1X370 MW YELAHANKA CCPP (KPCL)

TECHNICAL SPECIFICATION
FOR
COOLING TOWERS

VOLUME -III

Specification No. : PE-TS-409-165-N001

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
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 (to be submitted at contract stage), which are to be duly filled by the bidder and the same shall be furnished with the technical bid.

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.

INDEX

DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER

- COMPLIANCE CERTIFCATE
- SCHEDULE OF DEVIATIONS
- SCHEDULE OF PERFORMANCE GUARANTEE
- SCHEDULE OF PRICES
- SCHEDULE OF UNIT PRICES
- ELECTRICAL LOAD DATA

COMPLIANCE CERTIFICATE

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

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions with regard to same.

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 Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc.

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

e) The offered materials shall be either equivalent or superior to those specified in the specification.

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

f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself. Prices for special tools & tackles, if any, shall also be included in the base price.

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

h) The Performance guarantees shall stand valid till at least eighteen (18) months after full load commissioning of CT or as per commercial terms and conditions, whichever is later.

i) Specifically confirm compliance with Cl. Nos. 6.0 and 11.0 and their sub clauses of Sec. C1 of Technical Specification specification.

j) The hydrostatic testing of piping shall be carried out as specified i.e. at 1.5 times the design pressure.

k) Thermal design calculations and CT drawings for fill arrangements for the Project shall be got vetted and approved from any of the IIT's (Indian Institutes of Technology) in the event of order.

l) Complete mechanical equipment handling arrangement shall be provided by bidder:

- For lifting of complete equipments from ground to deck level.
- For moving of equipment at the deck level to desired installation.

The complete handling arrangement shall be of adequate design for ease of handling by the operator effortlessly. The details shall be submitted in the event of order and shall be subject to purchaser's approval.

FORM No. PEM - 6036-0

	TITLE	SPECIFICATION NUMBER
	*** SCHEDULE OF DEVIATIONS** ( ) From Conditions of Contract (Volume - I) ( ) From General Technical Conditions (Volume - II A) ( ) From Technical Specifications (Volume - II B)	**PE-TS-409-165-N001** VOLUME III PART - A SHEET ..... OF .....

* Each type of deviation shall be listed on a seperate sheet. ☑ Tick the applicable

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

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

1.	Guaranteed Pumping head at design capacity (viz. static lift w.r.t. FGL up to top of topmost pipe without any siphon recovery & frictional losses from bidders terminal point onwards including 10% margin, etc)	MWC
2.	Guaranteed Power Consumption at inlet to motor terminals of fans, at design capacity and design conditions	
	Per Fan motor	KW
	Total for the working Cells, per CT	KW
3.	Guaranteed Cold water temperature at design capacity & parameters with the working cells	Deg. C

	TITLE : SCHEDULE OF PRICES **1X370 MW YELAHANKA CCPP (KPCL)**	**SPEC NO:** **PE-TS-409-165-N001** Vol. III

SL. NO.	** Description of Works Or Equipment/ System	Prices (in Lakhs of Rs.)
1.	**A)** Total **Price for One (1) no. Induced Draft Cooling Tower** For Design, Manufacture, Inspection/ Testing, Supplies, Packing for transportation & delivery complete with commissioning spares/ special tools and tackles/ including all accessories & equipments, Civil Works (excluding Cement & Steel), piling (if required), Erection works, Commissioning and Performance testing as specified and as necessary for completion for cooling tower in all aspect.	Rs
	B) Total Price for Mandatory Spares for IDCT: (Mandatory spares list as per Data sheet-A, Section-D, Vol-IIB)	Rs
	C) Total (A+B)	Rs
	Note: Bidder to Indicate all duties, taxes, etc. stating whether included/ excluded in above prices.	

Bidder shall furnish this price Schedule in his price offer only

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	TITLE : SCHEDULE OF UNIT PRICES **1X370 MW YELAHANKA CCPP (KPCL)**	**SPEC NO:** **PE-TS-409-165-N001** Vol. III

SL. NO.	** Description of Works Or Equipment/ System	Prices (in Lakhs of Rs.)

1.0 Break up of Cl. 1.0 of "Schedule of Prices" for design, manufacture supplies and site works:

a) Design and engineering of one (1) no. CT — **Rs.**

b) Manufacture and supply of following for one (1) no. CT — **Rs.**
- Complete mechanical equipments
- Complete electrical and C&I equipments

c) Complete Civil works and piling (as required) of one (1) no. CT.
- Civil Works — **Rs.**

d) Cement & steel requirement(Free issue as per NIT)
(i) Cement — **Total Tonnes**
(ii) Steel — **Total Tonnes**

e) Erection & Commissioning of following for one (1) no. CT: — **Rs.**
- Complete mechanical equipments
- Complete electrical and C&I equipments

f) Performance Guarantee testing of one (1) no. CT. — **Rs.**

g) Mandatory spares (IDCT): — **Unit price** — **Total price**

i)	Fan bearings:---------	Two (2) Sets
ii)	Fan blade assembly:	One (1) Set
iii)	Motor bearings:-------	One (1) Set
iv)	Gear box assembly:-	One (1) Set
v)	Fan drive shaft:-------	One (1) Set
vi)	Oil seals / O-rings:--	50% of total requirement
vii)	Spray nozzles:-------	10% of total requirement

Note:

1.0 Sum total of Cl. 1.0 should match Cl. 1.0 (Schedule of prices) for one(1) IDCT. In the event of discrepancy the least of two figures shall be considered for award of contract.

2.0 Prices of commissioning & erection spares shall be included in the price of cooling tower.

Bidder shall furnish this price Schedule in his price offer only

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

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.	VERIFICATION FROM MOTOR DATASHEET (Y/N)	KKS NO
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

ANNEXURE-II

NOTES:
1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER
2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V
: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

	LOAD DATA (ELECTRICAL)	JOB NO.	409	ORIGINATING AGENCY		PEM (ELECTRICAL)
		PROJECT TITLE	1X370MW YELAHANKA TPS	NAME		DATA FILLED UP ON
		SYSTEM	IDCT	SIGN.		DATA ENTERED ON
		DEPTT. / SECTION	MSE	SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE

DOCUMENTS TO BE SUBMITTED ON THE PLACEMENT OF ORDER

- DATA SHEET-B COOLING TOWERS
- LIST OF SCHEDULES A OVERLEAF

	TITLE : DATA SHEET - B FOR INDUCTED DRAFT COOLING TOWER **1X370 MW YELAHANKA CCPP (KPCL)**	**SPECIFICATION NO.** **PE-TS-409-165-N001**
		VOLUME : III
		SECTION : A
		DATE : 30.12.2015
		SHEET 1 of 10

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
1.0	Type Model No. (Single air inlet, Double air inlet)		
2.0	Quantity	Nos/Unit	
3.0	Rated Capacity	M^3/Hr	
4.0	No. of Cells a) Working b) Standby	Nos./Tower	
5.1	Ambient Design Wet Bulb Temperature	°C	
5.2	Recirculation Allowance	°C	
5.3	Design Inlet Wet Bulb Temp (including recirculation allowance)	°C	
6.0	Cold Water Temperature	°C	
7.0	Cooling Tower Approach	°C	
8.0	Cooling Tower Range	°C	
9.0	Cooling Tower Loss		
	a. Evaporation Loss		
	b. Drift Loss		
	c. Blow Down Loss (Concentration Factor to be indicated)		
10.0	Basin Storage capacity	M^3/hr	
11.0	Cell size (Length x Width x Height)	M x M x M	
12.0	Overall Size of Cooling Tower (Length x Width x Height)	MxMxM	
13.0	Required Pumping Head including all	M	

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
	losses measured from basin, curb level		
14.1	Dia of fan stack	Metres	
15.0	Cooling Tower Levels		
	a. Graded Level	M	
	b. Maximum Water Level	M	
	c. Basin Curb Level	M	
	d. Minimum Water Level	M	
	e. Basin Bottom Level	M	
16.0	Overall Tower Height from Basin Floor	M	
17.0	Basin Dimensions		
	a. Length	M	
	b. Width	M	
	c. Depth (from basin curb)	M	
18.0	Free Board (Above Max. Water Level)	mm	
19.0	Heat Transfer Data	mm	
	a. Heat Transfer Coefficient (K)		
	b. Tower Coefficient © Ka V/L	M	
	c. Average Fill Height	M	
	d. Total Fill Volume	M^3	
	e. Total Water wetted surface	Sq. M	
	e. Total Tower Wetted Surface	M^2	
20.0	Hot Water Distribution Piping		
	a. Size (OD X Thk)	Mm X mm	
	b. Elevation of Center Line of Hot Water distribution Header	M	
	c. Design pressure for Hot Water Distribution System	Kg/cm^2 (g)	
21.0	Isolation Valves in Hot Water Risers		
	a. Size	mm	
	b. Quantity		

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
	➢ For Counter flow towers	Nos./ cell	
	➢ For cross flow tower	Nos. /Cells	
	c. Type/Code & Standard		
	d. Make		
	e. Pressure drop across the valve in fully open position	MWC	
	f. Materials of Construction		
	i) Body		
	ii) Disc		
	iii) Drive Shaft/Stub Shaft		
	iv) Bearings		
	g. Test Pressure duration	$kg/cm^2(g)$ Minutes	
22.0	Flow Control Valves (If Applicable)		
	a. Make		
	b. Size	Mm	
	c. No. of Cell	Nos.	
	d. Materials of Construction		
	i) Body		
	ii) Spindle		
	iii) Trim		
23.0	Isolating Valve in Sludge Pit		
	a. Size	Mm	
	b. Quantity	Nos./Tower	
	c. Type		
	d. Make		
	e. Conform to which code in respect of design/testing		
	f. Materials of Construction		
	i) Body		
	ii) Stem		
	iii) Trim		
24.0	Stationary Screen		
	a. Quantity	Nos. Tower	
	b. Size & Material of Bar		
	c. Clear Space between the bar		
	d. Lifting Arrangement		

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
25.0	Fill & Fill Supports		
	a. Type of fill		
	b. Material		
	c. Type of treatment (in case of timber fill)		
	d. Expected Life	Years	
	e. Arrangement of Fill/splash bars (horizontal etc.)		
	f. Method to prevent dislocation of Fills	Years	
	g. Type/Material/Size of fixing arrangement to supporting grid		
	h. Fill Support Grids		
	i) Type		
	ii) Material (give full specification)		
	iii) Size		
	iv) Colour of Fill		
	i. Grid Supporting Frames		
	i) Type		
	ii) Material (give full specification)		
	iii) Size		
	j. Fasteners		
	i) Type		
	ii) Fill		
	iii) Fill Support Grids		
	iv) Frames for Supporting the Grids		
26.0	Drift Eliminators		
	a. Number of Passes		
	b. Gross Face Area per pass	M^2	
	c. Type		
	d. Eliminator Blades		
	i) Material	mm	
	ii) Maximum Length of blade		
	iii) Size and shape of blades		

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
	iv) Type and material of drain boards		
	e. Blade Support Spacers i) Type ii) Material		
27.2	FANS		
	a) Manufacturer		
	b) Type		
	c) Model Number		
	d) Number furnished	Nos./Tower	
	e) Diameter	Metre	
	f) Number of Blades/fan		
	g) Fan speed	RPM	
	h) Tip speed	Metre/Sec/	
	i) Blade tip clearance	mm	
	j) BHP per fan		
	k) Air delivery per fan		
	l) Fan static efficiency		
	m) Blade material		
	n) Hub material		
	o) Fasteners & Hardware material		
	p) Entire fan assembly statically balanced		
	q. Total differential pressure drop mm H20 (considering receovery_		
	i. Drop through louvers	mm of HFO	
	ii. Drop through fills	mm of HFO	
	iii. Drop though eliminators	mm of HFO	

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
	iv. Velocity pressure	mm of HFO	
	v. Drop through plenum	mm of HFO	
	r. Noise level of fan at rated pitch and speed		
	s. Total guaranteed power consumption at motor inlet (to be supported by calculations)	KW/Fan	
	t. Fan motor rating	KW	

28.0 **GEAR REDUCER**

a) Manufacturer
b) Model Number
c) Reduction Ratio
d) Service factor at rated HP of drive
e) Bearing and material
f) Material of gear tooth and hardness.

29.0 **DRIVE SHAFT**

a) Manufacturer
b) Number
c) Rated HP
d) Drive and shaft material
e) Coupling material
f) Number of couplings furnished per driving unit
g) Type of couplings and whether coupling guard provided.
h) Drive shaft statically dynamically balanced.

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
30.0	**Gate in Cold Water Outlet Channel**		
	a. Number per cold water outlet channel		
	b. Gate Type		
	c. Name of Manufacturer		
	d. Gate Size		
	e. Weight of each gate		
	f. Are elements of gate dismantling type?		
	g. Weight of each Element		
	h. Frame Type		
	i. Fixing arrangement of frame with RCC channel		
	j. Lifting Arrangement of Gate		
	k. Type of treatment for the wood (in case of wooden gates)		
	l. Expected Life	Years	
31.0	**VERTICAL SLUDGE PUMP & MOTOR (Optional Item)**		
	Vertical sludge pumps complete with electric motors, valves, piping and fittings at their discharge offered.	Yes/No.	
	a. Make & Model No.		
	b. Rated capacity	M^3/Hr	
	c. TDH	MWC	
	d. Pump speed	RPM	
	e. Pump efficiency	RPM	
	f. Power consumption at rated flow	KW	
	g. Motor HP provided	HP/KW	

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
	h. Material of Construction i) Impeller ii) Casing iii) Pump & Line Shaft iv) Bearings v) Impeller/Casing Wearing Rings		
32.	a) Oil Level Indication in Gear Box provided	Yes/No	
	b) Vertical Switch ➢ Type & Model No. ➢ Manufacturer ➢ Contact rating		
33.0	**Cooling Tower Materials of Construction** a. Casing b. Louvers c. Cell Partition Walls d. Basin Partition Walls e. Stack f. Stair Case g. Hot Water piping h. Hot Water distribution basin i. Internal Walkways j. Supporting Structure k. Hand Rails l. Structure Connector m Bolts, nuts, washers and other hardware n. Nails o. Anchor Bolts p. Hot Water Distribution Nozzle q. Hot Water distribution Plates r. Spacers s. Mechanical Equipment Support		
34.0	**Weight of Equipments** a. Weight of Heaviest part to be handled	Kgs.	

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
	b. Size of largest part to be handled		
	c. Weight of gear box	kg.	
	d. Weight of fan drive motor		
35.0	**Inspection & Testing**		
	a. Hydro Test Pressure for Hot water piping		
	i) Test Pressure	Kg/cm^2 (g)	
	ii) Duration	Minutes	
	b. Balancing test for the fan and the drive shafts shall be conducted.	Yest/No	
	c. Field performance test for the tower shall be conducted.	yes/No	
36.0	**Painting Details**		
	a. **Externally painted Surfaces**		

	External Surface	**Surface Prepara-tion**	**Primer**	**Final Paint**
i.	Piping (Under Ground)			
ii.	Piping (Over Ground)			
iii.	Stationary Screens			
iv.	Drive shaft			
v.	Fan gear box			
vi.	Fan hub			
vii.	Hoist Derric			
viii.	Other Items			

b. **Internally painted Surfaces**

	Internal Surface	**Surface Prepara-tion**	**Primer**	**Final Paint**
i.	Piping and Valves			
ii.	Other Items			

37.0	Flow per cell at design condition	M^3/Hr	

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
38.0	Maximum Water Handling capacity (per cell)	M^3/Hr	
39.0	Cooling Water Flow Rate (L)	$Kg/m^2/Hr$	
40.0	Dry Air Flow Rate (G)	$Kg/m^2/Hr$	
41.0	Ratio of Water to Air	(L/G)	
42.0	Dry Air Flow	Kg/Hr	
43.0	Temperature of air leaving the Stack	°C	
44.0	Inlet air Enthalpy	KCal/Kg	
45.0	Exit air Enthalpy	KCal/Kg	
46.0	Total Heat Exchange/Kg of Inlet Dry air	KCal/Kg	
47.0	Losses in hot water piping in MWC	MWC	
48.0	Type of air inlet	MWC	
49.0	Pressure recovery from fan stack	mm	
50.0	Air inlet are per cell	Max.	
51.0	Splash surface of fill per cell in	M^2	
52.0	Whether fan blades are adjustable degree of pitch adjustment	°C	
53.0	Max. possible discharge through fan (indicate angle of pitch)	M^3/Hr	
54.0	Design value of discharge through fan (indicate angle pitch)	M^3/Hr	
55.0	Weight of complete fan assembly	kg	

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.			

FORM No. PEM - 6024-0

	TITLE	SPECIFICATION NUMBER
BHEL	**SCHEDULE OF DRAWINGS / CATALOGUES SUBMITTED WITH BID**	VOLUME III PART - A
		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

	TITLE : SCHEDULE OF OCCURRENCE OF KEY EVENTS OF DELIVERY ERECTION AND COMMISSIONING	SPECIFICATION NUMBER: VOLUME III PART-A Sheet of

EQUIPMENT/SYSTEM.	DESCRIPTION OF KEY EVENTS	MONTHS FROM (DATE OF LOI)

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

FORM No. PEM - 6026-0

	TITLE	SPECIFICATION NUMBER
BHEL	**SCHEDULE OF EQUIPMENT, MANUFACTURE, DESPATCH AND SHIPMENT TO SITE**	VOLUME III PART - A SHEET ..... OF .....

Equipment / Major Bought-out Items	Time for Manufacture/ Procurement from Date of Issue of Letter of Intent (Weeks)	Time for Test, Dismantling Packing & Ready for Despatch (Weeks)	Time required for 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 above time schedule in weeks for manufacture, despatch and shipment of each equipment and procurement of major boughtout items as listed above.

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

FORM No. PEM - 6027-0

	TITLE	SPECIFICATION NUMBER
BHEL	**SCHEDULE OF WEIGHTS & DIMENSIONS**	VOLUME III PART - A
		SHEET ..... OF .....

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

Description of Package(s)	Dimensions (in meters)	Weight (in tonnes)

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

FORM No. PEM - 6030-0

INSPECTION SCHEDULE

SPECIFICATION NUMBER

P.O. NUMBER

VOLUME - III PART-A

SHEET OF

S. No.	ITEM/COMPONENT	PLACE & ADDRESS OF TEST / INSPECTION	Scheduled Date of Inspection	Duration of Test / Inspection (in days)

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	COMPANY SEAL

FORM No. PEM - 60410

	TITLE	SPECIFICATION NUMBER
BHEL	* SCHEDULE OF DECLARATION	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.

Biders 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				
NAME				COMPANY SEAL

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

FORM No. PEM — 604

	QUALITY PLAN	CUSTOMER	PROJECT TITLE	
		BIDDER / VENDOR	QUALITY PLAN NUMBER	PACKAGE MISC. PUMPS
	SHEET OF	SYSTEM	ITEM	SECTION VOLUME III

COMPONENT / OPERATION	CHARACTE-RISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
								P	W	V	
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-6042-0)

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 shets, 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 11- 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 bgy BHEL and all tests as per relevent 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 presserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless other wise 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 BHELs 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 appropreate 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).

BHEL	**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	
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	VDN	PDN	
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	VDN	PDN	
	TITLE		
	VDN	PDN	
	TITLE		
	VDN	PDN	
	TITLE		

PARTICULARS OF VENDOR's/AUTHORISED REPRESENTATIVE

NAME	SIGNATURE	DATE	COMPANY SEAL

BHEL	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 LOI/PO NO | DATE

4. SYSTEM/ITEM DESCRIPTION

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

6. DESCRIPTION ANS 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 :..... LIKELY DURATION(No.of working days).....
WEEKLY OFF DAY : 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. PEM - 6053-0

	TITLE	SPECIFICATION NUMBER
BHEL	* SCHEDULE OF PRICES FOR COMMISSIONING AND MANDATORY SPARES	VOLUME III
		SHEET ..... OF .....

The bidder shall incidate 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 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

NAME				COMPANY SEAL

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

FORM No. PEM - 6054-0

	TITLE	SPECIFICATION NUMBER
BHEL	* SCHEDULE OF PRICES FOR RECOMMENDED SPARES	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.

S. No.	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.)

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

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

FORM No. PEM - 6055-0

BHEL	TITLE **SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS & TACKLES**	SPECIFICATION NUMBER VOLUME III SHEET ..... OF .....

The bidder shall be 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.

S. No	Description of Tools & Tackles	Quantity offered	Unit Price (Rs.)	Total Price (Rs.)

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.)

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

FORM No. PEM - 6056-0

	TITLE	SPECIFICATION NUMBER
BHEL	SCHEDULE OF BIDDER's MAN POWER FOR SUPERVISION OF E & C AND THEIR CHARGES	VOLUME III
		SHEET ..... OF .....

The bidder shal indicate below, designation-wise, the personnel required for superivsion 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

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

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE
