

CLAUSE NO.	LT SWITCHGEAR
	<ul style="list-style-type: none"> f) hand reset lockout relay with a blue lamp for monitoring. 3) incomers/bus coupler/outgoing breaker feeders other than motor feeders <ul style="list-style-type: none"> a) Definite time delay short circuit protection b) Hand reset lockout relay with a blue lamp 4) Incomer From DG Set. <ul style="list-style-type: none"> a) Differential Protection (87) - Three Pole b) Reverse Power Protection. c) Overload Alarm on one phase d) Earth Fault Detection Relay (64) e) Voltage controlled overcurrent relay e) Generator under/over voltage Protection f) Hand Reset/Lockout Relay with a blue lamp. g) 3 Phase Energy Meter having accuracy of 1.0 class.
5.04.05	<p>Meters / instruments</p> <p>All meters/ instrument shall be flush mounted on front panel, at least 96 sq.mm. size with 90 degree linear scales and accuracy class of 2.0.</p>
5.04.06	<p>All motors of 30kW and above shall have an Ammeter. Bus-section shall have bus VT, voltmeter with selector switch, and other relay and timers required for protection. Adequate control and selector switches, push buttons and indicating lamps shall be provided. Thermostatically controlled space heaters with switches shall be provided to prevent condensation.</p>
5.04.07	<p>In case of remote controlled breaker panels, following shall be ensured.</p> <p>Each feeder shall have local/remote selector switch. Closing from local shall be possible only in test position whereas closing from remote shall be possible in either service or test position. Tripping from local shall be possible only when local/remote selector switch is in local position. Tripping from remote shall be either breaker in service position or selector switch being in remote position.</p>
05.00	<p>Control from Remote</p> <p>Necessary hardware shall be provided in the switchgear panel like coupling relays (24V DC, with max burden 2.5VA), auxiliary relays, current & voltage transducers (4-20 mA, dual output) etc. to effect interlocks, exchange information / status and exercise control from remote.</p>

CLAUSE NO.	LT SWITCHGEAR
6.00.00	DESIGN AND CONSTRUCTIONAL FEATURES
6.01.00	<p>All 415V switch gear motor control centers (MCCs), AC & DC distribution boards (DBs), etc shall have following features :</p> <ol style="list-style-type: none"> 1) Shall be of metal enclosed, indoor, floor mounted and free standing type. 2) All frames and load bearing members shall be fabricated using mild steel structural sections or pressed and shaped cold rolled sheet steel of thickness not less than 2mm. 3) Frame shall be enclosed in cold rolled sheet steel of thickness not less than 1.6mm. Doors and covers shall also be of cold rolled sheet steel of thickness not less than 1.6 mm. Stiffeners shall be provided wherever necessary. Removable gland plates of thickness 3mm (hot/cold rolled sheet steel) or 4 mm (non-magnetic material) shall be provided for all panels. 4) All switchboards/panels shall be of dust and vermin proof. All cutouts shall have synthetic rubber gaskets. 5) For motors above 160kW, remote controlled electrical circuit breakers, and for smaller motors, switch-fuse contactor feeders shall be provided. The other outgoing feeders would be switch-fuse units or moulded case circuit breakers. 6) All switchboards, MCCs and DB s shall have following distinct vertical sections. <ol style="list-style-type: none"> a) Completely enclosed bus bar compartment for horizontal and vertical bus bars. b) Completely enclosed switchgear compartments (one for each circuit housing circuit breakers, motor starter or switch-fuse feeder). c) Compartment for cable alley or cable box for power and control cables In case of cable box, they shall be segregated with complete shrouding for individual feeders at the rear for direct termination of cables. d) For cable connection to circuit breaker, a separately enclosed cable compartment shall also be acceptable. e) Compartment for relays and other control devices associated with a circuit breaker, wherever necessary. f) The switchboards/MCC/DBs of 1600A & above rating shall be of DOP IP42 & of IP52 for less than 1600A rating g) All 415V switchgears, MCC's, AC & DC distribution boards etc. shall be painted by powder coating process. Paint shade shall be as follows

CLAUSE NO.	LT SWITCHGEAR	
	(i) Front & Back	: RAL 9002
	(ii) Extreme end covers	: RAL 5012
7)	Busbars shall be of high conductivity aluminium alloy or copper.	
8)	Minimum air clearance in air between phases and phase-earth shall be 25 mm for busbars and cable terminations. For all other components, the Clearances shall be at least 10mm. Wherever above is not possible except for horizontal and vertical busbars, insulation shall be provided by anti tracking sleeving or barriers. However for horizontal and vertical busbars, clearances specified above shall be maintained even when busbars are insulated/sleeved. In case of DC DBs/ fuse boards, the busbar system shall be insulated or physically segregated with barriers to prevent interpole short circuit.	
9)	Busbar insulators shall be of track-resistant high strength non-hygroscopic, non-combustible type and suitable to withstand stresses due to over-voltages and short circuit current. Insulators and barrier of inflammable material such as Hylam shall not be accepted.	
10)	All types of relays and timer shall be subject to Employer's approval. They shall be flush mounted with connections from inside, and shall have transparent & dust tight cover, removable from front, drawout construction for easy replacement and testing facility. The auxiliary relays and timer may be provided in fixed cases.	
11)	Maxi terminal /cage clamp type terminal blocks shall be provided for signals to be interfaced with DDCMIS/PLC.	
12)	The switchgears/MCC shall be designed to offer adequate level of safety to operating/maintenance personnel. Means shall be provided to prevent access to the live part to avoid accidents during service as well as maintenance period. Bidder shall bring out the safety means provided to achieve above. A detailed instruction plate suitable for wall mounting shall be provided for each switchgear/MCC room describing various safe operating procedure/safety precautions for safe operation and maintenance of switchgear/MCC.	
13)	All current and voltage transformers as required for metering & protection specified shall be completely encapsulated, cast resin insulated type. Incomers from transformers shall have CTs for transformer REF protection. All current and voltage transformers as required for metering and protection specified shall be completely encapsulated, cast resin insulated type. Incomers from transformers shall have CTs for transformer restricted earth fault protection. The accuracy shall be as follows:	
	CTs	PTs
	Protection	3P
	Metering	10
	REF	PS

CABLES SPECIFICATIONS


POWER CABLES:

1.1 kV grade, power cables with stranded compacted Aluminium conductor, XLPE insulated, PVC type ST2 extruded inner sheathed (no inner sheath for single core cables), Galvanised steel single layer round wire/ formed wire (non magnetic hard drawn aluminium single layer round wire H4 grade for single core cables) as per IS : 3975 (where applicable) and extruded PVC Type ST2 outer sheath with FRLS properties, generally conforming to IS:7098 (Part-1).

CONTROL CABLES:

1.1 kV control cables with stranded plain annealed copper conductor, PVC Type-A insulation, core identification by colour coding (upto five cores)/ number marking (more than five cores), distinct extruded inner sheath of PVC type ST1 material, GS formed/round wire armour as per IS: 3975 (where applicable), and extruded PVC Type ST1 outer sheath with FRLS properties, generally conforming to IS: 1554 (Part-1).

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



QUALITY PLAN

SHEET 2 OF 2

CUSTOMER :

PROJECT

SPECIFICATION :

BIDDER/ :

TITLE

NUMBER :

VENDOR

QUALITY PLAN
NUMBER PED-506-00-Q-006, REV-01

SPECIFICATION :

SYSTEM

ITEM AC ELECT. MOTORS BELOW 55KW (LV)

TITLE :

SECTION

VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	
<p>NOTES:</p> <p>1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON</p> <p>2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.</p> <p>3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.</p> <p><u>Legends for Inspection agency</u></p> <p>1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)</p> <p>P. PERFORM W. WITNESS V. VERIFY</p>												
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS- 402-165-N002

VOLUME : IIB

SECTION : D

REV. NO. 0

**DATE :
19.05.2014**

SHEET 1 of 1

**SECTION D3
STANDARD TECHNICAL SPECIFICATION
FOR
C&I SYSTEMS**



**STANDARD QUALITY PLAN
FOR
PROGRAMMABLE LOGIC CONTROLLER**

QUALITY PLAN NO.: PE-QP-999-145-I036 ____	
VOLUME	IIB
SECTION	D
REV. NO.	01
DATE:	24.08.2007
SHEET	1 OF 8

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
1.0	Materials /Components											
1.1	Panels & Control Desks	Physical Inspection for Dimensions, Painting, Cutouts, Lifting / Locking Arrangements, Components, Drawing Pocket, Mounting accessories, Plinth & AV Pads, Cable Gland Plates, Hardwares, Hinges, Louvers & Filters, Fans & Panel Lamps	MA	Visual	100%	Contract specifications, Approved GA Drawings, BOQ	As per ref documents. No physical damage.	BHEL Quality Inspection Report.	3/2	2	1	
1.2	Power Supply/Packs, Battery & Battery charger, Transformer, UPS.	Physical Inspection Physical Damages Dimensions Mounting Accessories	MA	Visual	100%	Contract specifications, BOQ.	As per reference documents, Test Report	BHEL Quality Inspection Report.	3/2	2	1	
1.3	Indicating Lamp, Annunciator, Meters, Transducers, Signal Converters, Instruments, Single Loop Controllers	Physical Verification Physical Damages Dimensions Accessories	MA	Visual	100%	Contract specifications, BOQ.	As per ref documents No physical damage. Test/ Calibration report.	BHEL Quality Inspection Report	3/2	2	1	
1.4	PLC processors, I/O modules, Power Supply modules, Communication modules, Mounting Racks, Ethernet	Physical Inspection <ul style="list-style-type: none"> • Identification Labels • Physical Damages • Quantity • Spare Capacity 	MA	Visual	100%	Product Catalogue, Data sheets, Approved Configuration diagram, BOQ	As per ref documents. Test Certificates	BHEL Quality Inspection Report.	3/2	2	1	

LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics	\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor
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**STANDARD QUALITY PLAN
FOR
PROGRAMMABLE LOGIC CONTROLLER**

QUALITY PLAN NO.: PE-QP-999-145-I036 ___	
VOLUME	IIB
SECTION	D
REV. NO.	01 DATE: 24.08.2007
SHEET	2 OF 8

SI. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
1.5	CPU, Monitor, Keyboard, Mouse, CD Drives, Printers, OS, System Software, Engineering software in the form of Licensed CD.	Physical Inspection Identification Labels, Tech. Specification Physical Damages Accessories Installation arrangements for Computers & Printers	MA	Visual	100%	Contract specifications, Product Catalogue, Approved GA / Configuration drawing, BOQ.	As per reference documents.	BHEL Quality Inspection Report.	3/2	2	1	

LEGEND:	* CR - Critical characteristics	\$ P - Agency Performing the Test.	1 - BHEL
	MA - Major characteristics	W - Agency Witnessing the Test.	2 - Vendor
	MI - Minor characteristics	V - Agency Verifying the Test.	3 - Sub-vendor



STANDARD QUALITY PLAN FOR PROGRAMMABLE LOGIC CONTROLLER

QUALITY PLAN NO.: PE-QP-999-145-I036 ___	
VOLUME	IIB
SECTION	D
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DATE:	24.08.2007
SHEET	3 OF 8

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	

2.0	Assembly											
2.1	Functional Test for HMI/OWS devices such as Monitors, Keyboards, Mouse, Printers etc.	Operation	MA	Functional	100%	Approved Configuration Diagram & BOQ and FAT	Correct Operation of interconnected Devices of HMI system.	BHEL Quality Inspection Report.	2	1	1	
2.2	Hardware Functional Verification.	Physical arrangement, Wiring check & labeling, Continuity Checking, IR & HV test	MA	Visual/ Electrical	100%	Approved GA Drawing, Panel Wiring Diagram, IR & HV as per relevant International standard	Test Certification	BHEL Quality Inspection Report.	2	2	1	
2.3	Powering Up	Healthiness of all the modules/equipment, associated with Powering of PLC system	MA	Visual /Electrical	100%	Approved power supply scheme	All equipment to be healthy on power ON	BHEL Quality Inspection Report.	2	1	1	
2.4	Burn in test for PLC modules	Healthiness of PLC modules on Continuous Energisation, Temperature maintenance	MA	Visual/ Electrical	100%	FAT Procedure	Test certification as per FAT	BHEL Quality Inspection Report.	2	2	1	

LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics	\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor
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STANDARD QUALITY PLAN FOR PROGRAMMABLE LOGIC CONTROLLER

QUALITY PLAN NO.: PE-QP-999-145-I036 ___	
VOLUME	IIB
SECTION	D
REV. NO.	01
DATE:	24.08.2007
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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	

3.0	Factory Acceptance Test (FAT)											
3.1	Input Output Functional Verification	I/O configuration, I/O operation	MA	Visual/ Eletrical	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.2	Processor Verification	Processor configuration, Powering up, standby operation (as applicable) and Loading	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.3	Power Supply Module Verification	Redundancy Operation	MA	Electrical	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.4	Communication System Verification	Redundancy operation of Communication System, Measurement of Response Time, Communication with third party system	MA	Electrical	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.5	Diagnostic Verification	Self Diagnostic features of PLC system	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.6	Control Panel/Desk Verification	Operation of PLC driven annunciation system, Mosaic, Push buttons & selector switches, Indicating lamps	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.7	Software Verification	(i) Control Logics (ii) Engineering Features (iii) HMI Features	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	

LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics	\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor
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**STANDARD QUALITY PLAN
FOR
PROGRAMMABLE LOGIC CONTROLLER**

QUALITY PLAN NO.: PE-QP-999-145-I036			
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FACTORY ACCEPTANCE TEST (FAT) PROCEDURE

This document covers procedure to conduct/witness PLC system functional tests in order to demonstrate conformity to purchase specifications and related engineering documents. The test shall be conducted at the system suppliers works. The system supplier shall conduct all functional tests before commencing FAT and test results shall be made available during FAT. Vendor must furnish following relevant drawings, duly approved by BHEL Engineering, for reference during FAT.

- a) Technical Specification of PLC.
- b) PLC System Configuration
- c) General Assembly Drawings.
- d) Panel Wiring Diagrams.
- e) Bill of Quantity for PLC System.
- f) Logic Diagram.
- g) HMI Schematics.
- h) Input / Output List.

Further the vendor shall furnish applicable product specification, datasheets, catalogues, test-certificates, and internal inspection records to enable FAT. Vendor shall also submit, [to the inspecting agency](#), his standard test procedure, for clauses given below; where vendor's standard practice has been referred.

APPLICABLE TEST PROCEDURE:

1. Input/Output Functional Verification.

Check for correctness of addressing of racks, slots and I/O modules as per applicable PLC configuration diagram. Appropriate signal generators shall be used to simulate Inputs and outputs to check operation and SCAN time. [Check online replacement of cards, processors, power supply etc.](#)

2. Processor Verification

PLC Configuration drawing to be referred for ascertaining

- i) Redundancy

**STANDARD QUALITY PLAN
FOR
PROGRAMMABLE LOGIC CONTROLLER**

QUALITY PLAN NO.: PE-QP-999-145-I036 ___			
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ii) Type (Hot or Cold)

Both the processors are to be checked for healthiness in case of redundant configuration as per vendor's standard practice. In case of hot redundancy, switchover of control from primary processor to standby processor shall be demonstrated for uninterrupted control and data processing as per vendor's standard practice. Switchover shall be witnessed, by manual power off or resetting the Primary CPU or simulating failure of primary processor. Checking should be by witnessing the lighting up of Processor's LEDs as per manufacturer's product standard.

Vendor shall demonstrate, as per Vendor's standard practice, adequate Loading (Spare Capacity) of Processors, as mentioned in contract specs. This shall be done, by simulating worst load operation of fully integrated PLC system.

3. Power Supply Module Verification

Check if PSM is in redundant mode as per specification. Check the healthiness of power supply from both the modules' lamp indication/measurement. Simulate failure of one PSM and verify that standby PSM has taken over without any interruption.

4. Communication System Verification

Communication system has to be in line with approved PLC Configuration Diagram. Verify that both the communication buses are intact and connected. Communication between PLC processors, I/O rack, OWS etc. is to be checked through simulation of input data. Simulate the bus failure by disconnection of working bus. Check that the communication continues without interruption or loss of data.

Following response times are to be demonstrated as per vendor's standard practice for conformance to contract specifications:

1. Screen update time
2. I/O scan time
3. SOE resolution time
4. Data transfer time with third party system using Communication Protocol as per Contract specification and as per quantum of data as per approved signal exchange list.

5. Diagnostic Verification

Product Catalogue/Literature shall be referred for checking of all diagnostic features. Hardware failure to be simulated by removing an I/O

**STANDARD QUALITY PLAN
FOR
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6. Control Panel /Desk Verification

- i) PLC driven annunciation system should be checked by alarm signal simulation.
- ii) Push Button and selector switch operation should be checked by verification of corresponding change of status of Data Base point.
- iii) Indicating lamp / MIMIC should be checked by corresponding Data Base point simulation.

7. Software Verification

- i). Control Logics:- Software switches, lamps and Analog sources shall be used for simulation of field conditions .Control logics shall be checked for its correct functionality as per approved logic schemes
- ii). Engineering features:-
 - a) Online changing of parameters, set points.
 - b) Online modification in Control Logic Diagrams.
 - c) Online configuration of Graphics, Trends, Logs, HSR.
- iii). HMI features:-

Check for configuration & operation of Graphics, Trends, Logs, HSR and Alarms, in the form of Displays and Printouts, by simulation of Inputs as per approved documents.

8. Burn in **Elevated Temperature test**

Electronic equipments shall be subjected to Burn in elevated temperature test as per the procedure detailed below:

- a) (i) PLC modules are kept at 50 Deg c under continuous energized condition for 48 hours.

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FOR
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23.03.2005			
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ii) 48 hours test period shall be divided into 4 equal time segment of 12 hours duration each. For every 12 hours duration segment, after lapse of first 11 hours 110% of nominal voltage shall be applied to the panel under test for a period of 30 minutes followed by application of 90% of nominal voltage for the next 30 minutes.

b) Assembled Panels with complete wiring shall be kept under continuous energized condition for 120 hours at ambient temperature. Temperature rise in panels should be below 10 Deg C above ambient.

2X500 MW NNTPS NEW NEYVELI


VOLUME –III

TECHNICAL SPECIFICATION FOR CONDENSER ON LOAD TUBE CLEANING SYSTEMS (COLTCS)

Specification No. : PE-TS- 402-165-N002 (REV. 0)



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI BLDG., SEC-16A, PLOT NO. 25
NOIDA – 201301 (UP)**

	TITLE : TECHNICAL SPECIFICATION FOR CONDENSER ON LOAD TUBE CLEANING SYSTEMS (COLTCS) PREAMBLE	SPEC. NO. PE-TS- 402-165-N002
		VOLUME : III
		REV. NO. 0 DATE :19.05.2014
		SHEET 1 OF 1

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 - 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 standard 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).

	TITLE : TECHNICAL SPECIFICATION FOR CONDENSER ON LOAD TUBE CLEANING SYSTEMS (COLTCS) PREAMBLE	SPEC. NO. PE-TS- 402-165-N002	
		VOLUME : III	
		REV. NO. 0	DATE :19.05.2014
		SHEET 1 OF 1	

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 instructions given in Document No.PES-100-901 in Volume-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.

	TITLE : TECHNICAL SPECIFICATION	SPEC. NO. PE-TS- 402-165-N002	
	FOR	VOLUME : III	
	CONDENSER ON LOAD TUBE CLEANING	REV. NO. 0	DATE :19.05.2014
	SYSTEMS (COLTCS)	SHEET 1 OF 1	
	PREAMBLE		

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SECTION	TITLE
A	DETAILS TO BE FURNISHED ALONGWITH BID
A1.	COMPLIANCE CERTIFICATE
A2.	PERFORMANCE GAURANTEE SCHEDULE
A3.	TECHNICAL DEVIATION SCHEDULE
A4.	ELECTRICAL LOAD DATA
A5.	GA DRAWING OF COLTCS/DF
A6.	SCHEDULE OF PRICES
A7.	SCHEDULES OF UNIT PRICES
B	DOCUMENTS TO BE SUBMITTED ON PLACEMENT OF LOI
B1.	DATASHEET – B
B2.	SCHEDULES AS PER LIST.



TITLE :
TECHNICAL SPECIFICATION FOR
COLTCS

SPEC. NO. PE-TS- 402-165-N002

VOLUME III

SECTION

REV. NO. 0


DATE 19.05.2014

SHEET 1 OF 1

SECTION A

SHALL BE FURNISHED ALONGWITH BID

- COMPLIANCE CERTIFICATE
- PERFORMANCE GUARANTEE SCHEDULE
- TECHNICAL DEVIATION SCHEDULE
- ELECTRICAL LOAD DATA
- GA DRG OF COLTCS/DF
- UNIT PRICE SCHEDULE
- TOTAL PRICE SCHEDULE.


	TITLE : COMPLIANCE CERTIFICATE FOR COLTCS	SPEC. NO.	PE-TS- 402-165-N002
	PROJECTS: 2X500 MW NNTPS NEW NEYVELI	DATE:	19.05.2014
		SHEET	1 OF 2

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/Customer's Consultant approval and 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. Charges for 3rd party inspection (TUV/ equivalent) for imported components wherever required shall be included by bidder in the base price itself.
- d) Any drawing/ document/ data-sheet/ calculation/ Quality plan/ Instrumentation etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ Customer/Customer's Consultant 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 including balls 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.
Recommended spares for 3 years shall be quoted separately with price indicated separately.
- g) Charges for Installation Checks, Commissioning of equipments, Trial runs and Performance Testing at site shall be included by bidder as per the price format.
- h) All Instruments shall be located in the Instrument Rack (as applicable) to be supplied by bidder.

The instrument rack shall be installed on ball recirculation pump skid for COLTCS with impulse piping, root valves, fittings, accessories, valve manifolds mounted on gauge racks etc. supplied by bidder accordingly.
- i) The main flanges for Ball separator shall be suitable for the forces and moments as per the specification.
- j) Injection nozzles – 2/4 numbers of stubs of 100 NB or size as informed by bidder shall be provided by BHEL. The injection nozzles, counter flanges for the stubs along with nuts, bolts and gaskets shall be supplied by the bidder.
- k) Provision for future installation of Cathodic protection with sacrificial anodes.
- l) Number of balls (Normal as well as abrasive) for COLTCS shall be as specified i.e Number of balls per charge shall be @ 10% of no. of tubes.
- m) The hydrostatic test pressure shall be 1.5 times the design pressure.
- n) All sub - vendors shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.

	TITLE : COMPLIANCE CERTIFICATE FOR COLTCS	SPEC. NO.	PE-TS- 402-165-N002
	PROJECTS: 2X500 MW NNTPS NEW NEYVELI	DATE:	19.05.2014
		SHEET	2 OF 2

- o) The Performance guarantees of equipments shall stand valid till the satisfactory completion of performance testing & its acceptance by BHEL/ Customer/Customer's Consultant.
- p) The offered COLTCS have been supplied by bidder in the past meeting the customers qualifying criteria of its operation at two sites for minimum period of two years. Any deviation to this criteria shall be suitably highlighted in the deviation schedule.
- q) The orientation of piping around COLTCS shall be finalised during detailed Engg.
- r) Electrical/ C&I :
- All selected motor ratings have minimum 15 % margin over maximum continuous demand of the driven equipment including voltage and frequency variations, temperature rise and other factors.
 - Supply of electrical viz. LT power cables, instrumentation and control cables, cable glands, lugs, cable trays etc. shall be as per specification. Their erection shall be done by BHEL
 - The junction boxes for termination of DPT/ DPS/ Actuator LS/ solenoid valves/ Ball oversize monitor/ Ball recirculating monitor are included in bidders scope. The instrumentation cable and cabling from instruments/ actuators to junction boxes is also included in bidders scope.
 - Valve actuators and controls shall be provided as specified in Data Sheet-A and Project specific requirements as specified in Section C-2 & Section C-3
 - Alarms/ annunciations/ instruments shall be finalised during detailed engineering in the event of order which shall be subject to BHEL/ Customer/Customer's Consultant approval and shall be without any commercial implications to BHEL.



**TITLE : SCHEDULE OF PERFORMANCE GUARANTEES
FOR
CONDENSER ON LOAD TUBE CLEANING SYSTEM (COLTCS)**

SPEC. NO. PE-TS- 402-165-N002


VOLUME : III

Sheet 1 of 1 Date- 19.05.2014

S.NO.	DESCRIPTION	UNITS	2X500 MW NNTPS NEW NEYVELI
1.	Pressure drop across the ball collecting Strainers (i.e. between inlet & outlet nozzle) under clean condition and Normal flow condition	MWC	
2	Percentage of ball recovery	%	
3	Life of sponge rubber balls	Weeks	

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL
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	TITLE * SCHEDULE OF DEVIATIONS () 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



TITLE :
UNIT PRICE SCHEDULE FOR
COLTCS
2X500 MW NNTPS NEW NEYVELI

SPEC. NO. PE-TS- 402-165-N002

VOLUME	III	SECTION
REV. NO.	0	DATE 19.05.2014

- 1.0 Unit price for design, manufacture, inspection and testing, packing and delivery of COLTCS for one set complete with all accessories except for clause no. 2 & 3 below. Rs/USD/Euro (As applicable)
- 2.0 **Lump sum price for 4 sets of COLTCS** Rs/USD/Euro (As applicable)
- Installation checks, Commissioning
 - PG test
- 3.0 **Mandatory spares(as per Annexure)** Rs/USD/Euro (As applicable)
- Lump sump price

Notes:-

- Total price of Unit prices given above at sl. No. 1 plus sl. No. 2 plus sl. No. 3 should tally with total price given in Sl. No. (1) of "Schedule of Prices"
- Unit price quoted by bidder, as above, shall be binding for any quantity variation, which is at discretion of purchaser.
- Price of commissioning & erection spares and other accessories not listed above shall be included in price of equipment & shall be supplied with the equipment.
- Indicate all taxes, duties etc. stating whether included/ excluded in above prices.
- 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.
Recommended spares are only for reference purpose and not to be considered for evaluation and ordering purpose.

2X500 MW NNTPS NEW NEYVELLI
Mandatory Spares List for COLTCS Package

<u>S.No.</u>	<u>Spare Description</u>	<u>Unit</u>	<u>Quantity for two units</u>
1	Sponge Balls	Charges	50 Charges (1,22,000 Balls)
2	Abrasive Balls	Charges	20 Charges (48,800 Balls)
3	Worm gear assembly for Ball separator Screen	Set	1 Set
4	Ball Separator Screen	Set	1 Set
5	DP Measuring System		
5.1	Connecting Board	No.	1 No.
5.2	O Ring	No.	1 No.
5.3	Micro Switch Assembly	Set	1 Set
5.4	DPG		
5.4.1	Glass Window	No.	1 No.
5.4.2	Gasket	No.	1 No.
5.4.3	Pointer	No.	1 No.
6	Ball recirculating pump for tube cleaning system		
6.1	Rotating Assembly	Set	1 Set (Rotating Assembly consists of all the rotating parts except bearings)
6.2	Shaft with sleeves	Set	1 Set
6.3	Wearing Rings (if applicable)	Set	1 Set
6.4	Bearings	Set	1 Set
6.5	Impeller	No.	1 No.
6.6	Ball recirculating pump motor	No.	1 No.
6.7	Bearings for recirculating pump motor	Set	1 Set
7	Diff. Pr. Transmitter of each type	Nos.	2 Nos.
8	Diff. Pr. Indicators of each type	Nos.	2 Nos.

2X500 MW NNTPS NEW NEYVELLI
Mandatory Spares List for COLTCS Package

9	Pressure Gauges of each type	Nos.	2 Nos.
10	Ball counter of each type	Nos.	2 Nos.
11	Valves, of each type	Nos.	2 Nos.
12	Diff. Switches of each type	Nos.	2 Nos.
13	Motor operated valves and actuators	Set	2 Sets
14	PLC cards (All types of cards/modules of PLC including CPU, power supply modules, interface modules, converter modules, I/O modules, relays, MCBs, fuses, terminal blocks, converters etc.)	%	10 %
15	Power Supply unit of each type	%	10 %
16	Graphic Interface Unit of each type	No.	1
17	Cooling Fan in PLC system/Cabinet	Nos.	2

Note:

1. In case the description / nomenclature of any of the items of spares/tools and tackles is differing from the description / nomenclature indicated in the list of mandatory spares/tools and tackles, the bidder shall offer functionally equivalent part in lieu of the listed item.
2. In case if such items of spares indicated as “not applicable”, are found applicable at a later date during execution of the project, such items of spares are to be supplied within the ordered cost of the mandatory spares.
3. If any of the items of spares ordered is found to be not applicable during detailed engineering stage/execution stage, the contractor shall have to supply alternative items of spares. The alternative items of spares are to be mutually agreed between BHEL and Vendor.
4. Wherever % is indicated for the mandatory spares, the quantity shall be calculated for % of supply for total quantity for 2 units of 2 x 500 MW, unless otherwise specified. The quantity to be reckoned for % indicated shall be rounded off to the next higher whole number. For example if the % arrived is 0.2 the quantity to be supplied shall be 1 and if the % arrived is 5.1 the quantity to be supplied shall be 6.
5. In respect of quantity mentioned as 'Set' means the total quantity of all the components/items used in particular equipment unless otherwise specified.



TITLE :
PRICE SCHEDULE FOR
COLTCS
2X500 MW NNTPS NEW NEYVELI

SPEC. NO. PE-TS- 402-165-N002

VOLUME III

SECTION

REV. NO. 0

DATE 19.05.2014

SHEET 1 OF 1

- 1.0 Total price for design, manufacture, assembly, inspection, testing, packing for transportation and delivery, including final check up of installation, commissioning, trial run and PG testing of FOUR (4) sets of COLTCS complete in all respect including all accessories & auxiliaries as specified in technical specification and as necessary including mandatory spares, commissioning spares of COLTCS including commission balls and special tools & tackles (as required) for erection & maintenance. Rs/USD/Euro (As applicable)
- 2.0 **Recommended spares** : Item-wise break up with item-wise price to be given as per "Schedule of Recommended Spares" enclosed under Vol. III of technical specification. Rs/USD/Euro (As applicable)

Note : Indicate all duties, taxes etc. stating whether included/ excluded in above price.



TITLE :
TECHNICAL SPECIFICATION FOR
COLTCS

SPEC. NO. PE-TS- 402-165-N002

VOLUME III

SECTION

REV. NO. 0

DATE 19.05.2014

SHEET 1 OF 1

SECTION B

SHALL BE FURNISHED ON PLACEMENT OF LOI

- DATASHEET B
- LIST OF SCHEDULES



TITLE :
TECHNICAL SPECIFICATION FOR
COLTCS

SPEC. NO. PE-TS- 402-165-N002

VOLUME III

SECTION

REV. NO. 0

DATE 19.05.2014

SHEET 1 OF 1

SECTION B1

DATASHEET B



Title **DATA SHEET - B**
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
 (SPONGE RUBBER BALL TYPE)

SPECIFICATION NO.
PE-TS-999-165-N001

VOLUME	III	PART	A
SHEET	I	OF	13

INSTRUCTION TO BIDDER 1. This data sheet shall be read in conjunction with Specification No. PES-179-01 Section - D, Volume - IIB.
 2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT
1.0	General :	
1.1	Number of Tube Cleaning System sets being supplied.	Nos.
1.2	Type	
1.3	Liquid handled	
1.4	Manufacturer	
1.5	Country of origin	
2.0	Design :	
2.1	Design Pressure	Bar (g)
	a) Ball Separator	
	b) Ball Recirculating Pump	
	c) Ball Collector	
	d) Piping	
	e) Valves	
	f) Distributors	
	g) Injection Nozzles	
2.2	Design Temperature	°C
2.3	Operating pressure at condenser inlet	Bar (g)
2.4	Design differential pressure	Bar (g)
2.5	Flow rate through ball separator	M ³ /hr
	a) Normal	
	b) Maximum allowable	
2.6	Flow rate through ball collector	M ³ /hr
	a) Normal	
	b) Maximum allowable	

Name of Bidder/ Vendor					
Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					
Date					



Title **DATA SHEET - B**
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
 (SPONGE RUBBER BALL TYPE)

SPECIFICATION NO.
PE-TS-999-165-N001

VOLUME	III	PART	A
SHEET	2	OF	13

INSTRUCTION TO BIDDER 1. This data sheet shall be read in conjunction with Specification No. PES-179-01 Section - D, Volume - IIB.

2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT
3.0	Guaranteed Performance	
3.1	Whether condenser back pressure/ overall heat transfer coefficient is guaranteed that it will be permanently maintained as long as the tube cleaning system is in operation.	YES/NO
3.2	Pressure drop across the ball separator (i.e., between inlet and outlet connections) :	
	a) Normal flow condition	
	b) Maximum allowable flow condition	
3.3	Power consumption by ball recirculating pump during :	KW
	a) Normal operation	
	b) Ball collection operation	
	c) Ball sorting operation	
3.4	Quantity of cleaning balls required per set for an operating period of one year	Nos.
4.0	Operation :	
	Whether tube cleaning system is designed for the following operation modes :	
4.1	Automatic start-up initiated by push button.	YES/NO
4.2	Automatic shut-down with ball collection effected by :	
	a) Push button	YES/NO
	b) Adjustable timer	YES/NO
	Ball monitoring system	YES/NO

Name of Bidder/ Vendor					
Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					
Date					



Title
DATA SHEET - B
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
(SPONGE RUBBER BALL TYPE)

SPECIFICATION NO.
PE-TS-999-165-N001

VOLUME III PART A
 SHEET 3 OF 13

INSTRUCTION TO BIDDER 1. This data sheet shall be read in conjunction with Specification No. PES-179-01 Section - D, Volume - IIB.
 2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT
PARTICULARS		
4.3	Automatic backwashing of ball separator with ball collection effected by :	
	a) Differential pressure measuring system	YES/ NO
	b) Adjustable timer	YES/ NO
	c) Push button	YES/ NO
4.4	Automatic emergency backwashing of ball separator effected by differential pressure measuring system.	YES/ NO
4.5	Automatic flushing of differential pressure measuring system.	YES/NO
4.6	Automatic ball sorting initiated by push button.	YES/NO
4.7	Whether provision for manual operation of the complete tube cleaning system is made in case of control system failure.	YES/NO
5.0	Ball Separator :	
5.1	Make	
5.2	Nos. provided per set	Nos.
5.3	Code/ Standard	
5.4	Body outer diameter	mm
5.5	Body thickness	mm
5.6	Manhole type & size	mm
5.7	Whether sight glass is provided	
5.8	No. of screens/ strainers provided per each ball separator	Nos.
5.9	Type of arrangement provided to prevent lodging of the debris at the entrance of ball extraction pipes.	

Name of Bidder/ Vendor

Revision Number 0 1 2 3 4

Signature of Bidder/ Vendor
 Authorised Representative

Date



Title

DATA SHEET - B
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
 (SPONGE RUBBER BALL TYPE)

SPECIFICATION NO.

PE-TS-999-165-N001

VOLUME	III	PART	A
SHEET	4	OF	13

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PES-179-01 Section - D, Volume - IIB.
 2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	PARTICULARS	ITEM	UNIT
5.10	Clearance between screen/ strainer bars.		mm
5.11	Materials : a) Body/ Housing b) screen/ Strainer section c) Screen/ Strainer shaft d) Hardware for fixing the screen/ Strainer e) Other internal hardware f) External hardware		
5.12.	Lining material (if applicable)		
6.0	Ball Recirculating Pump :		
6.1	Make		
6.2	Nos. provided per set		Mos.
6.2	Design discharge flow		M ³ /hr
6.4	Design discharge pressure		Bar
6.5	Design pump Speed		RPM
6.6	Design pump efficiency		%
6.7	Seal for the pump		
6.8	Materials : a) Casing b) Impeller c) Shaft		
7.0	Ball Collector :		
7.1	Nos. provided per set		Nos.

Name of Bidder/ Vendor

Revision Number

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Signature of Bidder/ Vendor

Authorised Representative



Title
DATA SHEET - B
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
(SPONGE RUBBER BALL TYPE)

SPECIFICATION NO.
PE-TS-999-165-N001

VOLUME	III	PART	A
SHEET	5	OF	13

INSTRUCTION TO BIDDER

- This data sheet shall be read in conjunction with Specification No. PES-179-01 Section - D, Volume - IIB.
- Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT
7.2	Code/ Standard	
7.3	Whether inspection window/ sight glass is provided.	YES/ NO
7.4	Materials : a) Shell/ Body b) Internals	
7.5	Lining material (if applicable)	
7.6	Whether provision for separating and collecting the undersized balls, is made	YES/ NO.
8.0	Differential Pressure Measuring System:	
8.1	Differential Pressure Switch/ Transmitter a) Type b) Make and Model c) Range d) Accuracy e) Material of sensing element f) No. of contacts g) Contact rating h) Enclosure i) Mounting	Nos.
8.2	Whether differential Pressure gauge is provided for manual observation.	
8.3	Differential Pressure Gauge : a) Type b) Make and Model c) Range	

Name of Bidder/ Vendor					
Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					



Title
DATA SHEET - B
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
 (SPONGE RUBBER BALL TYPE)

SPECIFICATION NO.
 PE-TS-999-165-N001

VOLUME III PART A
 SHEET 6 OF 13

INSTRUCTION TO BIDDER 1. This data sheet shall be read in conjunction with Specification No. PES-179-01 Section - D, Volume - IIB.
 2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT
	PARTICULARS	
	d) Accuracy	
	e) Material of sensing element	
	f) No. of contacts	Nos.
	g) Dial size	mm
	h) Enclosure	
	i) Mounting	
8.4	Whether the contacts for differential pressure gauge and switch/ transmitter are independent.	YES/ NO
9.0	Timer for Backwashing	
9.1	Timer make	
9.2	Range of duration setting	
9.3	Range of frequency	
10.0	Ball Monitoring System :	
10.1	Type	
10.2	Maake & Model	
10.3	Whether ball monitoring system is designed to perform the following functions :	
	a) Continuously counting the balls in circulation and giving an alarm calling for investigation of ball losses, when the number of circulating balls falls below a set value	YES/ NO
	b) Continuously measuring the size of the balls in circulation and initiating the shut-down of the tube cleaning system with alarm calling for replacement of balls, when the number of oversized balls falls below a set value.	

Name of Bidder/ Vendor

Revision Number

0

1

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3

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Signature of Bidder/ Vendor

Authorised Representative

Date



Title **DATA SHEET - B**
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
 (SPONGE RUBBER BALL TYPE)

SPECIFICATION NO. **PE-TS-999-165-N001**
 VOLUME III PART A
 SHEET 7 OF 13

INSTRUCTION TO BIDDER 1. This data sheet shall be read in conjunction with Specification No. PES-179-01 Section - D, Volume - IIB.
 2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT
10.4	Whether electronic processor of the ball monitoring system is provided with the following a) Indicators for <ul style="list-style-type: none"> ◆ Required basic ball charge ◆ Recirculating Ball quantity ◆ Oversized ball quantity b) Time counters for <ul style="list-style-type: none"> ◆ Total cleaning system operating hours ◆ Cleaning system operating hours with sufficient number of oversized balls c) Recorder for ball consumption	YES/ NO YES/ NO YES/ NO YES/ NO. YES/NO YES/NO
10.5	Whether provision for Self-testing and Self Calibration are made	YES/NO
11.0	Cleaning Balls :	
11.1	Type	
11.2	Size	mm
11.3	Specific gravity	
11.4	Material	
11.5	Hardness	
11.6	Total Ball recirculation quantity per set	Nos.
11.7	abrasive coated ball recirculation quantity per set - (if any)	No.s
12.0	Piping :	
12.1	Ball Extraction Piping	

Name of Bidder/ Vendor

Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					



Title
DATA SHEET - B
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
(SPONGE RUBBER BALL TYPE)

SPECIFICATION NO.
PE-TS-990-165-N001

VOLUME	III	PART	A
SHEET	8	OF	13

INSTRUCTION TO BIDDER

- This data sheet shall be read in conjunction with Specification No. PES-179-01 Section - D, Volume - IIB.
- Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT
12.2	Ball Transport Piping	
	a) OD x thicknes	mm x mm
	b) Material	
	c) Length of piping being supplied	M
12.3	Differential pressure measuring system flushing piping.	
	a) OD x thicknes	mm x mm
	b) Material	
	c) Length of piping being supplied	M
2.4	Any other	
3.0	Valves (Indicate Type of Valves)	
3.1	Sizes	: mm
3.2	Nos. provided per set	Nos.
3.3	Materials	
	a) Body	
	b) Disc/ Trim	
	c) Shaft	
3.0	Distributors	
3.1	Nos. provided per set	Nos.
3.2	Materials :	
	a) Body	
	b) Sight glass	
	c) Sight glass flanges	
	d) Internal parts	

Name of Bidder/ Vendor					
Division Number	0	1	2	3	4
Signature of Bidder/ Vendor					
Authorised Representative					
Date					



Title DATA SHEET - B
**CONDENSER ON LOAD TUBE
 CLEANING SYSTEM
 (SPONGE RUBBER BALL TYPE)**

SPECIFICATION NO. PE-TS-999-165-N001

VOLUME III **PART** A

SHEET 9 **OF** 13

INSTRUCTION TO BIDDER

1. This data sheet shall be read in conjunction with Specification No. PES-179-01 Section - D, Volume - IIB.

2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO. PARTICULARS	ITEM	UNIT
14.3	Lining material (if applicable)	
15.0	Injection Nozzles :	
15.1	Nos. provided per each CW inlet pipe	Nos.
15.2	Size of the stubs to be provided in CW inlet pipe for installing the injection nozzles.	mm
15.3	Material	
15.4	Lining material (if applicable)	
16.0	Actuators :	
16.1	Actuators for ball separator :	
	a) Nos. provided per ball separator	No.s
	b) Type & make	
	c) Motor rating	KW
16.2	Actuators for ball collector	
	a) Nos. provided per ball collector.	No.s
	b) Type & make	
	c) Motor rating	KW
16.3	Actuators for Valves:	
	a) Nos. provided per set	No.s
	b) Type & motor	
	c) Motor rating	KW
16.4	Any other	

Name of Bidder/ Vendor

Revision Number

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**Signature of Bidder/ Vendor
 Authorised Representative**

Date



Title
DATA SHEET - B
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
 (SPONGE RUBBER BALL TYPE)

SPECIFICATION NO.
 PE-TS-999-165-N001

VOLUME III PART A
SHEET 10 OF 13

INSTRUCTION TO BIDDER

- This data sheet shall be read in conjunction with Specification No. PES-179-0: Section - D, Volume - IIB.
- Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT
17.0	Electric Drive Motors	
17.1	Drive motor for recirculating pump :	
	a) Type and make	
	b) Rating	KW
17.2	Drive motor for differential pressure measuring system flushing pump (if applicable)	
	a) Type and make	
	b) Rating	KW
17.3	Any other.	
18.0	Control Panel	
18.1	Type	
18.2	Model & Manufacturer	
18.3	Operating Voltage/ frequency	V/ Hz
18.4	Control Voltage/ frequency	V/ Hz
18.5	Materials of housing and door	
18.6	Protections/ interlocks provided for :	
18.7	Class of Protection	
18.8	Control Hardware	
18.8	Alarms/ Annunciations provided for :	
18.9	Indicators provided for :	
18.10	Whether interconnecting control and power cabling between the control panel and various drive is included in the offer.	
19.0	Pressure gauges :	
19.1	Manufacturer & Type, Model	

Name of Bidder/ Vendor					
Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					
Date					



Title **DATA SHEET - B**
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
 (SPONGE RUBBER BALL TYPE)

SPECIFICATION NO. **PE-TS-999-165-N001**

VOLUME III PART A
 SHEET 11 OF 13

INSTRUCTION TO BIDDER 1. This data sheet shall be read in conjunction with Specification No. PES-179-01 / Section - D, Volume - IIB.
 2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT
19.2	Nos. provided per set	Nos.
19.3	Location	
19.4	Dial size	mm
19.5	Range & Accuracy	
19.6	Materials of construction :	
	a) Sensing element	
	b) Movement	
	c) Casing	
19.7	Enclosure	
19.8	Mounting	
20.0	Counter Flanges :	
20.1	Whether counter flanges complete with gaskets, bolts and nuts etc. for all terminal points are included in the offer.	YES/ NO
20.2	Type	
20.3	Rating	
20.4	Materials	
	a) Flanges	
	b) Bolts and Nuts	
	c) Gaskets	
20.5	Code/ Standard	
21.0	Whether lifting arrangement is provided for various equipments.	YES/ NO.
22.0	Whether ball recirculating pump, ball collector with interconnecting piping and valves are mounted on a single frame.	YES/ NO
23.0	Whether supports (wherever necessary) complete with foundation plates, bolts, nuts, inserts etc. are included in the offer.	YES/ NO

Name of Bidder/ Vendor

Revision Number

0

1

2

3

Signature of Bidder/ Vendor
 Authorised Representative

Date :



Title
DATA SHEET - B
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
 (SPONGE RUBBER BALL TYPE)

SPECIFICATION NO.
 PE-TS-999-165-N001

VOLUME	III	PART	A
SHEET	12	OF	13

INSTRUCTION TO BIDDER

- This data sheet shall be read in conjunction with Specification No PES-179-01 Section - D, Volume - IIB.
- Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	PARTICULARS	ITEM	UNIT
24.0	Shop Inspection and Tests		
24.1	Whether all the tests and inspections as detailed in the specification/ quality plan are carried out.		YES/NO
24.2	Hydrostatic Test :		
	a) Test Pressure	Bar (g)	
	<ul style="list-style-type: none"> ◆ Ball Separator ◆ Recirculating Pump ◆ Ball Collector ◆ Distributors ◆ Injection nozzles ◆ Piping & Valves 		
	a) Test duration	Minutes	
24.3	Lekage Test :		
	a) Test Pressure	Bar (g)	
	b) Test duration	Minutes	
25.0	Painting :		
25.1	External Surfaces :		
	a) Surface Preparation		
	b) Primer		
	a) Finish		
25.2	Internal Surfaces :		
	a) Surface Preparation		
	b) Primer		
	a) Finish		
26.0	Weights :		
26.1	Empty Weight		Kg.
	a) Ball Separator		

Name of Bidder/ Vendor					
Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor					
Authorised Representative					
Date					



Title **DATA SHEET - B**
CONDENSER ON LOAD TUBE
CLEANING SYSTEM
 (SPONGE RUBBER BALL TYPE)

SPECIFICATION NO.
 PE-TS-999-165-N001

VOLUME	III	PART	A
SHEET	13	OF	13


INSTRUCTION TO BIDDER 1. This data sheet shall be read in conjunction with Specification No. PES-179-01 Section - D, Volume - IIB.
 2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT
	PARTICULARS	
	b) Recirculating pump c) Ball collector d) recirculating unit	
26.2	Operating weight	kg
	a) Ball Separator b) Recirculating pump c) Ball collector d) recirculating unit	
26.3	Weight of the heaviest equipment/ assembly to be handled.	kg.
27.0	Overall Dimensions	
27.1	Ball Separator	
27.2	Recirculating Unit	
28.0	Other information (if any)	
G:\MSEVASH\DS-COTCS.RTF		

Name of Bidder/ Vendor


Revision Number	0	1	2	3	4
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Signature of Bidder/ Vendor Authorised Representative					
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	TITLE	SPECIFICATION NO.
	MOTOR DATA SHEET - C	VOLUME II B
		SECTION D
		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	SPECIFICATION NO.	
	MOTOR DATA SHEET - C	VOLUME	II B
		SECTION	D
		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	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	Characteristic curves/ drawings (To be enclosed for motors of rating $\geq 55KW$)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



TITLE :
TECHNICAL SPECIFICATION FOR
COLTCS

SPEC. NO. PE-TS- 402-165-N002

VOLUME III

SECTION

REV. NO. 0

DATE 19.05.2014

SHEET 1 OF 1

SECTION B2
LIST OF SCHEDULES

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
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**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



**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

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 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

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 Whenever 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 of the appropriate status or at the time of final inspection as required.
- 8 This Quality Plan is also applicable to states of the order scope of supply of Vendor.



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



QUALITY PLAN		SHEET OF		CUSTOMER		PROJECT TITLE		SPECIFICATION NUMBER											
										BIDDER/VENDOR		QUALITY PLAN NUMBER		SPECIFICATION TITLE					
COMPONENT / OPERATION		CHARACTERISTIC CHECK		CAT		TYPE/METHOD OF CHECK		EXTENT OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORM		FORMAT OF RECORD		SECTION		REMARKS	
																VOLUME III			
S. No.	2	3	4	5	6	7	8	9	10	11	P	W	V						
BHEL																			
PARTICULARS																			
BIDDER / VENDOR																			
NAME																			
SIGNATURE																			
DATE																			
BIDDER/VENDOR 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

	TITLE * SCHEDULE OF DECLARATIONS	SPECIFICATION NO
		VOL III
		SHEET..... OF.....

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

DECLARATION

Icertify 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

	TITLE * SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS & TACKLES	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



***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				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL