

**GSECL**

**1 X 800MW WANAKBORI, UNIT-8**

**VOLUME -III**

**TECHNICAL SPECIFICATION  
FOR  
MISCELLANEOUS PUMPS**

**Specification No. : PE-TS-408-100-N001 (REV. 0)**



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



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-408-100-N001

MISCELLANEOUS PUMPS

VOLUME:

III

SECTION:

REV. NO.

0

DATE:

19.12.2015

**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 UNPRICED SCHEDULE OF PRICES (AS PER NIT FORMAT)
  - A.5 INPUTS FOR HT MOTORS
  - A.6 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-408-100-N001

MISCELLANEOUS PUMPS

VOLUME:

III

SECTION:

A

REV. NO.


0

DATE:

19.12.2015

## DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER

- A1 COMPLIANCE CERTIFICATE
- A2 SCHEDULE OF DEVIATIONS
- A3 SCHEDULE OF PERFORMANCE GUARANTEES
- A4 UNPRICED SCHEDULE OF PRICES (AS PER NIT FORMAT)
- A5 INPUTS FOR HT MOTORS
- A6 GENERAL ARRANGEMENT DRAWING

	TECHNICAL SPECIFICATIONS	SPECN. NO.:		PE-TS-408-100-N001	
	MISCELLANEOUS PUMPS	VOLUME:	III	SECTION:	A1
	COMPLIANCE CERTIFICATE	REV. NO.	0	DATE:	19.12.2015
<p>The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnish same with the offer.</p> <p>a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification &amp; there are no exclusions/ deviations with regard to same.</p> <p>b) QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification &amp; QP enclosed therein.</p> <p>QP will be subject to BHEL/ CONSULTANT/ CUSTOMER approval in the event of order &amp; 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.</p> <p>c) All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/ CONSULTANT/ CUSTOMER approval.</p> <p>d) There are no other deviation with respect to specification other than those furnished in the 'Schedule of Deviations'.</p> <p>e) Mandatory spares as indicated in Datasheet A shall be included in the base price</p> <p>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.</p> <p>f) 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.</p> <p>g) Prices for recommended spares (if any) for 3 years operation shall be furnished separately &amp; not included in the base price.</p> <p>h) The commissioning spares (if any) are supplied on 'As Required Basis' &amp; 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).</p> <p>i) All sub vendors shall be as per BHEL/CONSULTANT/CUSTOMER approved list.</p> <p>j) 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, than the equipment shall be rectified or replaced by the vendor, at his own cost.</p> <p>k) Any special tools &amp; tackles, if required, shall be in bidder's scope.</p> <p>l) 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.</p> <p>m) All selected motor ratings have minimum margins as per Datasheet A, Section D1 of Vol IIB</p>					
<p>We the undersigned hereby undertake to meet the compliance requirements as listed above on the conditions as elsewhere specified.</p>					
PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE					
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL	



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-408-100-N001**

VOLUME III PART - A

SHEET .....OF.....

Tick the applicable

\* Each type of deviation shall be listed on a separate sheet.

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

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

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

**SCHEDULE OF PERFORMANCE GUARANTEES****1X800MW WANAKBORI TPS, UNIT-8**

SPECN. NO.:

PE-TS-408-100-N001

VOLUME:

III

SECTION:

A3 Sheet 1 of 1

REV. NO.

0

DATE:

19.12.2015

**Following parameters are guaranteed for following pumps**

Sl. No.	Pump Description	Guaranteed Capacity	Guaranteed TDH	Guaranteed Pump Eff.	Guaranteed Motor Eff.	Guaranteed Power consumption at inlet to motor terminals	Pump model	Motor Rating	Pump GD <sup>2</sup> Value for HT motor only	Pump RPM	T/S Curve attached for HT motor
		(M3/Hr)	(MWC)	%	%	(KW)		(KW)			
<b>Horizontal pumps ( Group I)</b>											
1	# DMCW TG AUX. PUMPS	1065	38		94						YES
2	# DMCW SG AUX. PUMPS	910	58		94						YES
3	EMERGENCY HOTWELL MU PUMPS	140	50								
4	BOILER FILL PUMPS	200	170		94						YES
5	# CW MAKE UP PUMPS	950	10								
6	SERVICE WATER BOOSTER PUMPS	20	47								
7	POTABLE WATER PUMPS	20	65								
8	# HVAC PUMPS	50	72								
9	# CLARIFIED WATER TRANSFER PUMPS	150	20								
10	# AHP PUMPS	80	44								
11	DM MAKE UP PUMPS	25	50								
12	APH WASH/ ESP WATER WASH PUMPS	465	80		94						YES

Note: 1 # Bid evaluation and LD is applicable for these pumps only as per clause 4.00.00 & Data Sheet-A of Standard Technical Specification for pumps, Section D1, 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
------	-------------	-----------	------	--------------



TECHNICAL SPECIFICATIONS

SPECN. NO.:

PE-TS-408 100-N001

MISCELLANEOUS PUMPS

VOLUME:

III

SECTION:

B

REV. NO.


0


DATE:

19.12.2015

## 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 (REFER STANDARD PUMP QP ATTACHED AT SECTION D OF VOL II B)
- B.4 MOTOR DATASHEET -C ALONG WITH OTHER MOTOR DOCUMENTS
- B.5 MOTOR QAP (REFER STANDARD MOTOR QP ATTACHED AT SECTION D OF VOL II B)
- B.6 ELECTRICAL LOAD DATA
- B.7 SCHEDULE AS PER LIST


		PROJECT: MISCELLANEOUS PUMPS DATASHEET - B		VENDOR DOC. NO.	REV NO.
				BHEL DOC. NO.	REV NO.
SL.	DESCRIPTION	UOM	PUMP DATA	PUMP DATA	PUMP DATA
<b>1.0</b>	<b>GENERAL</b>				
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 <sup>2</sup>			
1.6	Specific Gravity of fluid to be handled	-			
<b>2.0</b>	<b>PERFORMANCE PARAMETERS</b>				
2.1	Performance standard				
2.2	Rated capacity. (No negative tolerance)	M <sup>3</sup> /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 <sup>3</sup> /hr			
	b) Max.Flow	M <sup>3</sup> /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 (2.9.2 is applicable in addition to 2.9.1 for Pumps with speed less than 600 RPM )				
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) Guaranteed power at motor input	KW			
2.13	NPSH required at rated capacity	MWC			
<b>3.0</b>	<b>DESIGN &amp; CONSTRUCTION FEATURES</b>				
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: MISCELLANEOUS PUMPS DATASHEET - B		VENDOR DOC. NO.	REV NO.
				BHEL DOC. NO.	REV NO.
SL.	DESCRIPTION	UOM	PUMP DATA	PUMP DATA	PUMP DATA
3.8	Specific speed $N = \frac{\text{RPM} \times (\text{Flow in USGPM})^{1/2}}{(\text{Head in Ft.})^{3/4}}$				
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 <sup>3</sup> /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.				
<b>4.0</b>	<b>MATERIAL OF CONSTRUCTION (Indicate applicable code/ standard)</b>				
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				
<b>5.0</b>	<b>CONNECTIONS AND OTHER DIMENSIONAL DETAILS</b>				
5.1	Impeller diameter	mm			
<b>6.0</b>	<b>DRIVE DATA</b>				
6.1	Drive unit output at 50°C ambient condition	KW/ P			
<b>7.0</b>	<b>INSPECTION &amp; TESTING</b>				
7.1	Material test				
7.2	Hydrostatic test pressure	Kg/cm <sup>2</sup>			
7.3	Hydrostatic test duration	Min.			
7.4	Performance test on pump at shop				
7.5	Dyanamic balance test				
<b>8.0</b>	<b>WEIGHT AND LOADING DATA</b>				
8.1	Weight of the pump & drive assembly	Kg			
8.2	Weight of the heaviest piece to be handled	Kg			

SL.	DESCRIPTION	UOM	PROJECT:		VENDOR DOC. NO.	REV NO.
			MISCELLANEOUS PUMPS DATASHEET - B		BHEL DOC. NO.	REV NO.
8.3	Size of base plate (length x width)	mm				
<b>9.0</b>	<b>ADDITIONAL INFORMATION FOR VERTICAL PUMPS</b>					
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 <sup>3</sup>				
9.13	Nos of forced lubrication pumps	Nos.				
9.14	Capacity of forced lubrication pumps	m <sup>3</sup> /Hr				
9.15	TDH of forced lubrication pumps	MLC				





	TITLE	SPECIFICATION NO.
	<p style="text-align: center;"><b>MOTOR</b></p> <p style="text-align: center;"><b>DATA SHEET - C</b></p>	VOLUME II B
		SECTION D
		REV NO. 00 DATE 08/09/2010
		SHEET 1 OF 7

**LT MOTORS**


**A. GENERAL**

1. Manufacturer & Country of origin.  
(Shall be as per approved QA make)
2. Equipment driven by motor
3. Motor type
4. Quantity

**B. DESIGN AND PERFORMANCE DATA**


1. Frame size
2. Type of duty
3. Type of enclosure /Method of cooling/Degree of protection
4. Applicable standard to which motor generally conforms
5. Efficiency class as per IS 12615
6. (a) Whether motor is flame proof Yes/No  
(b) If yes, the gas group to which it conforms as per IS:2148
7. Type of mounting
8. Direction of rotation as viewed from DE END\_\_
9. Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)
10. Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)
11. Maximum continuous load demand of driven equipment in KW
12. Rated Voltage (volts)
13. Permissible variation of :

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE	SPECIFICATION NO.	
	<p style="text-align: center;"><b>MOTOR</b></p> <p style="text-align: center;"><b>DATA SHEET - C</b></p>	VOLUME	II B
		SECTION D	
		REV NO. 00	DATE 08/09/2010
		SHEET	2 OF 7

- a. Voltage (Volts)
  - b. Frequency (Hz)
  - c. Combined voltage and frequency
14. Rated speed at rated voltage and frequency(RPM)
15. At rated Voltage and frequency:
- a. Full load current
  - b. No load current
16. Power Factor at
- a. 100% load
  - b. NO load
  - c. Starting.
17. Efficiency at rated voltage and frequency,
- a. 100% load
  - b. 75% load
  - c. 50% load
18. Starting current (amps) at
- a. 100 % voltage
  - b. 85% voltage
  - c. 80% voltage
19. Minimum permissible starting Voltage (Volts)
20. Starting time with minimum permissible voltage
- a. Without driven equipment coupled
  - b. With driven equipment coupled

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			


	TITLE	SPECIFICATION NO.
	<b>MOTOR DATA SHEET - C</b>	VOLUME II B
		SECTION D
		REV NO. 00 DATE 08/09/2010
		SHEET 3 OF 7

21. Safe stall time with 100% and 110% of rated voltage
  - a. From hot condition
  - b. From cold condition
22. Torques :
  - a. Starting torque at min. permissible voltage(kg-mtr.)
  - b. Pull up torque at rated voltage.
  - c. Pull out torque
  - d. Min accelerating torque (kg.m) available
  - e. Rated torque (kg.m)
23. Stator winding resistance per phase (ohms at 20 Deg.C.)
24.  $GD^2$  value of motors
25. No of permissible successive starts when motor is in hot condition
26. Locked Rotor KVA Input
27. Locked Rotor KVA/KW
28. Vibration limit :Velocity (mm/s)
29. Noise level limit (dBA)

**C. CONSTRUCTIONAL FEATURES**


1. Stator winding insulation
  - a. Class & Type
  - b. Winding Insulation Process
  - c. Tropicalised (Yes/No)

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE	SPECIFICATION NO.
	<p style="text-align: center;"><b>MOTOR</b></p> <p style="text-align: center;"><b>DATA SHEET - C</b></p>	VOLUME II B
		SECTION D
		REV NO. 00 DATE 08/09/2010
		SHEET 4 OF 7

- d. Temperature rise over specified maximum ambient temperature of 50 deg C
  - e. Method of temperature measurement
  - f. Stator winding connection
2. Main Terminal Box
- a. Type
  - b. Location (viewed from NDE side)
  - c. Entry of cables(bottom/side)
  - d. Recommended cable size (To be matched with cable size envisaged by owner)
  - e. Fault level (MVA), Fault level duration (sec)
  - f. Cable glands & lugs details (shall be suitable for power cable)
3. Type of DE/NDE Bearing
4. Motor Paint shade
5. Weight of
- a. Motor stator (KG)
  - b. Motor Rotor (KG)
  - c. Total weight (KG)
- D. List of accessories.**
- 1. Space Heaters (Applicable for 30 KW & above motor) (Nos./Power in watts/supply voltage)
  - 2. Terminal Box for Space Heater (Yes/No)
  - 3. Speed switch (Yes/No)  
No of contacts and contact ratings of speed switch

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE	SPECIFICATION NO.
	<p style="text-align: center;"><b>MOTOR</b></p> <p style="text-align: center;"><b>DATA SHEET - C</b></p>	VOLUME II B
		SECTION D
		REV NO. 00 DATE 08/09/2010
		SHEET 5 OF 7

4. Insulation of bearing (Yes/No)

5. Noise reducer(Yes/No)

6. Grounding pads

i) No and size on motor body

ii) Nos on terminal Box

7. Vibration pads

i) Nos and size

ii) Location

8. Any other fitments

**E. List of curves.**

1. Torque speed characteristic of the motor

2. Thermal withstand characteristic

3. Starting. current Vs. Time

4. Starting. current Vs speed

5. P.F. and Effi. Vs Load

**F. Additional Data to be filled for each rating of DC Motor**

1. Rated armature voltage (Volt)

2. Rated field excitation (Amp)

3. Permissible % variation in voltage


4. Minimum Permissible Starting voltage (volt)

5. At rated voltage

i) Full load Armature current.(Amp)


ii) Full load Field current (Amp)

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE	SPECIFICATION NO.
	<b>MOTOR</b>  <b>DATA SHEET - C</b>	VOLUME                      II B
		SECTION D
		REV NO. 00    DATE 08/09/2010
		SHEET            6    OF    7

- iii) No load Armature current (Amp)
- 6. Full load Field current (Amp)
- 7. No load Aramature current (Amp)
- 8. Minimum permissible field current(Amp) to avoid overspeeding at
  - i) Maximum permissible voltage
  - ii) Rated voltage
  - iii) Minimum Permissible Voltage
- 9. Resistance (indicative Values) in ohm
  - i) Armature winding (Arm + IP + Series) at 25 deg.C
  - ii) Field Winding at 25 deg. C
- 10. Inductance (indicative values)
  - i) Armature winding
  - ii) Field winding
- 11. Value of trimmer resistance (ohm) to be connected in series with the shunt field to obtain rated speed at
  - i) 220 V DC
  - ii) 250 V DC
  - iii) 187 V DC
- 12. Value of the external resistance (ohm) required to be connected in series with armature during starting only
- 13. Technical data sheet for external resistance box
- 14. GA drawing of motor
- 15. Starting time calculation

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE	SPECIFICATION NO.
	<p style="text-align: center;"><b>MOTOR</b></p> <p style="text-align: center;"><b>DATA SHEET - C</b></p>	VOLUME                      II B
		SECTION D
		REV NO. 00    DATE 08/09/2010
		SHEET        7        OF    7

- 16.                    Starter resistance design calculation
- 17.                    Electrical connection diagram of motor

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

**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 Occurrence 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 Occurrence 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-6057	Schedule of Daily & Overtime Rates.	
23.	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**

SPECIFICATION NO:

VOL III

SHEET..... OF.....

**Section C/D enclosed with the specification indicate the drawings / catalogues to be furnished with the bid. The bidder in addition to furnishing the same, can also include any other drawings / catalogues which he may desire to submit with the bid. This schedule duly lists out such drawings as enclosed by the bidder with the bid.**

DRAWING/ CATALOGUE NUMBER	DESCRIPTION	NUMBER OF SHEETS

**PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE**

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



**SCHEDULE OF EQUIPMENT,  
MANUFACTURE, DESPATCH AND  
SHIPMENT TO SITE**

SPECIFICATION NO:

VOL III

SHEET..... OF.....

Equipment/Major Bought-out items	Time for Manufacture/ Procurement from Date of issues of Letter of intent (Weeks)	Time for Test Dismantling Packing & Ready for Despatch (Weeks)	Time required fro Shipment to Site (Weeks)	Total Time from Date of Issue of Letter of intent to Shipment to Site (Weeks)

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

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



**SCHEDULE OF  
WEIGHTS & DIMENSIONS**

SPECIFICATION NO:

VOL III

SHEET..... OF.....

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

Description of Package(S)	Dimension (in meters)	Weight (in tones)

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



**INSPECTION SCHEDULE**

SPECIFICATION NO


VOL III

SHEET..... OF.....

S No.	ITEM/COMPONENT	PLACE & ADDRESS OF TEST / INSPECTION	SCHEDULE D DATE OF INSPECTION	DURATION OF TEST / INSPECTION (IN DAYS)

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

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

	<b>TITLE</b> <b>* SCHEDULE OF DEVIATIONS</b> ( ) From Conditions of Contract (Volume – 1) ( ) From General Technical Conditions (Volume – II A ) ( ) From Technical Specifications (Volume –II B)	SPECIFICATION NO
		VOL III
		SHEET..... OF.....

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

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

	<b>TITLE</b> <b>* SCHEDULE OF DECLARATIONS</b>	SPECIFICATION NO
		VOL III
		SHEET..... OF.....

\* Bidder shall include this schedule both in technical and Price offers

**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 format proposal number Dated ..... and there is no deviation to the specification.

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

Biders Company Name .....

Authorised representative's Signature .....

Name .....

Bider's Name The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated

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

6: ISO FORMS / P & M FORMS

Bid FORM No. PEM - 6041-0

S. NO.		QUALITY PLAN										SPECIFICATION NUMBER	
		COMPONENT / OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
		SHEET	OF	SYSTEM	ITEM	QUALITY PLAN NUMBER	PROJECT TITLE	CUSTOMER		SPECIFICATION TITLE		SECTION	VOLUME III
1		2	3	4	5	6	7	8	9	10			11
		BHEL											
		PARTICULARS										BIDDER / VENDOR	
		NAME											
		SIGNATURE											
		DATE											
												BIDDER'S / VENDOR'S COMPANY SEAL	

**INSTRUCTIONS FOR FILLING QUALITY PLAN**  
(Form No. PEM-6042 (1))

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:

- 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 as 1, 2 & 3  
'1' stands for (BHEL)  
'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.

**NOTES**

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 compiled with.
7. Inspection reports, log sheets, test reports/certificate, etc. shall be furnished to BHEL at the appropriate stages 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).



**\*SCHEDULE OF PRICES FOR COMMISSIONING AND MANDATORY SPARES**

SPECIFICATION NO

VOL III

SHEET..... OF.....

**\*Unpriced schedule shall also be furnished along with Part A- Schedule in technical bid**

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.

Type	Manufacturer's Drawing No / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity Recommended	If Set, Nos. Per Set	Delivery Period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)
Erection & Commissioning									
Mandatory Spares									
Additional Spares Mandatory Erection / Commissioning									

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

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



	<b>TITLE</b> <b>* SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS &amp; TACKLES</b>	SPECIFICATION NO
		VOL III
		SHEET..... OF.....

**\*Unpriced schedule shall also be furnished along with Part A- Schedule in technical bid**  
 The bidder shall be given 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

S. No	DESCRIPTION OF TOOLS & TACKLES	QUANTITY OFFERED	UNIT PRICE (Rs.)	TOTAL PRICE (Rs.)

**NOTE :** The hire charges for vendors equipment called for in this schedule shall include the cost of consumables, operation services, descriptions, 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).

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