horizontal axial split
3.4	Coupling type	Spacer type		
3.5	Sealing arrangement	Gland packing Initially & Mech Seal later	Gland packing Initially & Mech Seal later	Gland packing
3.6	Lubrication	Oil / Grease / Self Water	Oil / Grease / Self Water	Oil / Grease / Self Water
3.7	Pump characteristics	Non overloading type & stable		
3.8	Drain plugs, vent, lifting lugs etc.	Required	Required	Required
4.0	MATERIAL OF CONSTRUCTIONS			
4.1	Casing	ASTM-A-351 CF-8M		2.5%Ni Cl to IS 210 GR FG 260
4.2	Column pipe material	NA		NA
4.3	Minimum column pipe thickness mm	NA		NA
4.4	Impeller	ASTM-A-351 CF-8M		Bronze to IS318-Gr III or SS 316
4.5	Shaft	SS-316		SS-316
4.6	Shaft sleeves	SS-410		SS-410
4.7	Wearing ring	SS-316		High leaded Bronze to IS 318 Gr.V/SS-316 in case of SS impeller
4.8	Welded fasteners	SS		SS
4.9	Fasteners (others)	SS		SS
4.10	Gland	SS-316		2.5% Ni Cl to Is 210 GR FG-260
4.11	Lantern ring	SS-316		Bronze
4.12	Intermediate stage bearings	NA		NA
4.13	Mech. Seal	Mech. seal as per mfr. std.		NA
4.14	Stuffing box	ASTM-A-351 CF-8M		2.5% Ni Cl to Is 210 GR FG-260
4.15	Gland packing	PTFE		PTFE
4.16	Base Plate	MS Fabricated IS 2062 (Min. thick 10mm) epoxy coated.		
4.17	Connecting pipe material	Carbon Steel (IS:2062), rolled and welded conforming to IS:3589.		

DATA SHEET - A		SPECIFICATION NO.: PE-TS-380/381-100-N001		
MISCELLANEOUS PUMPS		REV. NO.: 00		DATE: 17.04.12
2X600 MW SCCL, ADILABAD TPP (BTG)		VOLUME: IIB		SECTION: D
Sl. No.	Description	DMCW PUMPS-TG AUX.	DMCW Pump-SG AUX.	ACW PUMPS
HORIZONTAL PUMPS (GROUP-I)				
(As indicated below)				
5.00	Mandatory Spares			
i)	Impeller	1 No. of each type & size	1 No. of each type & size	1 No. of each type & size
ii)	Shaft	1 No. of each type & size	1 No. of each type & size	1 No. of each type & size
iii)	Shaft sleeves	1 Set of each type & size	1 Sets of each type & size	1 Set of each type & size
iv)	Casing and impeller wearing ring	2 Set of each type & size	2 Sets of each type & size	2 Set of each type & size
v)	Bearing for Pumps	2 Set of each type & size	2 Sets of each type & size	2 Set of each type & size
vi)	Motor bearings	1 Set of each type & size	1 Sets of each type & size	1 Set of each type & size
vii)	Thrust bearings	2 Set of each type & size	2 Sets of each type & size	2 Set of each type & size
viii)	Sleeve nuts and O-rings	1 Set of each type & size	1 Sets of each type & size	1 Set of each type & size
ix)	Gland packing	2 Set of each type & size	2 Sets of each type & size	2 Set of each type & size
x)	Fasteners	1 Set of each type & size	1 Sets of each type & size	1 Set of each type & size
xi)	Complete coupling (Pump & Motor)	1 Set of each type & size	1 Sets of each type & size	1 Set of each type & size
xii)	Mechanical seal (DE & NDE)	1 Set of each type & size	1 Sets of each type & size	1 Set of each type & size
xiii)	Motor	1 No.	1 No.	1 No.
6.0	Bid Evaluation			
6.1	Bid evaluation rate	Rs 1.5 Lacs/ KW	Rs 1.5 Lacs/ KW	Rs 1.5 Lacs/ KW
6.2	Maximum permissible efficiency for Bid evaluation benchmarking			
6.2.1	Pump Efficiency	84	84	84
6.2.2	Motor Efficiency	92	92	92
Notes :				
1	For Items stated as not applicable by bidder, shall have to be supplied without any cost implication to BHEL in the event they are found to be applicable during detail engineering stage.			
2	Material of construction for other components not specified above shall be similarly selected in line with the above for the duty intended and subject to approval.			
3	Wherever SS material is coming in contact with non SS material, suitable isolation (rubber etc.) shall be provided to avoid galvanic corrosion.			

2X600 MW SCCL, Adilabad TPP

CLAUSE NO.	PROJECT INFORMATION			
	CLARIFIED WATER ANALYSIS			
	S.No	Constituent	As	mg/l
	1	Calcium	CaCo ₃	110
	2	Magnesium	CaCo ₃	45
	3	Sodium & Potassium	CaCo ₃	25
		Total cations	CaCo ₃	180
	4	HCO ₃	CaCo ₃	120
	5	P-alkalinity	CaCo ₃	0
	6	Chloride	CaCo ₃	20
	7	Sulphate	CaCo ₃	40
		Total Anions	CaCo ₃	180
	8	Silica, Reactive	Si	10
	9	Iron (Total)	Fe	0.3
	10	pH		7.0-8.0
11	Turbidity	NTU	2	
13	Temperature	0 ^c	15-36	
	ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER			
	Sl.No.	Characteristics	Value	
	1.	Silica (Max.)	0.02 ppm as SiO ₂	
	2.	Iron as Fe	Nil	
	3.	Total hardness	Nil	
	4.	pH value	6.8 to 7.2	
5.	Conductivity	Not more than 0.1 µs/cm excluding the effects of free CO ₂		
SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-A	SUB-SECTION-I PROJECT INFORMATION	PAGE 1 of 1

	TECHNICAL SPECIFICATIONS	SPECN. NO.: PE-TS-380/381-100-N001		
	MISCELLANEOUS PUMPS	VOLUME:	IIB	SECTION: D1
	DATA SHEET - C	REV. NO.	0	DATE: 16.04.2012

Drawings / documents distribution schedule to be followed by successful bidder :

- 1.0 Drawings/documents submission schedule, from the date of LOI shall be as per Sec-C1 of this volume. The successful bidder shall submit following drawings/ documents.
- 1.1 Fully dimensioned outline general arrangement drawings of the pump and motor assembly. This drawing should include foundation base plate and sole plate details as applicable, civil foundation and anchor bolt details and loading data, points of connections of external piping and cables and mounting of devices furnished by the supplier.
- 1.2 Cross sectional drawing of the equipment showing the details of assembly of components and their material of construction with standard applicable codes.
- 1.3 Characteristic curves of pump showing the following:

- a) Flow Vs Head
- b) Flow VS Power
- c) Flow Vs Efficiency
- d) Flow Vs NPSHR

1.4 Operation and maintenance manual.

1.5 Lubrication arrangement drawings for external lubrication.

2.0 Within the stipulated time period as per vendor's drawings/ documents schedule, the following shall be submitted but not later than one month before 1st dispatch.

- a) Drawings of components & details as deemed necessary.
- b) Instruction manual for erection, operation & maintenance.
- c) Storage instruction.

3.0 Before despatch of the equipment the bidder shall furnish the following.

- a) Material test certificates.
- b) Shop test reports & certificates.

4.0 Distribution of drawings / documents for all projects:

The no. of drawing/ documents to be submitted by the successful bidder, after the award of the contract shall be intimated after award of contract.



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN

QUALITY PLAN FOR MISCELLANEOUS PUMPS

CUSTOMER		PROJECT TITLE	
BIDDER/VENDOR		QUALITY PLAN NUMBER	
		PE-V6-XXX-100-N004 (For Hor. Pumps) PE-V7-XXX-100-N004 (For Ver. Pumps)	

SYSTEM		ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)	
SHEET 1 OF 6			
S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY
1	2	3	4

1.1	CASINGS (INCLUDING BOWLS,DIFFUSERS, STAGE BODIES, DISCH- HEAD (IF CAST)), ETC. - (AS APPLICABLE) AND IMPELLER	MECHANICAL AND CHEMICAL PROPS	CR	DO-	MECHANICAL AND CHEM ANALYSIS	ONE/HEAT/BATCH	APPROVED CS DRAWING/DATA SHEET	RELEVANT MATERIAL SPECN.	LAB REPORT/ MTC	3/2.	2,1	
1.2	STUFFING BOX, SUCTION BELL, WEARING RINGS,NECK RINGS, SHAFT SLEEVES	HARDNESS DIFFERENCE BETWEEN CASING / IMPELLER AND WEARING RING	MA	DO-	LAB. TEST	100%	APPROVED CS DRAWING/ DATA SHEET	DO-	DO-	3/2.	2,1	
1.3	BARS/FORGINGS FOR SHAFTS, LINE SHAFTS	1. PHYSICAL & CHEMICAL PROPS	CR		1. MECHANICAL & CHEMICAL ANALYSIS.	1/CAST OR 1/BARS	DO-	DO-	MILL T.C. OR LAB. REPORT	3/2.	2,1	CORRELATION REQUIRED, IDENTIFICATION AS PER TC
		2. DIMENSIONS	CR		2. MEASUREMENT		MFR. DRAWING	MFR. DRAWING	INSP. REPORT	3/2.	2,1	
		3. INTERNAL DEFECTS FOR 40MM & ABOVE DIA SHAFTS.	CR		3. ULTRA SONIC TEST	100%	ASTMA388 BACK WALL ECHO 100%	DEFECT ECHO MAX 20% OF B.W.E. LOSS OF BACK WALL ECHO 20% MAX	NDT CERTIFICATE	3/2.	2,1	
1.4	STRESS RELIEVING/ HEAT TREATMENT OF CASTING OF ALL ABOVE (IF APPLICABLE)/ SOLUTION ANNEALING OF SS CASTING	1. VERIFICATION OF HT CHART	MA		VERIFICATION OF SR/HT CHART	ALL BATCHES	RELEVANT MATERIAL SPECN.	DO-	CORRELATED SR/HT CHARTS	3/2.	2,1	
		2. IGC TEST FOR SS CASTING	MA		LAB. TEST	ONE SAMPLE/ HT BATCH	ASTM A 282	ASTM A 282 Gr A	LAB. REPORT	3/2.	2,1	
1.5	SHAFT ENCLOSING TUBES, COLUMN PIPES & DISCHARGE ELBOW	1. MECHANICAL & CHEMICAL PROPS. 2. DIMENSIONS. 3. SURFACE FINISH	MA		1. MECH & CHEM TEST 2. MEASUREMENT 3. VISUAL EXAM	1/BATCH 100%	APPROVED GA DRG/DATA SHEET	RELEVANT MATERIAL SPECN/MAPS/ APPROVED DOCS	MFR T.C OR LAB. REPORT	3/2.	2,1	

PARTICULARS		BIDDER / VENDOR	
BHEL			
NAME			
SIGNATURE			
DATE			
		BIDDER/VENDOR SEAL	



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN

QUALITY PLAN FOR MISCELLANEOUS PUMPS

CUSTOMER		PROJECT TITLE										
BIDDER/VENDOR		QUALITY PLAN NUMBER										
SHEET 2 OF 6												
SYSTEM		ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)										
S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECKED	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	P	W	V	11
1.6	PLATE FLANGE, C/FLANGE	1. MECHANICAL & CHEMICAL PROS. 2. DIMENSIONS. 3. SURFACE FINISH	MA	1. MECH & CHEM TEST 2. MEASUREMENT 3. VISUAL EXAM.	1/CAST 100% 100%	APPROVED GA DRG./DATA SHEET	RELEVANT MATERIAL SPECN/ MFR. DRG./ APPROVED DDC	MILL TC/ LAB REPORT	3/2		2,1	CORRELATION REQ. FOR MAT OTHER THAN IS 2062
1.7	SUCTION STRAINER (IF APPLICABLE)	MECHANICAL & CHEMICAL PROS.	MI	MECH. & CHEMICAL TEST	1/HEAT	DO-	DO-	DO-	3/2		2,1	
1.8	MECHANICAL SEAL (IF APPLICABLE)	TYPE, SIZE, MFRS, NO., MAKE	MA	VISUAL EXAM	100%	APPROVED DATASHEET	APPROVED DATASHEET		3/2		2,1	COMPLIANCE TC FOR APPROVED MAKE
IN PROCESS CONTROL												
2.1	ALL COMPONENTS UNDER 1.00 ABOVE	VISUAL DEFECTS, DIMENSIONS	MA	VISUAL EXAM, MEASUREMENT	100%	MFG. DRAWING	MFG. DRAWING	COMPLIANCE TC	3/2		2,1	
2.2	IMPELLER	CLEANING AND DEBURRING	MA	VISUAL	100%	MFG. DRAWING	MFG. DRAWING		3/2			
2.3	IMPELLER-ALL ACCESSIBLE SURFACES DIFFUSERS (EXCEPT CI)	DP TEST	MA	DP TEST ON M/CED AREA	100%	APPENDIX 8 OF ASME SEC. VIII DIV. 1		NDT CERTIFICATE	3/2	2,1		WITNESS BY BHEL & VERIFICATION BY CUSTOMER
2.4	WIERING RING, SHAFT SLEEVES, CASING	DP TEST	MA	DP TEST ON M/CED AREA	100%	APPENDIX 8 OF ASME SEC. VIII DIV. 1		NDT CERTIFICATE	3/2		2,1	
2.5	SHAFT	DP TEST	MA	DP TEST ON M/CED AREA	100%	ASTM E 165	NO RELEVANT INDICATION ALLOWED	NDT CERTIFICATE	3/2	2,1		WITNESS BY BHEL & VERIFICATION BY CUSTOMER
2.6	CASINGS/ BOWLS, STAGE BODIES, DISCHARGE HEAD (IF CAST), SUCTION HOUSING, COLUMN PIPE DISCHARGE PIPE ETC	LEAK TIGHTNESS	CR	VISUAL	100%	TECHNICAL DATA SHEET AND NOTE 2.	NO LEAKAGE FOR TEST DURATION OF 30 MIN.	HT CERTIFICATE	3/2		2,1	
BHEL												
PARTICULARS												
NAME												
SIGNATURE												
DATE												
BIDDER/VENDOR SEAL												



CUSTOMER	PROJECT TITLE
BIDDER/VENDOR	QUALITY PLAN NUMBER

ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)

S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.7	FABRICATED COMPONENTS											WELDING PROCEDURE APPROVAL BY BHEL ALT. 3RD PARTY (LLYODS,BVQI OR EQ.) IS ACCEPTABLE.
2.7.1	WELDING PROCEDURE SPECIFICATION	CORRECTNESS	MA	EXAM.	100%	ASME SEC.IX	ASME SEC.IX	QW 482 OF ASME SEC.IX	3/2	2.1		
2.7.2	WELDING PROCEDURE QUALIFICATION	WELD SOUNDNESS	MA	VISUAL,PHYS. TESTS RT (AS APPLICABLE)	100%	ASME SEC.IX	ASME SEC.IX	QW 483 OF ASME SEC.IX	3/2	2.1		
2.7.3	WELDER PERFORMANCE QUALIFICATION	WELD SOUNDNESS	MA	DO.	100%	ASME SEC.IX	ASME SEC.IX	QW 484 OF ASME SEC.IX	3/2	2.1		
2.7.4	WELD FIT-UPS	DIMENSION & ALIGNMENT	MA	MEAS.VISUAL EXAM	100%	WPS, MFG DRAWING	WPS, MFG DRAWING	IR/LOGBOOK	3/2			
2.7.5	ROOT RUNS	SURFACE DEFECTS	MA	PENETRANT TEST	100%	ASTM E 165	NO SURFACE DEFECT	DO.	3/2	2.		
2.7.6	WELDMENTS	SURFACE DEFECTS	MA	DO.	100%	ASTM E 165	ASME-VIII, DIV I	INSPN REPORT	3/2	2.1.	WITNESS BY BHEL & VERIFICATION BY CUSTOMER	
BHEL				PARTICULARS		BIDDER / VENDOR						
				NAME								
				SIGNATURE								
				DATE								
						BIDDER/VENDOR SEAL						



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN

QUALITY PLAN FOR MISCELLANEOUS PUMPS

CUSTOMER		PROJECT TITLE									
BIDDER/VENDOR		QUALITY PLAN NUMBER									
SYSTEM		ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)									
SHEET 4 OF 6											
S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS	
									P	W	V
1	2	3	4	5	6	7	8	9	10	11	
2.7.7	BUTT WELDS	INTERNAL DEFECT	MA	UT/RT	100%			IR	3/2		2.1
2.7.8	DISCHARGE HEAD, COLUMN PIPE, DISCHARGE PIPE, ETC.	1. LEAK TIGHTNESS 2. DIMENSION	CR	1. HYDROTEST 2. MEASUREMENT	100%	TECHNICAL SPEC/DATA SHEET, MFR. DRAWING	1. NO LEAKAGE 2. MFR. DRAWING	DO	3/2	2.1	
3.0	SUB-ASSEMBLY CONTROL										
3.1	ROTOR ASSEMBLY	ECCENTRICITY	MA	MEASUREMENT	100%	MFR. DRAWING	MFR. DRAWING	IR/LOG BOOK	3/2		
3.2	ROTOR ASSEMBLY RESIDUAL UNEBALANCE	STATIC & DYNAMIC	CR	STATIC & DYNAMIC BALANCING	100%	ISO 1940	ISO 1940 G 8.3	BALANCING CERTIFICATE	3/2	2.1	WITNESSING ONLY FOR SIZE GREATER THAN 10KW
3.3	COMPLETE PUMP ASSEMBLY	COMPLETENESS, CORRECTNESS, CLEANLINESS, FREERNESS, ALIGNMENT	MA	VISUAL EXAM MEASUREMENT	100%	APPROVED DRG & MFG. STANDARDS	APPROVED DRG & MFG. STANDARDS	I.R. & CHECK LISTS	3/2	2.1	CHP
BHEL		PARTICULARS		BIDDER / VENDOR							
		NAME									
		SIGNATURE									
		DATE									
BIDDER/VENDOR SEAL											



**BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN**

QUALITY PLAN FOR MISCELLANEOUS PUMPS											
CUSTOMER		PROJECT TITLE		QUALITY PLAN NUMBER							
BIDDER/VENDOR											
SHEET 5 OF 6											
SYSTEM		ITEM - CENTRIFUGAL PUMPS (HORIZONTAL/ VERTICAL)									
S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS	
									P	W	V
1	2	3	4	5	6	7	8	9	10	11	
4	FINAL INSPECTION, TESTS & PACKING DESPATCH CONTROL										
4.1	PUMP WITH JOB/SHOP MOTOR ASSEMBLED ON INDIVIDUAL BASE FRAME	1. Q/VIS HEAD. 2. Q/VIS POWER. 3. Q/VIS PUMP EFF. 4. VIBRATION 5. NOISE 6. BEARING TEMP. 7. LEAKAGES	CR	PERFORMANCE TEST	100%	APPD. PERFORMANCE TEST PROCEDURE/ APPD. DATA SHEET/APPD. CURVES FOR VIBRATIONS - ANSI/HIS 984-2009 FOR BEARING TEMP - BEARING HOUSING SHOULD NOT BE UNTOUCHABLY HOT.		IR., PERF. TEST RECORD, PLOTTED CURVES	3/2.	2.1.	* MINIMUM 7 POINTS FROM SHUT-OFF TO MAX. OPERATING FLOW COVERING ENTIRE OPERATION RANGE OF PUMP SHALL BE TAKEN. * CUSTOMER HOLD POINT
4.2	STRIP DOWN AFTER PERFORMANCE TEST	NPSH REQUIRED	CR	NPSH TEST	1/MODEL	DO.		IR. NPSH TEST RECORD, PLOTTED CURVES	3/2.	2.1.	IF SPECIFIED or INSISTED BY CUSTOMER.
4.3	COMPLETE PUMP WITH UNIT MOTOR BASE FRAME, COUNTER FLANGES ETC. INCLUDING ALL ACCESSORIES AS PER SECTION C OF SPECN.	1. UNDUWEAR TEAR AND RUBBING	MA	VISUAL EXAM AFTER STRIPPING	1/MODEL	NO UNDUWEAR TEAR & RUBBING ON IMPELLER & WEAR RING		INSP. REPORT	3/2.	1	WITNESS REQUIRED ONLY WHEN ABNORMAL SOUND OBSERVED DURING PERFORMING TEST.
		COMPLETENESS, CLEANLINESS, OVERALL DIMENSIONS ORIENTATION, WORKMANSHIP AND FINISH	MA	VISUAL EXAM MEASUREMENT	100%	APPD. G.A DRAWING	APPD. G.A DRAWING	INSP. REPORT	3/2.	1	
BHEL		PARTICULARS		BIDDER / VENDOR							
		NAME									
		SIGNATURE									
		DATE									
										BIDDER/VENDOR SEAL	



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
STANDARD QUALITY PLAN

QUALITY PLAN FOR MISCELLANEOUS PUMPS

CUSTOMER		PROJECT TITLE								
BIDDER/VENDOR		QUALITY PLAN NUMBER								
SYSTEM		ITEM - CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL)								
SHEET 6 OF 6										
S. No.	COMPONENT / OPERATION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	10	11
4.4	COMPLETION OF ALL STAGES	1.COMPLETION	MA	VERIFICATION OF IRT,C.ETC.	100%	MFG. DRG/TECHNICAL DOCS.	APPD. MFG. DRG/TECHNICAL DOCS	IR.	3/2. 2.1	WITNESSING ONLY BY BHEL, CUSTOMER VERIFICATION ONLY BUT CHP
4.5	PAINTING	1.SURFACE FINISH, DFT, MARKINGS ETC.	MA	VISUAL EXAM MEASUREMENT AESTHETIC	100%	APPD.DRG.	APPD.DOCS	IR.	3/2.	2
4.6	PACKING, MARKING	SOUNDNESS OF PACKING	MI	VISUAL AESTHETIC	100%	MFG. STANDARD	MFG. STANDARD		3/2.	2

MTC -Mill Test Certificate, MA-Major, MI-Minor, TC-Test Certificate, Crt-Critical, IGC- Inter Granular Corrosion

1.AS CAST HEAT MARKS SHALL BE PROVIDED ON CI CASTING LIKE TOP & BOTTOM CASING.

2. HYDRO TEST PRESSURE SHALL BE AT LEAST 2(TWO) TIMES THE DUTY POINT (OR) 1.5 TIMES OF SHUT OFF HEAD (OR) SYSTEM DESIGN PRESSURE, WHICHEVER IS HIGHER.

3. THIS QAP IS ALSO APPLICABLE FOR SPARES.

4. NO WELD REPAIRS PERMISSIBLE ON CI CASTING.


5. MATERIAL SHALL BE AS PER APPROVED CROSS SECTION DRG./ DATA SHEET.

6. STRIP TEST- IN CASE OF ABNORMAL NOISE OBSERVED DURING PERF. TEST, THOSE PUMP WILL BE STRIPPED DOWN FOR VISUAL INSPECTION OF IMPELLER & WEAR SHALL BE OFFERED FOR VISUAL INSPECTION FOR WEAR /RUBBING MARKS.

LEGEND : 1- BHEL OR BHEL NOMINATED THIRD PARTY / SUB SUPPLIER,
2- VENDOR,
3-SUB-VENDOR

P- PERFORM, W- WITNESS, V-VERIFICATION

BHEL	PARTICULARS		BIDDER / VENDOR
	NAME		
	SIGNATURE		

	TECHNICAL SPECIFICATIONS	SPECN. NO.: PE-TS-380/381-100-N001		
	MISCELLANEOUS PUMPS	VOLUME:	IIB	SECTION: D2
		REV. NO.	0	DATE: 16.04.2012
<p>SECTION D2</p> <p>STANDARD MOTOR SPECIFICATION</p> <p>STANDARD QUALTY PLAN FOR MOTORS</p>				




TITLE :
GENERAL TECHNICAL REQUIREMENTS
FOR
LV MOTORS

SPECIFICATION NO.
PE-SS-999-506-E101
VOLUME NO. : II-B
SECTION : D
REV NO. : 00 DATE : 24/05/2005
SHEET : 1 OF 1

GENERAL TECHNICAL REQUIREMENTS

FOR
LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 24/05/2005
		SHEET : 1 OF 4

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 of 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.

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101 VOLUME NO. : II-B SECTION : D REV NO. : 00 DATE : 24/05/2005 SHEET : 2 OF 4
	<p>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.</p> <p>3.3.3 The following frequency of starts shall apply</p> <p>i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.</p> <p>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)</p>	
	<p>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</p> <p>3.4 Running Requirements</p> <p>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.</p> <p>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.</p> <p>3.5 Stress During bus Transfer</p>	
	<p>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.</p> <p>3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.</p> <p>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.</p> <p>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.</p> <p>4.0 CONSTRUCTIONAL FEATURES</p> <p>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</p> <p>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.</p> <p>Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled</p> <p>4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.</p>	



TITLE :

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.

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SECTION : D

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SHEET : 3 OF 4

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

Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".
- 4.7.2. Unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.
- 4.7.3 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or V W & V respectively.
- 4.7.4 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.
- 4.7.5 Motor terminals and terminal leads shall be fully insulated with no bare 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.



TITLE :
GENERAL TECHNICAL REQUIREMENTS
FOR
LV MOTORS

SPECIFICATION NO.
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SECTION : D
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SHEET : 4 OF 4

4.9 General

- 4.9.1 Motors provided for similar drives shall be interchangeable.
- 4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.
- 4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.
- 4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.
- 4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.
- 4.9.6 Name plate with all particulars as per IS: 325 shall be provided
- 4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS: 5 motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be 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-506-00-007/2 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.

SHEET 1 OF 8		CUSTOMER :		PROJECT :		SPECIFICATION :				
COMPONENT/OPERATION		BIDDER/ VENDOR		TITLE		NUMBER :				
QUALITY PLAN		SYSTEM		QUALITY PLAN		SPECIFICATION :				
CHARACTERISTIC CHECK		CAT.		ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)		TITLE				
SHEET 1 OF 8		EXTENT OF CHECK		REFERENCE DOCUMENT		SECTION				
TYPE/ METHOD OF CHECK		CHECK		ACCEPTANCE NORM		AGENCY				
CHECK		CHECK		NORM		P W V				
1	2	3	4	5	6	7	8	9	10	11
1.0	RAW MATERIAL & BROUGHT CONTROL									
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	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	-
1.2	HARDWARES	MA		VISUAL	100%		FREE FROM CRACKS, UN-EVENNESS ETC.	-DO-	3	-
	2.PROPERTY CLASS	MA		VISUAL	SAMPLES	MANFR'S DRG./SPEC BOOK	RELEVANT IS/SPEC.	SUPPLIERS TC & LOG	3	2
	1.SURFACE CONDITION	MA		VISUAL	100%		FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK	3	-
1.3	CASTING	MA		CHEM & MECH TEST	1/HEAT NO.	MANFR'S DRG./SPEC	RELEVANT IS/	SUPPLIERS TC	3	2
	3.DIMENSIONS	MA		MEASUREMENT	100%	MANFR'S DRG.	MANFR'S DRG.	LOG BOOK	3	-
1.4	PAINT & VARNISH	MA		VISUAL	100% CONTINUOUS	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	LOG BOOK	3	-
BHEL		PARTICULARS		BIDDER/VENDOR						
NAME		SIGNATURE		DATE		BIDDER'S/VENDORS COMPANY SEAL				


SHEET 2 OF 9		CUSTOMER :		PROJECT		SPECIFICATION :	
QUALITY PLAN		BIDDER/ VENDOR		TITLE		NUMBER :	
COMPONENT/OPERATION		SYSTEM		QUALITY PLAN		SPECIFICATION :	
SL. NO.		CAT.		REFERENCE DOCUMENT		SECTION	
CHARACTERISTIC CHECK		TYPE/ METHOD OF CHECK		EXTENT OF CHECK		AGENCY	
3		4		5		6	
1		2		3		4	
1.5		MA		VISUAL		100%	
1.6		MA		CHEM. & PHYSICAL TESTS		1/HEAT NO. OR HEAT TREATMENT BATCH NO	
2		MA		MEASUREMENT		100%	
3		CR		UT		100%	
4		MA		VISUAL		100%	
5		MA		MEASUREMENT		100%	
6		MA		TEST		100%	
7		MA		TEST		100%	
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CUSTOMER :		PROJECT :		SPECIFICATION :							
TITLE		TITLE		NUMBER :							
BIDDER/ VENDOR		QUALITY PLAN		SPECIFICATION :							
SYSTEM		ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)		TITLE							
CAT.		REFERENCE DOCUMENT		SECTION							
CHARACTERISTIC CHECK		ACCEPTANCE NORM		VOLUME III							
SHEET 3 OF 9		EXTENT OF CHECK		REMARKS							
COMPONENT/OPERATION		TYPE/ METHOD OF CHECK		P W V							
2		3		4							
1		5		6							
1		7		8							
1		9		10							
11		12		13							
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND.	MA	100%	NO VISUAL DEFECTS	INSPT. REPORT	3	-	-	-	-
		2. OTHER CHARACTERISTICS	MA	SAMPLE	MANUF'S SPEC.	LOG BOOK AND OR SUPPLIER'S TC	3	-	2	-	-
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND.	MA	100%	NO VISUAL DEFECTS (FREE FROM BURS)	LOG BOOK	3	-	-	-	-
		2.DIMENSIONS INCLUDING BURS HEIGHT	MA	SAMPLE	MANUF'S DRG.	LOG BOOK	3	-	2	-	-
		3. ACCEPTANCE TESTS	MA	DO	RELEVANT IS	SUPPLIER'S TC	3	-	2	-	-
1.9	CONDUCTORS	1. SURFACE FINISH	MA	100%	FREE FROM VISUAL DEFECTS	LOG BOOK	3	-	-	-	-
		2.ELECT. PROP. & MECH. PROP	MA	SAMPLES	RELEVANT IS/ BS OR OTHER STANDARDS	SUPPLIER'S TC & VENDOR'S INSPN. REPORTS	3/2	-	2	-	-
BHEL		PARTICULARS		BIDDER/VENDOR							
		NAME		SIGNATURE		DATE					


CUSTOMER : PROJECT TITLE		SPECIFICATION : NUMBER :	
BIDDER/ VENDOR		SPECIFICATION : TITLE	
SYSTEM		VOLUME III	
SHEET 4 OF 9		REMARKS	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	REMARKS
1	2	3	4
1.10	BEARINGS	3.DIMENSIONS 1.MAKE & TYPE 2.DIMENSIONS	MA MA MA
1.11	SLIP RING	3.SURFACE FINISH 1.SURFACE COND. 2.DIMENSIONS 3.TEMP.WITH- STAND CAPACITY 4.HV/IR	MA MA MA MA
1.12	OIL SEALS & GASKETS	1.MATERIAL OF GASKET 2.SURFACE COND. 3.DIMENSIONS	MA MA MA

CUSTOMER :		PROJECT TITLE		SPECIFICATION : NUMBER :						
QUALITY PLAN		BIDDER/ VENDOR SYSTEM		SPECIFICATION : TITLE						
SHEET 6 OF 9		CAT.		VOLUME III						
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY	REMARKS	
1	2	3	4	5	6	7	8	9	10	11
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	MANUF'R'S SPEC.	MANUF'R'S SPEC.	Log Book	3	-
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-DO-	-DO-	Log Book	3	-
		3.CORE LOSS & HOTOPOT	MA	ELECT.TEST	-DO-	-DO-	-DO-	Log Book	3	2
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	MANUF'R'S SPEC./BHEL SPEC.	MANUF'R'S SPEC./BHEL SPEC.	Log Book	3	-
		2.CLEANLINESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	-
		3.IR-HV-IR	CR	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	3	-
		4.RESISTANCE	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	2
		5.INTERTURN INSULATION	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	2
		6.SURGE WITH STAND AND TAN. DELTA TEST	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	2
2.6	IMPREGNATION	1.VISCOSITY	MA	PHY. TEST	AT STARTING	-DO-	-DO-	Log Book	3	1
		2.TEMP. PRESSURE VACUUM	MA	PROCESS CHECK	CONTINUOUS	-DO-	-DO-	Log Book	3	-
		3.NO. OF DIPS	MA	-DO-	-DO-	-DO-	-DO-	Log Book	3	2
										THREE DIPS TO BE GIVEN
BHEL		PARTICULARS		BIDDER/VENDOR						
		NAME		SIGNATURE						
		DATE								
						BIDDER'S/VENDOR'S COMPANY SEAL				

[illegible]

		CUSTOMER :		PROJECT TITLE		SPECIFICATION : NUMBER :	
QUALITY PLAN		BIDDER/ VENDOR :		QUALITY PLAN		SPECIFICATION : TITLE	
SHEET 8 OF 9		SYSTEM CAT.		ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD
1	2	3	4	5	6	7	8
3.0	TESTS	1. TYPE TESTS INCLUDING SPECIAL TESTS AS PER BHEL SPEC. 2. ROUTINE TESTS INCLUDING SPECIAL TEST AS PER BHEL SPEC. 3. VIBRATION 4. OVERALL DIMENSIONS AND ORIENTATION 5. DEGREE OF PROTECTION 6. NAMEPLATE DETAILS 7. EXPLOSION FLAME PROOFNESS (IF SPECIFIED) 8. PAINT SHADE, THICKNESS & FINISH	MA	ELECT. TEST	100%	IS-325/ BHEL SPEC/ DATA SHEET	IS-325/ BHEL SPEC/ DATA SHEET
			MA	-DO-	100%	-DO-	-DO-
			MA	-DO-	100%	IS-12075	IS-12075
			MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS
			MA	ELECT. & MECH. TEST	100%	RELEVANT IS	BHEL SPEC. AND DATA SHEET
			MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET
			MA	EXPLOSION FLAME PROOF TEST	100%	IS-3882 IS-8239 IS-8240	IS-3882 IS-8239 IS-8240
			MA	VISUAL & MEASUREMENT BY ELKOMETER	100%	BHEL SPEC. & DATA SHEET	BHEL SPEC. & DATA SHEET
BHEL		PARTICULARS		BIDDER/VENDOR			
NAME		SIGNATURE		DATE			
BIDDER'S/ VENDORS COMPANY SEAL							

		QUALITY PLAN SHEET 9 OF 9		CUSTOMER : BIDDER/ : VENDOR : SYSTEM :		PROJECT TITLE QUALITY PLAN NUMBER PED-506-00-Q-007/2 ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)		SPECIFICATION : NUMBER : SPECIFICATION : TITLE :		
SL. NO.	COMPONENT / OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY	VOLUME III REMARKS
1	2	3	4	5	6	7	8	9	10	11
NOTES: 1 DEPENDING UPON THE SIZE AND CRITICALLY, WITNESSING BY BHEL SHALL BE DECIDED. 2 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON. 3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THESE TEST MAY NOT BE REPEATED. 4 WHEREVER CUSTOMER IS INVOLVED IN INSPECTION WITH THE CUSTOMERS, AGENCY (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.										
BHEL										
PARTICULARS										
BIDDER/VENDOR										
NAME										
SIGNATURE										
DATE										
BIDDER'S/VENDORS COMPANY SEAL										

		QUALITY PLAN		CUSTOMER :		PROJECT		SPECIFICATION :			
BIDDER/		VENDOR		SYSTEM		TITLE		NUMBER :		SPECIFICATION :	
SHEET 2 OF 2		CHARACTERISTICS		TYPE/		EXTENT OF		NUMBER PED-506-00-Q-006/0		TITLE :	
COMPONENT/OPERATION		CHECK		METHOD OF		CHECK		ITEM AC ELECT. MOTORS BELOW 75KW (LV)		VOLUME III	
SL. NO.		CAT.		CHECK		DOCUMENT		ACCEPTANCE		REMARKS	
								NORM		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	3 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>											
BHEL		PARTICULARS		BIDDER/VENDOR							
		NAME									
		SIGNATURE									
		DATE									
BIDDER'S/VENDORS COMPANY SEAL											

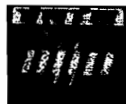
**DB POWER (MADHYA PRADESH) LIMITED (DBP(MP)L)
SINGARENI COLLIERIES COMPANY LIMITED (SCCL)**

**DBP(MP)L - 2 x 660 MW SINGRAULI STPP
SCCL - 2 x 600 MW ADILABAD TPP**

VOLUME -III

**TECHNICAL SPECIFICATION
FOR
MISCELLANEOUS PUMPS**

Specification No. : PE-TS-380/381-100-N001 (REV. 0)



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI BUILDING, SECTOR 16 A
NOIDA - 201301**

	PREAMBLE		SPECN. NO.: PE-TS-380/381-100-N001	
	REV. NO.	0	DATE:	16.04.12

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

1.1 Volume - I CONDITIONS OF CONTRACT

This consists of four parts as below:

Volume - I A : This part contains instructions to bidders for making bids to BHEL.

Volume - I B : This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume - I C : This part contains special conditions of contract.

Volume - I D : This part contains commercial conditions for erection and commissioning site work, as applicable.

1.2 Volume - TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume II which comprises of:

Volume - II A : General Technical Conditions

Volume - II B : Technical specification including drawings, if any.

1.2.1 Volume - II B :

This volume is sub-divided into following sections:

Section - A : This section outlines the scope of enquiry.

Section - B : This section provides "Project Information"

Section - C : This section indicates technical requirements specific to the contract, not covered in Section-D.

Section - D : This section comprises of technical specifications of equipments complete with data sheet A, B & C.

Data sheet - A specifies data and other requirements pertaining to the equipment.


Data sheet - B specifies data to be filled by the bidder (Data Sheet B is contained in Volume - III)

Data sheet - C indicates data documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).


1.2.2 Volume - III TECHNICAL SCHEDULES

This volume contains technical schedules and Data Sheets - B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per checklist, sec B7 in vol III

2.0 The requirements mentioned in Section C/Data Sheets-A of Section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section -D.

	TECHNICAL SPECIFICATIONS	SPECN. NO.: PE-TS-380/381-100-N001	
	MISCELLANEOUS PUMPS	VOLUME: III	SECTION:
		REV. NO. 0	DATE: 16.04.12

INDEX	
SECTION	TITLE
A	DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER
A.1	COMPLIANCE CERTIFICATE
A.2	SCHEDULE OF DEVIATIONS
A.3	SCHEDULE OF PERFORMANCE GUARANTEE
A.4	SCHEDULE OF PRICES
A.5	SCHEDULE OF UNIT PRICES
A.6	INPUTS FOR HT MOTORS
A.7	GENERAL ARRANGEMENT DRAWING
B	DOCUMENTS TO BE SUBMITTED ON PLACEMENT OF LOI
B.1	PUMP DATA SHEET -B ALONG WITH PERFORMANCE CURVE
B.2	GA & CROSS SECTIONAL DRAWING
B.3	PUMP QAP
B.4	MOTOR DATASHEET -C ALONG WITH OTHER MOTOR DOCUMENTS
B.5	MOTOR QAP
B.6	ELECTRICAL LOAD DATA
B.7	SCHEDULE AS PER LIST

	TECHNICAL SPECIFICATIONS	SPECN. NO.:		PE-TS-380/381-100-N001	
	MISCELLANEOUS PUMPS	VOLUME:	III	SECTION:	A
		REV. NO.	0	DATE:	16.04.12
<p style="text-align: center;">DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER</p> <p>A1 COMPLIANCE CERTIFICATE A2 SCHEDULE OF DEVIATIONS A3 SCHEDULE OF PERFORMANCE GUARANTEES A4 SCHEDULE OF PRICES A5 SCHEDULE OF UNIT PRICES A6 INPUTS FOR HT MOTORS A7 GENERAL ARRANGEMENT DRAWING</p>					

	TECHNICAL SPECIFICATIONS	SPECN. NO.: PE-TS-380/381-100-N001		
	MISCELLANEOUS PUMPS COMPLIANCE CERTIFICATE	VOLUME:	III	SECTION: A1
		REV. NO.	0	DATE: 16.04.12

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

- The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same.
- QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein.

QP will be subject to BHEL/ CONSULTANT/ CUSTOMER approval in the event of order & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc.
- All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/ CONSULTANT/ CUSTOMER approval.
- There are no other deviation with respect to specification other than those furnished in the 'Schedule of Deviations'.
- Mandatory spares as indicated in Datasheet A shall be included in the base price

Any mandatory spares stated as not applicable, shall have to be supplied without any cost implication to BHEL in the event they are found to be applicable during detail engineering stage.
- The offered materials should be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty. All materials shall be subject to approval in the event of order.
- Prices for recommended spares (if any) for 3 years operation shall be furnished separately & not included in the base price.
- The commissioning spares (if any) are supplied on 'As Required Basis' & prices for same included in the base price (If bidders reply to this is "No commissioning spares are required" and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL).
- All sub vendors shall be as per BHEL/CONSULTANT/CUSTOMER approved list.
- Tests for noise, vibration, parallel running etc. for pumps shall be conducted at site by BHEL and if the site performance is found not meeting the requirements in any respect as specified, then the equipment shall be rectified or replaced by the vendor, at his own cost.
- Any special tools & tackles, if required, shall be in bidder's scope.
- All models offered have been supplied by bidder in the past and are meeting the experience qualifying criteria of BHEL/CONSULTANT/CUSTOMER (viz. offered model is successfully operating in two separate stations for at least two years as on the date of submission of the offer). Any deviation to this criteria shall be suitably highlighted in deviation schedule.
- All selected motor ratings have minimum margins as per Datasheet A, Section D1 of Vol IIB

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

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

FORM No. PSM - 0036-0



TITLE

*** SCHEDULE OF DEVIATIONS**

- () From Conditions of Contract (Volume - I)
- () From General Technical Conditions (Volume - II A)
- () From Technical Specifications (Volume - II B)

SPECIFICATION NUMBER PE-TS-256-165-N001

VOLUME III **SECTION A-2**

SHEET ... **OF** ...

Mark the applicable


... type of deviation shall be listed in a separate sheet

We the undersigned hereby certify that the above mentioned are the only deviations.

PARTICULARS OF BIDDER / AUTHORIZED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	

COMPANY SEAL

	SPECN. NO.: PE-TS-380/381 -100-N001	
	VOLUME: III	SECTION: A3
	REV. NO. 0	DATE: 16.04.12

SCHEDULE OF PERFORMANCE GUARANTEES
2X600 MW SCCL, ADILABAD TPP (BTG)

Following parameters are guaranteed for following pumps

Sl. No.	Pump Description	Guaranteed Capacity (M3/Hr)	Guaranteed TDH (MWC)	Guaranteed Pump Eff. %	Guaranteed Motor Eff. %	Guaranteed Power consumption at inlet to motor (KW)	Pump model	Motor Rating (KW)	Pump GD ² Value for HT motor only	Pump RPM	T/S Curve attached for HT motor
1	#DMCW PUMPS-TG AUX.	1070	40								
2	#DMCW Pump-SG AUX.	480	68								
3	#ACW PUMPS	1410	20								

Note: # Bid evaluation and LD is applicable for these pumps only as per clause 4.00.00 of std technical specn for pumps, section D1, Volume IIB, in conjunction with clause 7.0 of section C of volume IIB.

We the undersigned hereby undertake to meet the performance guarantees as listed in the table above on the conditions as elsewhere specified. Any variation of the specified conditions during official tests will be taken in account by the customer

PARTICULARS OF BIDDER/AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL
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	TITLE:	SPECIFICATION NO.	PE-TS-380/381-100-N001	
	SCHEDULE OF PRICES	VOLUME	III	
		SECTION	A.4	DATE 16.04.12
	DB POWER(MP)L - 2 x 660 MW SINGRAULI STPP	REV. NO.	00	SHEET 1 OF 2

SL. No.	DESCRIPTIONS OF WORKS OR EQUIPMENT
---------	------------------------------------

- 1.0 Total price for design, manufacture, assembly, inspection, testing, packed for transportation and delivery of Misc. pumps including motors, special tools/tackles, commissioning spares, installation checks and replacement of gland packing with mechanical seal arrangement (if applicable) at site, all accessories, auxiliaries etc. including Mandatory Spares as specified and necessary as per Technical specification for :

Horizontal Group of Pumps

i.) ACW PUMPS	Six (6) Nos.	Total Rs.
ii.) DMCW PUMPS FOR TG AUX	Six (6) Nos.	
iii.) DMCW PUMPS FOR SG AUX	Four (4) Nos.	
iv.) DMCW PUMPS FOR STATION AUX	Two (2) Nos.	

- 2.0 Recommended spares item-wise breakup with item-wise price to be given as per "Schedule of Recommended Spares" enclosed under Vol. III of Technical Specification. Rs.

- 3.0 Price for site visit (per manday basis) Rs.
(Optional and additional , apart from that included in 1.0 above))


NOTE:

1. Indicate all duties, taxes etc. stating whether included/ excluded in above price.
2. Bidder to include cost of three site visits for three days each for installation check & replacement of gland packing with Mechanical seal (As applicable), in their base price in 1.0 above. Further optional & additional prices for site visit are to be quoted as per 3.0 above.

Bidder shall furnish this price Schedule in his price offer only

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE

NAME	SIGNATURE	DATE	COMPANY SEAL

	TITLE:	SPECIFICATION NO.	PE-TS-380/381-100-N001		
	SCHEDULE OF PRICES	VOLUME	III		
		SECTION	A 4	DATE	16.04.12
	2X600 MW SCCL, ADILABAD TPP (BTG)	REV. NO.	00	SHEET	2 OF 2


SL. No.	DESCRIPTIONS OF WORKS OR EQUIPMENT			
1.0	Total price for design, manufacture, assembly, inspection, testing, packed for transportation and delivery of Misc. pumps including motors, special tools/tackles, commissioning spares, installation checks and replacement of gland packing with mechanical seal arrangement (if applicable) at site, all accessories, auxiliaries etc. as specified and necessary, including Mandatory Spares as specified in Technical specification for :			
Horizontal Group of Pumps				
i.) DMCW PUMPS TG AUX		Six (6) Nos.	Total Rs.	
ii.) DMCW PUMPS SG AUX		Four (4) Nos.		
iii.) ACW PUMPS		Six (6) Nos.		
2.0	Recommended spares item-wise breakup with item-wise price to be given as per "Schedule of Recommended Spares" enclosed under Vol. III of Technical Specification.			Rs.
3.0	Price for site visit (per manday basis) (Optional and additional , apart from that included in 1.0 above))			Rs.
NOTE:				
1.	Indicate all duties, taxes etc. stating whether included/ excluded in above price.			
2.	Bidder to include cost of three site visits for three days each for installation check & replacement of gland packing with Mechanical seal (if applicable), in their base price in 1.0 above. Further optional & additional prices for site visit are to be quoted as per 3.0 above.			


Bidder shall furnish this price Schedule in his price offer only


PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE

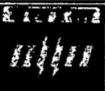
NAME	SIGNATURE	DATE	COMPANY SEAL	


TITLE:		SPECIFICATION NO.		PE-TS-380/381-100-N001	
SCHEDULE OF UNIT PRICES		VOLUME		III	
DB POWER(MP/L) - 2 x 660 MW SINGRAULI STPP		SECTION		A 5	DATE 18.04.12
		REV. NO.		0	SHEET 1 of 2
SL. No.	DESCRIPTIONS OF WORKS OR EQUIPMENT	PRICE (In Rs.)			
1.0	Unit price for Design, manufacture, inspection and testing, packed for transportation and delivery for following Pumps as specified in the Technical specification covering complete scope including installation checks and replacement of gland packing with mechanical seal arrangement (if applicable) at site, accessories, auxiliaries etc including Mandatory Spares as specified and necessary as per Technical specification for :				
1.1	Pumps and Motor Unit price (Horizontal Pumps Group I):				
(i)	ACW Pumps Pump price: Motor price: Pump/ Motor accessories (As applicable) Mandatory spares	Rs. Rs. Rs. Rs.	HT MOTOR IN BHEL's SCOPE		
(ii)	DMCW Pumps For TG AUX. Pump price: Motor price: Pump/ Motor accessories (As applicable) Mandatory spares	Rs. Rs. Rs. Rs.	HT MOTOR IN BHEL's SCOPE		
(iii)	DMCW Pumps For SG AUX. Pump price: Motor price: Pump/ Motor accessories (As applicable) Mandatory spares	Rs. Rs. Rs. Rs.			
(iv)	DMCW Pumps For STATION AUX. Pump price: Motor price: Pump/ Motor accessories (As applicable) Mandatory spares	Rs. Rs. Rs. Rs.	HT MOTOR IN BHEL's SCOPE		
(v)	Cost of Site visits for installation checks and replacement of Gland packing with Mechanical seal (As applicable)	Rs.			
2.0	Recommended spares list with item-wise break-up to be given separately as per respective price schedule in Volume-III.	Rs.			
3.0	Others, if any (please specify)	Rs.			
4.0	NOTES: a) Total price of Unit Prices given above should tally with Total price given in SL No. (1) of "Schedule of Prices". In case of discrepancy, the lowest of two shall be considered for order. Bidder to note that prices mentioned in the "Schedule of prices" and "Schedule of Unit Prices" shall be binding for evaluation purposes. b) Unit price quoted by bidder, as above, shall be binding for any quantity variation, which is at the discretion of purchaser. c) Price of commissioning & erection spares and other accessories not listed above shall be included in the price of pump & shall be supplied with the pump. d) Indicate all taxes, duties etc. stating whether included/ excluded in above prices.				
Bidder shall furnish this price Schedule in his price offer only					
NAME		DESIGNATION	SIGNATURE	DATE	COMPANY SEAL


PROJECT 		TITLE:		SPECIFICATION NO.		PE-TS-380/381-100-N001	
SCHEDULE OF UNIT PRICES				VOLUME		III	
2X600 MW SCCL, ADILABAD TPP (BTG)				SECTION		A 5	
				DATE		16.04.12	
				REV. NO.		0	
				SHEET		2 of 2	
SL. No.		DESCRIPTIONS OF WORKS OR EQUIPMENT			PRICE (In Rs.)		
1.0		Unit price for Design, manufacture, inspection and testing, packed for transportation and delivery for following Pumps as specified in the Technical specification covering complete scope including installation checks and replacement of gland packing with mechanical seal arrangement (if applicable) at site, accessories, auxiliaries etc including Mandatory Spares as specified and necessary as per Technical specification for :					
1.1		Pumps and Motor Unit price (Horizontal Pumps Group I):					
(i)		DMCW Pumps TG AUX. Pump price: Motor price: Pump/ Motor accessories (As applicable) Mandatory spares			Rs. Rs. Rs. Rs.		
(ii)		DMCW Pumps SG AUX. Pump price: Motor price: Pump/ Motor accessories (As applicable) Mandatory spares			Rs. Rs. Rs. Rs.		
(iii)		ACW Pumps Pump price: Motor price: Pump/ Motor accessories (As applicable) Mandatory spares			Rs. Rs. Rs. Rs.		
(iv)		Cost of Site visits for installation checks and replacement of Gland packing with Mechanical seal (As applicable)			Rs.		
2.0		Recommended spares list with item-wise break-up to be given separately as per respective price schedule in Volume-III.			Rs.		
3.0		Others, if any (please specify)			Rs.		
4.0		NOTES:					
		a) Total price of Unit Prices given above should tally with Total price given in Sl. No. (1) of "Schedule of Prices" . In case of discrepancy, the lowest of two shall be considered for order. Bidder to note that prices mentioned in the "Schedule of prices" and "Schedule of Unit Prices" shall be binding for evaluation purposes.					
		b) Unit price quoted by bidder, as above, shall be binding for any quantity variation, which is at the discretion of purchaser.					
		c) Price of commissioning & erection spares and other accessories not listed above shall be included in the price of pump & shall be supplied with the pump.					
		d) Indicate all taxes, duties etc. stating whether included/ excluded in above prices.					
Bidder shall furnish this price Schedule in his price offer only							
NAME		DESIGNATION		SIGNATURE		DATE	
						COMPANY SEAL	

	TECHNICAL SPECIFICATIONS	SPECN. NO.: PE-TS-380/381-100-N001			
	MISCELLANEOUS PUMPS	VOLUME:	III	SECTION:	B
		REV. NO.	0	DATE:	16.04.12
<p style="text-align: center;">DOCUMENTS TO BE SUBMITTED ON PLACEMENT OF LOI</p> <p>B1 DATA SHEET - B MISCELLANEOUS PUMPS B2 DATA SHEET - C MISCELLANEOUS DRIVES B3 ELECTRICAL LOAD DATA B4 SCHEDULES AS PER LIST</p>					

		PROJECT:		VENDOR DOC. NO.	REV NO.
		MISCELLANEOUS PUMPS DATASHEET - B		BHEL DOC. NO.	REV NO.
SL.	DESCRIPTION	UOM	PUMP DATA	PUMP DATA	PUMP DATA
1.0	GENERAL				
1.1	Designation of the Pump				
1.2	Manufacturer				
1.3	Model No.				
1.4	No. of pumps	Nos.			
1.5	System Design Pressure	Kg/cm ²			
1.6	Specific Gravity of fluid to be handled				
2.0	PERFORMANCE PARAMETERS				
2.1	Performance standard				
2.2	Rated capacity. (No negative tolerance)	M ³ /hr			
2.3	Total Dynamic Head (TDH) at rated capacity (No negative tolerance)	MWC			
2.4	Shut off head	MWC			
2.5	Range of Operation of the Pump				
	a) Min.Flow	M ³ /hr			
	b) Max.Flow	M ³ /hr			
2.6	The pumps offered have continuously rising head capacity curves from the duty point towards shut off point.				
2.7	The pumps offered have stable rising H-Q curves within the "Range of Operation"				
2.8	Pump rated speed	RPM			
2.9	Vibration measurements				
2.9.1	Max.value of vibration on any pump /motor bearing w.r.t. velocity (Vrms) as per ANSI/ HIS 9.6.4 for speed > 600 RPM				
	a) Guaranteed at manufacturer's works	mm/s			
	b) Guaranteed at site	mm/s			
2.9.2	Max.value of vibration on any pump /motor bearing w.r.t. peak to peak amplitude as per ANSI/ HIS 9.6.4 for speed <= 600 RPM				
	a) Guaranteed at manufacturer's works	microns			
	b) Guaranteed at site	microns			
2.10	Max. noise Level (Guaranteed at site)	dB			
2.11	Guaranteed Pump efficiency at rated head & rated capacity without -ve tolerance	%			
2.12	Power consumption				
	a) Guaranteed pump input power at duty point	KW			
	b) Guaranteed max. Pump input power within range of operation.	KW			
	c) Max. pump input power at shut off	KW			
	d) Guranteed power at motor input	KW			
2.13	NPSH required at rated capacity	MWC			
3.0	DESIGN & CONSTRUCTION FEATURES				
3.1	Type of pump casing				
3.2	Pump duty				
3.3	Type of Impeller				
3.4	Location				
3.5	Pump suitable for parallel operation.				
3.6	Torque speed curve of the pump & drive motor furnished for pumps with drive motor rating of 100 KW and above.				
3.7	Pump number of stages				


		PROJECT:		VENDOR DOC. NO.	REV NO.
		MISCELLANEOUS PUMPS DATASHEET - B		BHEL DOC. NO.	REV NO.
SL.	DESCRIPTION	UOM	PUMP DATA	PUMP DATA	PUMP DATA
3.8	Specific speed $N = \text{RPM} \times (\text{Flow in USGPM})^{1/2}$ (Head in Ft.) ^{3/4}				
3.9	Minimum suction head required in MLC for pump operation at maximum discharge point within the 'Range of Operation' specified (NPSHR at max. flow).				
3.10	Whether pump is suitable/designed so that pump internals can be attended without disturbing suction and discharge piping.				
3.11	Type of coupling between pump & motor				
3.12	Bearing (DE & NDE)				
	a) Type and manufacturer				
	b) Bearing no.				
	c) Type of lubrication				
	d) Design life (Hrs.)				
3.13	Shaft Sealing arrangement				
	a) Type and manufacturer				
	b) Sealing liquid				
	c) Requirement of external water if any				
	i) Quality				
	ii) Quantity/ Pump	M ³ /hr			
3.14	In case separate oil/grease/water pump or any such equipment required for bearing lubrication/stuffing box gland sealing, furnish full technical details of these equipment and their drive.				
4.0	MATERIAL OF CONSTRUCTION (Indicate applicable code/ standard)				
4.1	Casing				
4.2	Impeller				
4.3	Shaft				
4.4	Shaft sleeves				
4.5	Wear ring				
4.6	fasteners				
4.7	Gland				
4.8	Lantern ring				
4.9	Mechanical seals (faces)/ Gland packing				
4.10	Base plate				
5.0	CONNECTIONS AND OTHER DIMENSIONAL DETAILS				
5.1	Impeller diameter	mm			
6.0	DRIVE DATA				
6.1	Drive unit output at 50°C ambient condition	KW/ P			
7.0	INSPECTION & TESTING				
7.1	Material test				
7.2	Hydrostatic test pressure	Kg/cm ²			
7.3	Hydrostatic test duration	Min.			
7.4	Performance test on pump at shop				
7.5	Dyanamic balance test				
8.0	WEIGHT AND LOADING DATA				
8.1	Weight of the pump & drive assembly	Kg			
8.2	Weight of the heaviest piece to be handled	Kg			
8.3	Size of base plate (length x width)	mm			

		PROJECT: MISCELLANEOUS PUMPS DATASHEET - B		VENDOR DOC. NO.		REV NO.	
				BHEL DOC. NO.		REV NO.	
SL.	DESCRIPTION	UOM	PUMP DATA	PUMP DATA	PUMP DATA		
9.0	ADDITIONAL INFORMATION FOR VERTICAL PUMPS						
9.1	Type of pump						
9.2	No. of stages for Vertical Turbine Pump	Nos.					
9.3	Bowl Head	MLC					
9.4	Bowl Efficiency	%					
9.5	Setting Length	m					
9.6	Column pipe OD X Thickness	mm X mm					
9.7	No of column pieces	Nos.					
9.8	No of intermediate shafts	Nos.					
9.9	No of bearings	Nos.					
9.10	Type & make of Bearing						
9.11	Sealing/lubrication arrangement of bearings						
9.12	Capacity of overhead forced lubrication tank	m ³					
9.13	Nos of forced lubrication pumps	Nos.					
9.14	Capacity of forced lubrication pumps	m ³ /Hr					
9.15	TDH of forced lubrication pumps	MLC					

	TITLE	SPECIFICATION NO.
	<p align="center">MOTOR</p> <p align="center">DATA SHEET - C</p>	VOLUME III B
		SECTION B-2
		REV NO. 00 DATE 29/08/2005
		SHEET 1 OF 2

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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.
		VOLUME III
		SECTION B2
		REV NO. 00 DATE 29/08/2005
		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	Q / 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			

FORM No. PEM - 6020-2

CHECKLIST — LIST OF SCHEDULES

Sl. No.	Form No.	Description	Tick Applicable Forms
1.	PEM-6024	Schedule of Drawings / Catalogues submitted with Bid	✓
2.	PEM-6025@	Schedule of Occurance of Key Events of Delivery, Erection & Commissioning	
3.	PEM-6026	Schedule of Equipment Manufacture, Despatch and Shipment to Site.	✓
4.	PEM-6027	Schedule of Weights & Dimensions	
5.	PEM-6028@	Schedule of Performance Guarantee	
6.	PEM-6030	Inspection Schedule	✓
7.	PEM-6031	Schedule of Cement and Steel and Quarterly Cement Requirement	
8.	PEM-6032	Schedule of Quarterly Requirement of Reinforcing Bars and Structural Steel	
9.	PEM-6033@	Bill of Quantities (Civil Works)	
10.	PEM-6035	Schedule of Bidder's Proposed Construction / Site Fabrication Facilities.	
11.	PEM-6036	Schedule of Deviations	✓
12.	PEM-6040	Schedule of Declaration	✓
13.	PEM-6041	Quality Plan	✓
14.	PEM-6042	Vendor's Drawings / Documents Schedule	✓
15.	PEM-6043@	Schedule of Occurance of Key Events for Civil / Structural Works	
16.	PEM-6046	Inspection Request	✓
17.	PEM-6051	Schedule of Prices	✓
18.	PEM-6052@	Schedule of Unit Prices	✓
19.	PEM-6053	Schedule of Prices for Commissioning & Mandatory Spares	✓
20.	PEM-6054	Schedule of Prices for Recommended Spares	✓
21.	PEM-6055	Schedule Prices for Erection and Maintenance Tools & Tackles	✓
22.	PEM-6056	Schedule of Bidder's Man-power for Supervision of E & C and their Charges.	✓
23.	PEM-6057	Schedule of Daily & Overtime Rates	
24.	PEM-6058	Schedule of Hire-charges for Construction / Site Fabrication Facilities	
For Forms marked with @ certain information to be filled by DEs - before issuing to bidder.			

**SCHEDULE OF DRAWINGS /
CATALOGUES SUBMITTED WITH BID**

~~VOLUME III - PART A~~

~~SECRET~~

DRAWING /
CATALOGUE
NUMBER

NUMBER
OF SHEETS**PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE****COMPANY SEAL**

Sheet of[illegible]

We the undersigned hereby undertake to meet the schedule of occurrence of the key event as listed above regarding the delivery, Erection & Commissioning of Equipment/System

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE

SCHEDULE OF EQUIPMENT, MANUFACTURE, DESPATCH AND SHIPMENT TO SITE

SHEET OF .

We, the undersigned hereby undertake to meet the above time schedule in weeks for manufacture, despatch and shipment of each equipment and procurement of major boughtout items as listed above.

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TITLE

SCHEDULE OF WEIGHTS & DIMENSIONS

SPECIFICATION NUMBER

VOLUME III PART - A

SHEET _____ OF _____

The bidder shall state below the weights and dimensions of various packages for shipment covering the complete scope.

[illegible]

SPECIFICATION	NUMBER
---------------	--------

P.O.

~~NUMBER~~

VOL FIVE - III PART-A

SHEET 102

This schedule shall be in line with specification and quality plan requirements. The information in this form shall be furnished after receipt of LOI / PO.

PARTICULARS OF VENDOR's / AUTHORISED REPRESENTATIVE			
NAME	SIGNATURE	DATE	



TITLE

*** SCHEDULE OF DECLARATION**

SPECIFICATION NUMBER

VOLUME III PART - A

SHEET OF

DECLARATION

I certify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our formal proposal number Dated and there is no deviation to the specification.

I hereby certify that I am duly authorised representative of the Bidder's company whose name appears above my signature.

Bidders Company Name

Authorised representative's
Signature

Name

Bidder's Intent

The bidder hereby agrees to fully comply with the requirements and intent of this specifications for the price indicated.

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

[illegible]

(Form No. PEM-6042-0)

Column 1-	Serial Number
Column 2-	Component/Operation- The component and/or operation being checked shall be given here.
Column 3-	Characteristics check- The characteristics being checked shall be given here. e.g., chemical composition, mechanical properties, leak tightness, surface defects etc..
Column 4-	Category - 'CR' stands for critical characteristic - affecting safety of equipment and personnel 'MA' stands for major Characteristic - affecting safety of equipment and personnel 'MI' stands for minor characteristic - affecting appearance etc.
Column 5-	Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.
Column 6-	Extent of check, such as, 100, 10, 1 per heat etc.
Column 7-	Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done.
Column 8-	Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.
Column 9-	Format of Record - Formats, log sheets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.
Column 10-	Agency - The agency which performs the test/instruction shall be written in sub-column 'W' The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V' The agencies are codified '1' stands for (BHEL) as 1.2 & 3 '1' means the operation shall be cleared by BHEL before the start of the next operation. '2' Stands for Vendor '3' stands for sub-Vendor of the Vendor and so on.
Example :	
Entry	'3' in column 'P' means test/inspection to be performed by sub-Vendor's QC
Entry	'2' in column 'W' means test/inspection to be witnessed by Vendor's QC
Entry	'1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL
Column II-	Remarks - Any special remarks shall be given here.

1. In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn by BHEL and all tests as per relevant specifications shall be carried out in their presence or in recognized Government Laboratory.
2. When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be preserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless otherwise agreed.
3. For castings and forgings integral test specimens shall be provided. When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
5. This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings. If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
6. Wherever inspection by BHEL's Purchaser/Third Party/Statutory authorities are mandatory, this shall be complied with.
7. Inspection reports, log sheets, test reports/certificate, etc. shall be furnished to BHEL, at the appropriate stage or at the time of final inspection, as required.
8. This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor.
9. The quality plan shall be submitted in septuplicate (7 Copies).



**VENDOR's
DRAWINGS/DOCUMENTS SCHEDULE**
(Information in this form is to be furnished
only after receipt of LOI/IPO)

SPECIFICATION NO

VOLUME **III**

SECTION **PART-A**

REV NO. **0**

SHEET **1 OF 1**

TITLE OF SPECIFICATION

S. NO.	Vendor's Drawing/Document No. (VDN)	PEM's Drawing/Document No. (PDN)	First Submission Date
	TITLE		Final Approval Date
	VDN	PDN	
	TITLE		
	VDN	PDN	
	TITLE		
	VDN	PDN	
	TITLE		
	VDN	PDN	
	TITLE		
	VDN	PDN	
	TITLE		
	VDN	PDN	
	TITLE		
	VDN	PDN	
	TITLE		

PARTICULARS OF VENDOR's/AUTHORISED REPRESENTATIVE

NAME	SIGNATURE	DATE	COMPANY SEAL



**VENDOR's
DRAWINGS/DOCUMENTS SCHEDULE**
(Information in this form is to be furnished
only after receipt of LOI/IPO)

SPECIFICATION NO

VOLUME III

SECTION PART-A

REV. NO. 0

SHEET 1 OF 1

INSPECTION REQUEST
(From Vendor to BHEL Inspection Agency)

1. PROJECT TITLE

2. NAME OF VENDOR

3. BHEL'S LO/PO NO

DATE

4. SYSTEM/ITEM DESCRIPTION

5. ITEM BEING OFFERED FOR INSPECTION WITH SL. NO. AS PER LO/PO/BILLING SCHEDULE

6. DESCRIPTION AND SL. NO. OF INSPECTION AS PER QUALITY PLAN

7. QUANTITY OFFERED FOR INSPECTION

8. PLACE OF INSPECTION (FULL ADDRESS AND NAME OF SUB-VENDOR, IF ANY)

PLACE

ADDRESS

9. CONTACT PERSON (FOR SL. NO. 8 ABOVE)-

NAME

DESIGNATION

TELEPHONE

FAX

TELEGRAM

TELEX

10. THE FOLLOWING DOCUMENTS ARE APPROVED BY BHEL AND AVAILABLE AT PLACE OF INSPECTION

(A) QUALITY PLAN (B) DRAWINGS (C) DATA SHEETS, CHARACTERISTIC CURVES ETC.
(D) PLANT STANDARDS

11. REQUIRED DATE OF INSPECTION

WEEKLY OFF DAY

LIKELY DURATION (No. of working days)

WORKING HOURS

(At least 15 days prior notice shall be given by the Vendor to Inspection Agency)


We hereby certify that the above items are complete in all respects and have been fully inspected/tested by us and are found to be as per technical specification/approved drawings/data sheets/characteristic curves and are acceptable to our QC department. The detailed inspection and test reports of our QC department are enclosed.

VENDOR'S PARTICULARS

Name	Designation	Signature	Place	Date	Seal

FORM No. PEN - 6053-0

* Unpriced schedule shall also be furnished along with Part-A Schedule in Technical Bid.

		TITLE * SCHEDULE OF PRICES FOR COMMISSIONING AND MANDATORY SPARES				SPECIFICATION NUMBER VOLUME III SHEET OF			
<p>The bidder shall indicate here the quantity required for erection / commissioning and mandatory spares for equipment as listed in Section-C / Section - D. If the listed spares are not adequate, then the bidder shall indicate those and additional spares considered necessary by him.</p>									
Type	Manufacturer's Drawing No. / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity Required	If set. Nos Per set	Delivery period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)
Erection and Commissioning									
Mandatory Spares									
Additional Spares Mandatory Erection / Commissioning									
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE									

* Unpriced schedule shall also be furnished along with Part-A Schedule in Technical Bid.



TITLE

* SCHEDULE OF PRICES FOR RECOMMENDED SPARES

SPECIFICATION NUMBER

~~VOLUME III~~

~~SHEET~~ ~~OF~~

The bidder shall give below a list of spares recommended for three years (or as otherwise specified in section - C) for trouble free performance of the equipment / system offered.

[illegible]

SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS & TACKLES

SHEET _____ OF _____

The bidder shall give below the list of erection and maintenance tools and tackles as offered by him. This shall also include the customer's list of maintenance tools, if specified in Section - C / Section - D.

NOTE : The hire charges for vendor's equipment called for in this schedule shall include the cost of consumables, operation services, depreciation, wear and tear as well as vendor's over head and profit. (These rates will be payable by customer to the vendor, only if the customer's requires the use of this equipment for carrying out his own work out side the scope of this contract.)

\$3

FORM No. PEAT - 6056-D



TITLE

**SCHEDULE OF BIDDER'S MAN POWER
FOR SUPERVISION OF E & C
AND THEIR CHARGES**

SPECIFICATION NUMBER

VOLUME III

SHEET OF

The bidder shall indicate below, designation-wise, the personnel required for supervision of erection and commissioning and their charges.

SUPERVISION OF ERECTION

S. No.	Designation	Normal rate per day of 8 hours	Overtime rate per hour

SUPERVISION OF COMMISSIONING

S. No.	Designation	Normal rate per day of 8 hours	Overtime rate per hour

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

