

MANUFACTURING QUALITY ASSURANCE PLAN

MICON VALVES (I) PVT.LTD 7, WADEE MANZIL, 2ND FLOOR, OPP. MEMON CO.OP. BANK, 75-77E, LADY JAMSHEDJI RD, MAHIM, MUMBAI - 16	PROJECT:- FOHS 2x250 MW BHAVNAGAR TPP QAP NO:- 562 REV NO:- 01 DATE :- 08/10/2012. PAGE NO:- 4 OF 4
CLIENT:	
P.O.NO:-P-197-LOI-10	
DATE:-03.07.2012	
Gate, Globe, Swing Check.	

SL NO.	COMPONENT & OPERATIONS	CHARATERISTICS	TYPE & METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
								P	W	V		
3.0	FINAL INSPECTION (Before Painting)											
3.1	Gate Valve Globe Valve Swing Check Valve.	a. Dimension	Flange Drilling Face to Face	100%	Appr.Drg.	Appr.Drg.	Dimensional report	3	3.2	1,2	Random by TPI	
		b. Operational Test	1. Full Opening / Closing Test	100%	Appr.Drg.	Appr.Drg.	Dimensional report	3	3.2	1,2		
		c. Pressure Testing	Hydro shell Hydro Seat Air Seat	100%	Appr.Drg. Appr.Drg. Appr.Drg.	Appr.Drg. Appr.Drg. Appr.Drg.	Testing Register Testing Register Testing Register	3 3 3	3.2 3.2 3.2	1,2 1,2 1,2		100% by Manufacturers & 10% by Third Party Inspection Agency
Paint & Packing	a. Surface	Visual	Dryness				Testing Register	3	3.2	1,2	For a C.S. Casting 105 micron minimum and for forgings painting is not applicable.	
		Visual	Two coat of redoxide One coat of hammer tone dark grey Anti rust layer at machined surface Fixing of wooden/plastic and protector				Testing Register	3	3.2	1,2		
		Visual				Painting certificate						
		Visual				Film thickness Shall be more then 105 micron						
		Visual						Testing Register	3	3.2		1,2

1. BECL/ICE
2. BHEL/TSP
3. MANUFACTURER (MICON VALVES)



Customer's Inspector
(Sign & Stamp)

QUALITY ASSURANCE MECHANICAL

FUEL OIL HANDLING SYSTEM

CLAUSE NO.	QUALITY ASSURANCE	
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FUEL OIL HANDLING SYSTEM

Tanks and Vessels

1. Only Qualified welders as per approved WPS and PQR shall be deployed for fabrication of tanks.
2. Dimensional checks, during in-process and final inspection, shall be carried out for alignments, circularity, verticality, orientation of connections, slope of bottom plate etc.
3. NDT on weld joints shall be done as per relevant / applicable standard. However, minimum requirement of NDT , as given below, shall be complied :
 - a. 100% DPT on root run (butt welds / back-gouged welds).
 - b. 100% DPT on all finished welds.
 - c. RT on butt welded seams (which shall cover 'T' / Cross joints) as per design code / Standard..
4. All tanks shall be subjected to hydraulic test. Other tests, as per relevant code, given below shall be applicable :
 - a. Vacuum test for bottom plate seam testing and annular plate.
 - b. Air / vacuum test for roof testing.

~~Fuel Oil Pumps/Drain Oil Pump/Water Pump~~

- ~~1. Pump casing shall be hydraulically tested at a pressure 150% of specified shut off head or 2 times working pressure (whichever is higher) for leak tightness.~~
- ~~2. Rotating parts i.e. Screws / Rotors shall be statically and dynamically balanced as per requirements of code ISO: 1940 Gr. 6.3 or better.~~
- ~~3. Pump rotors / Screws shall be subjected to NDT i.e. UT (dia. is ≥ 50 mm) at proof machine condition and DPT after machining.~~
- ~~4. All pumps shall be performance tested as per relevant / applicable code.~~

SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-E-87 FOH MECHANICAL	PAGE 1 OF 3
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CLAUSE NO.	QUALITY ASSURANCE	
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PIPING, VALVES, ~~STRAINERS~~ AND FITTINGS:

1. All pipes and fittings shall be tested as per applicable code. Welds of Steam Pipe joints shall be 10% radio graphed and 100% DP tested.
2. Pipes dia 450mm and above if fabricated from plate as well as fabricated fittings shall be hydro tested at 1.5 times design pressure. All such fabrication welds are also to be 100% DP tested after root run and on finished welds.
3. All valves shall be hydraulically tested for body, seat and back seat (as applicable) as per relevant standard. Check valves shall also be tested for leak tightness test at 25% of the specified seat test pressure.
4. Valves shall be offered in unpainted condition.
5. Functional checks of the valves for smooth operation, valve travel, opening and closing time shall be checked. Current drawn by actuators shall also be checked.
6. Fire safe test for ball/Plug valves shall also be done as per applicable codes/standard.
7. Strainer body shall be hydraulically tested and Pressure drop v/s flow rate test shall be done for Strainers. Weld joints are to be DP tested.

~~SUCTION HEATERS / FLOOR COIL HEATERS:~~

1. ~~All pipes / tubes / plates shall be tested as per applicable code.~~
2. ~~Only qualified welders shall be deployed as per approved and qualified procedure.~~
3. ~~Checks for tube thinning, mock-up for tube to tube-sheet joints shall be done.~~
4. ~~Hydro test for shell side and tube side shall be done at 150% of specified design pressure (including temp. correction) for respective sides. Complete heating coils shall also be hydrotested.~~
5. ~~Dimensinal Checks, NDT, Heat treatment shall be done on dished ends as per relevant / applicable code.~~
6. ~~NDT on weld joints, including weld joints of dished ends if any, shall be done as per relevant / applicable standard. However for weld joints under Steam Pressure are to be 10% radiographed as minimum requirement.~~

SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-E-87 FOH MECHANICAL	PAGE 2 OF 3
-------------------------------------------------------	---------------------------------------------------	------------------------------------	----------------

CLAUSE NO.	QUALITY ASSURANCE	
------------	-------------------	-------------------------------------------------------------------------------------

Insulation :

1. Rockwool/Mineral Wool/Glass Wool shall be tested as per relevant IS. However Thermal Conductivity type test shall be minimum once in six months as per IS:3346.
2. Lagging/Cladding shall be tested as per relevant Standard to meet data sheet requirements.

Monorail Hoists:

1. 100% RT on tension joints, 10% RT on compression joints of butt welds shall be done.
2. Forging of dia 50mm or more shall be UT tested.
3. Chain pulley block shall be tested as per IS:3832
4. Deflection, load, overload and travel check as per IS:3177 shall be done on assembled HOT.

Flex Hoses

Tests such as Adhesion, Property before and after aging, swelling, tensile, elongation at break for rubber and vacuum test, pressure test, burst/proof pressure test, dimension of finished hose shall be carried out as per relevant standard.

Pressure Reducing Station, Steam Traps:

Functional check to meet the data sheet requirements and pressure test at 1.5 x Design Pressure shall be carried out for individual component as well as for assembled pressurized system.

SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-E-87 FOH MECHANICAL	PAGE 3 OF 3
-------------------------------------------------------	---------------------------------------------------	------------------------------------	----------------

QUALITY ASSURANCE CONTROL & INSTRUMENTATION

PROCESS CONNECTION AND PIPING

ELECTRICAL ACTUATOR WITH INTEGRAL STARTER

ELECTRICAL ACTUATOR WITH INTEGRAL STARTER

ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	Test/Attributes Characteristics													
	RPM ®													
	No Load Current ®													
	IR & HV Test®													
	Mounting Dimension®													
	All routine Test as per Standard & Specification®													
	Correct Phase Sequence®													
	Operation & Setting of limit Switch/Torque Switch®													
	Stall Torque/Current (A)													
	Hand Wheel operation/ Auto de clutch function (A)													
	Function of Aux. like Potentiometer, space heater, position													
	EPT output ®													
	Grease leakage ®													
	Local/ Remote (Open-Stop-Close) Operation® Safety check (Single phasing, Phase correction, Tripping etc.) (A)													
ELECTRICAL ACTUATOR WITH INTEGRAL STARTER(IS 9334)														
Motor	Y	Y	Y	Y	Y									
Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the practices and procedure adopted along with relevant supporting documents.														
® - Routine Test (A) - Acceptance Test Y - Test applicable														

MEASURING INSTRUMENTS

MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)									
TESTS ITEMS	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (if applicable)(R)	Hydro Test(R)	Material Test certificate ®
	1. PR Gauge (IS-3624)	Y	Y	Y	Y	Y			
2. Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y				
3. Pr./D.P.Switch (BS-6134)	Y	Y	Y	Y	Y	Y			
4. Electronic Transmitter(IEC-770)	Y	Y	Y	Y	Y	Y			
5. Temp. Switch	Y	Y	Y	Y	Y	Y			
6. Recorder(IS-9319/ANSI C-39.4)	Y	Y	Y	Y	Y	Y			
7. Vertical indicators	Y	Y	Y	Y		Y			
8. Digital Indicators	Y	Y	Y	Y		Y			
9. Integrators	Y	Y	Y	Y					
10. Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y	Y			
11. Transducer (IEC-688)	Y	Y	Y	Y	Y	Y			
12. Thermocouples (ANSI-MC-96.1)	Y	Y	Y	Y	Y	Y			
13. RTD(IEC-751)	Y	Y	Y	Y	Y	Y			
14. Thermowell	Y		Y				Y	Y	Y
R-Routine Test A- Acceptance Test Y – Test applicable									
: Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions									
2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.									

ITEMS	TESTS											
	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	Insulation Resistance (R)	IBR Certification as applicable (R)	Hydro test (R)	Material test certificate (A)
15. Cold junction compensation box	Y	Y	Y	Y					Y			
16. Orifice plate(BS-1042)	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y
17. Flow nozzle(BS-1042)	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y
18. Impact head type element	Y	Y	Y					Y				Y
19. Level transmitter/float type switch	Y	Y	Y	Y					Y	Y	Y	Y
20. Flue Gas analyser	Y	Y	Y	Y								
21. Dust emission monitors	Y	Y	Y	Y								
*Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated.												
** If applicable												

R-Routine Test A- Acceptance Test Y – Test applicable

Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions
 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.



TITLE
TECHNICAL SPECIFICATION FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II B


SECTION -D

REV 0

DATE


SHEET OF

ANNEXURE-IV

	TITLE	SPECIFICATION NO.	PE-TS-389-166-A001		
	TECHNICAL SPECIFICATION FOR FUEL OIL STORAGE & TRANSFER SYSTEM	VOLUME	II - B		
		SECTION	- C		
		REV	0	DATE	
		SHEET	1	OF	3

Tentative list of Sub-vendors

S.no	Package	Vendor	
MECHANICAL			
	CS PALTES & STRUCTURES	SAIL TISCO- JAMSHEDPUR ESSAR STEEL	
	CS/GI PIPES- ERW	TISCO SAIL AJANTA TUBES, GHAZIABAD JINDAL , GHAZIABAD SURYA ROSHINI, BAHADUR GARH	UPTO 400 NB UPTO 350 NB UPTO 400 NB
	SEAMLESS PIPES	ISMT, AHMEDNAGAR MAHARASHTRA SEAMLESS, RAIGARH BHEL, TRICHY	
	SS PIPES	REMI, MUMBIA RATNAMI, AHMEDABAD CHOKSI, AHMEDABAD	
	FITTINGS	MS FITTINGS, KOLKATA SIDDHATHA & GAUTAM , FARIDABAD EBY, MUMBAI BHRAT FORGE , PUNE TUBE PRODUCTS, BARODA NITIN PROFILE, BARODA	
	RUBBER HOSE	D WREN & CO., KOLKAT SUDEEP INDUSTRIES, KOLKATA HYDROKIMP, MUMBAI PRESIDENCY RUBBER, KOLKATA	
	METALLIC HOSES	M/S TUBEX	OTHER MAKES ALSO ACCEPTABLE SUBJECT TO FURNISHING OF CREDENTIALS TO THE SATISFACTION OF BHEL.
	CAST STEEL GATE/GLOBE/NR VALVES	BABCOCK BORSIG ESPANA, S.A. CRESCENT VALVES MFG.CO.PVT.LTD. FOURESS ENGG.INDIA LTD. KSB PUMPS LTD. LEADER VALVES LTD. NITON INDUSTRIES B.D.K ENGG INDUSTRIES LTD.	
	CARBON STEEL BALL VALVES	AQUA VALVES PVT.LTD. CRESCENT VALVES MFG.CO.PVT.LTD. FISHER-XOMOX SANMAR LTD. KSB PUMPS LTD. LEADER VALVES LTD. MICROFINISH VALVES LTD. B.D.K ENGG INDUSTRIES LTD.	Valves shall be of Fire Safe Design
	CARBON STEEL PLUG VALVES	AUDCO INDIA LIMITED, CHENNAI B.D.K ENGG INDUSTRIES LTD. FISHER-XOMOX SANMAR LTD.	
	G.M. GATE/GLOBE/NRV	A.V. VALVES LIMITED LEADER VALVES LTD. SANT VALVES PVT. LTD.	

TITLE		SPECIFICATION NO. PE-TS-389-166-A001	
		TECHNICAL SPECIFICATION FOR	
		FUEL OIL STORAGE & TRANSFER SYSTEM	
		VOLUME II - B	
		SECTION - C	
		REV 0	DATE
		SHEET 2 OF 3	
SUMP PUMPS / SUBMERSIBLE PUMPS	KIRLOSKAR BROS. LTD. KSB PUMPS LTD. KISHOR PUMPS PVT.LTD SU MOTORS PVT.LTD. MATHER & PLATT SAM		
FUEL OIL PUMPS	UT PUMPS & SYSTEMS LTD., FARIDABAD TUSHACO PUMPS LTD., MUMBAI ROTO PUMPS, KANPUR ALWEILER, GERMANY		
THERMAL INSULATION	LLOYD INSULATION (INDIA) LTD., BANGALORE MINWOOL ROCK FIBRES LTD., HYDERABAD MEGA INSULATIONS PRIVATE LIMITED, GUJARAT ROCKWOOL INDIA LTD. GOENKA ROCKWOOL (INDIA) PVT.LTD		
ALUMINIUM SHEETS/COILS (THERMAL INSULATION PKG)	BHARAT ALUMINIUM CO.LTD. HINDALCO INDUSTRIES LTD. INDIAN ALUMINIUM CO.LTD. NALCO		
STRAINERS	FILTRATION ENGINEERS (I) PVT.LTD. MULTITEX FILTRATION ENGINEERS LTD. JAYPEE INDUSTRIES PVT. LTD. OTOKLIN PLANTS & EQUIPMENTS LTD GREAVES COTTON		
M.E. BELLOWS	EXPANSION JOINT SYSTEMS INC. USA FLUIDINE ENGRS.INDIA PVT.LTD FLEXICAN BELLOWS & HOSES PVT.LTD. LONESTAR INDUSTRIES MUNRO & MILLER FITTINGS LTD., U.K METALLIC BELLOWS (INDIA) PVT. LTD.		
SUCTIONHEATER	PARKAIRE, NEW DELHI REYNOLD ENGINEERING, MUMBAI		Other makes also acceptable subject to furnishing of credentials to the satisfaction BHEL.
PRESSURE REDUCING VALVE	LEADER JN MARSHALL MAZDA		
SAFETY RELIEF VALVE	LEADER, JULLANDAR JN MARSHALL, MUMBAI BHEL, TRICHY KEYSTONE, BARODA		
STEAM TRAPS	SPIRAX MARSHAL PENNANT ENGINEERING LEADER VALVES LTD CRESCENT VALVES MFG. CO. LTD.		

NOTE:-

Sub vender list is indicative only and will be subject to customer approval during detail engineering of the package without any commercial implication on account of the same.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C' -
ANNEXURE-V

REVISION 00

DATE:

ANNEXURE-V



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C' -
ANNEXURE-V

REVISION 00

DATE:

PAGE 1 of 3

**ANNEXURE-V
(PAINTING SCHEDULE)**

A.0.0 SURFACE PREPARATION AND PAINTING FOR PIPING

A.1.0 Preparation and cleaning of piping

(a) The pipeline shall be thoroughly cleaned of all rust, grease, dirt, weld scales and weld burrs etc. moisture or other foreign matter by power cleaning method such as sand blasting, power tool cleaning, etc. Grease or heavy oil shall be removed by washing with a volatile solvent such as gasoline. Kerosene will not be permitted for cleaning. This cleaning operation shall be immediately followed by priming with the mechanical priming machine.

(b) Certain inaccessible portions of the pipe line (which otherwise not possible to be cleaned by power cleaning methods) may be scrubbed manually with a stiff wire brush and scrapped where necessary.

(c) The cleaning and priming operation shall be carried out at site. The entire pipe length shall be cleaned but the ends of the pipes shall be left without coating for a distance of 230mm for joints, which shall be coated manually at site after laying, welding and testing the pipe.

(d) On the internal surface for pipes 1000 Nb and above, a coat of primer followed by a hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied to achieve a total DFT of 150 microns.

Pipes shall be cleaned both internally and externally thoroughly by blast cleaning or power tool cleaning method as indicated above. In case of oil piping, cleaning will have to be done by pickling. No painting is required on galvanised pipe surface or galvanised steel surface. Similarly no painting is required on stainless steel pipe or stainless steel surfaces. However, necessary colour banding for identification as per colour code shall be done. External surface of piping shall be cleaned and prepared as indicated in the painting schedule below.

A.2.0 Primer painting

After the surface is prepared in a manner acceptable to the Project Manager two coats of red oxide (zinc chromate / zinc phosphate) primer conforming to IS- 2074/IS-12744 or equivalent BS shall be applied. Primer shall be applied by brushing to ensure a continuous film without holidays. Primer shall be immediately applied without any time lag after the surface preparation.

Any equipment which has been given the shop coat of primer shall be carefully examined after its erection in the field and shall be treated with a touch up coat of red oxide primer wherever the shop coat has been abraded, removed or damaged during transit/erection, or defaced during welding.

A.3.0 Finish painting

(a) Paint to be used shall be synthetic enamel paint conforming to IS-2932 or equivalent. The manufacturer of paints and colour/shade shall be as approved by the Project Manager.

(b) Finish paintings shall be carried out in three coats consisting of one under coat and two finishing coats.

(c) The primed surface shall be cleaned of dust/ dirt/ grease etc. without scratching or in any way damaging the primer coat. Over this dry surface an optimum coat of under coating of synthetic enamel shall be applied. The under coat shall be allowed to dry.

(d) Paint shall be applied by brushing. It shall be ensured that brush marks are minimum and the requirements of workmanship is as specified in IS-1477.

(e) Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready mixed



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C'-
ANNEXURE-V

REVISION 00

DATE:

PAGE 2 of 3

type in original sealed containers as packed by the paint manufacturer. No thinners shall be permitted.

(f) No painting shall be done in frost/foggy weather or when the humidity is high to cause condensation on the surface to be painted.

(g) The dry film thickness (DFT) after the painting shall not be less than 150microns.

A.4.0 Other requirements

(a) Paint manufacturer's instructions shall be followed in method of application, handling, drying time etc.

(b) The colour of the finish paint shall be as per approved colour coding scheme.

(c) If finish paint was applied in shop, one coat of finish paint shall be applied at site.

(d) Protection of other surfaces adjacent to the surface being painted is the responsibility of the Contractor.

(e) The dry film thickness of the finish paint shall not be less than 0.15mm.

(f) All painting materials such as paints, varnishes, primer, solvents, thinners shall be supplied by the Contractor. All the services, tools etc. required for preparation/cleaning and painting shall be provided by the Contractor. The Contractor shall be required to estimate the quantity of painting material required.

A.5.0 Application

The paint manufacturer's instructions covering thinning, mixing, method application, handling, and drying time shall be strictly followed and considered as a part of this specification. Paint shall not be applied to damp surfaces or in rainy weather or when temperature is below 130C or above 360C, except when specifically permitted to do so as per manufacturer's instructions. The prime coat shall be applied by brushing, rolling or spraying and on the same day as the surface is prepared. Under coats, intermediate coats and finish coats shall be applied by brush, roller or spray method with the specified amount of time allowed between coats . The colour of each coat shall contrast with the previous coats's colour to avoid skip and holidays. Apart from surface preparation of the piping etc. attention should be of paid to the details, particularly the following :

(a) Sharp edges that may have a deleterious effects on coatings should be removed.

(b) Burrs caused by removal of temporary lugs etc. should be ground flat.

(c) Welds should be dressed and weld spatter removed by grinding.

(d) Nuts and bolts should be properly treated.

(e) Fasteners, such as pipe hangers, clamp etc., should be treated before being fixed to the main structure.

Painting Schedule

A. Surface preparation	Commercial blast clean.
B. Primer	Conforming to BS-5493, table-4F, part-2, Reference FP-3A. IS2074/12744 (For primer) / IS2937 (For enamel).
Main pigment	Zinc phosphate/Zinc chromate.
Nominal coating thickness	70 microns.
C. Under Coats	Conforming to BS-5493, Table-4F, Part-3, Reference FU2A. /IS2937. Main pigment Coloured pigments (full colours) suitably extended.
Nominal coating thickness	30 microns.
D. Finish coats	Conforming to BS-5493, Table-4F, Part-4, Reference FF3B /IS2937.
Main pigment	Fade-resistant coloured pigments.
Nominal coating thickness	50 microns.
E. Dry film thickness	150 microns(minimum)

B.0.0 PAINTING SCHEDULE FOR LDO STORAGE TANKS



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C' -
ANNEXURE-V

REVISION 00

DATE:

PAGE 3 of 3

B.1.0 After erection of tanks all surfaces shall be cleaned thoroughly by wire brushing and sand blasting to remove completely all loose dirt, rust, mill scales and any deleterious material. The surface shall then be prepared in accordance with manufacturers recommendations for applying an approved primer. After preparation of the surfaces in strict conformance to the specification the painting shall be applied.

B.2.0 Interior surface of the tanks shall be coated with the primer and finish paint as noted below :

i) LDO storage tank, and Drain oil tank primer (a) Epoxy red oxide - 2 coats of 30 microns each
zinc phosphate

(b) Epoxy high build - 2 coats of 100 microns each.
coating

B. 3.0 All external surfaces (non insulated) of the tanks shall be painted with primer coat of Epoxy resin based zinc phosphate (1x100 microns), one intermediate coat of epoxy resin based paint pigmented with titanium dioxide (1x100 microns) and finish coat of epoxy paint of approved shade (1x75 microns).

B.4.0 Outside surface of bottom plates of all tanks resting on ground shall be given one (1) coat of coal tar epoxy enamel.



TITLE
TECHNICAL SPECIFICATION FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SPECIFICATION NO. PE-TS-392-166-A001

VOLUME II B

SECTION -D

REV 0

DATE

SHEET OF

ANNEXURE-VI



TITLE TECHNICAL SPECIFICATION FOR FUEL OIL UNLOADING & STORAGE SYSTEM	SPECIFICATION NO. PE-TS-389-166-A001	
	VOLUME II - B	
	SECTION - C	
	REV 0	DATE
	SHEET 1 OF 1	

ANNEXURE-VI**DRAWINGS/ DOCUMENTS TO BE SUBMITTED WITH THE BID**

Bidder shall submit the following drawings / documents along with their bid

- a) Copy of pre-bid clarification, if any, duly signed and stamped.
- b) ~~Manual calculation for total steam, in case steam required is more than 16 T/Hr.~~
- c) Total Instrument Air Consumption
- d) Technical details of Oil & Condensate Hoses
- e) List of special maintenance tools & tackles, if any
- f) Approved piping layout of fuel oil unloading area and P/H of similar project.
- g) Copy of Electrical Scope between BHEL & Vendor duly signed & stamped
- h) Electrical Equipment Specification (1 sheet) for Fuel Oil System duly signed & stamped
- i) Electrical load list duly filled up
- j) **Deviation schedule** with reference to specific clauses of the specification along with reason for such deviation.
- k) Copy of un priced bid indicating "QUOTED" / "NOT QUOTED"/ "NOT APPLICABLE" as the case may be.

OFFER WILL BE CONSIDERED AS INCOMPLETE IN ABSENCE OF ANY OF ABOVE DOCUMENTS.

DOCUMENT OTHER THAN ABOVE, IF ANY, SUBMITTED WITH THE OFFER WILL NOT FORM PART OF CONTRACT AND ACCORDINGLY WILL NOT BE CONSIDERED FOR BID EVALUATION.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C'-
ANNEXURE-VII

REVISION 00

DATE:

ANNEXURE-VII

DRAWING / DOCUMENT REQUIRED DURING DETAIL ENGINEERING

The successful bidder shall submit the following drawing/documents during detailed engineering for approval/information/reference(as the case may be):-

Sl. No.	Customer Drawing No.	BHEL Drawing No.	Drawing Title	Submission Schedule from LOI date	Resubmission After Incorporating Comments
VENDOR GENERATED DWGS/ DOCS					
A	P&ID DRAWINGS				
1		PE-V0-389-166-A101	P&I DIAGRAMS FOR HFO, LDO , STEAM & CONDENSATE SYSTEM.	4 WEEKS FROM LOI	with in 1 week
2		PE-V0-389-166-A102	OPERATION PHILOSOPHY & CONTROL WRITE UP	4 WEEKS FROM LOI	with in 1 week
B	DESIGN CALCULATION				
1		PE-V0-389-166-A201	DESIGN CALCULATION OF LDO TANK	6 WEEKS	with in 1 week
2		PE-V0-389-166-A202	FOHS SIZING CALCULATION (PIPE SIZING)	4 WEEKS	with in 1 week
3		PE-V0-389-166-A203	FO PUMP SIZING CALCULATIONS	12 WEEKS	with in 1 week
C	DATA SHEETS				
1		PE-V0-389-166-A301	PAINTING SCHEDULE	6 WEEKS	with in 1 week
2		PE-V0-389-166-A302	DATA SHEET , GAD & CROSS SECTIONAL DETAILS, PERFORMANCE CURVES OF SCREW PUMPS & MOTORS	14 WEEKS	with in 1 week
4		PE-V0-389-166-A304	DATA SHEETS OF PIPES & FITTINGS	8 WEEKS	with in 1 week
5		PE-V0-389-166-A305	DATA SHEETS & GAD OF VLAVES	12 WEEKS	with in 1 week
6		PE-V0-389-166-A306	DATA SHEETS & GA OF FLAME ARRESTOR, HOSES & ANY OTHER MECHANICAL BOI AS APPLICABLE FOR THE PROJECT	14WEEKS	with in 1 week
7		PE-V0-389-166-A307	FOHS- ELECTRICAL AND C&I DATASHEETS (ALL GAUGES, INDICAOTRS, SWITCHES, TRANSMITTERS, JUNCTION BOXES, TEMPERATURE, CONTROL CIRCUIT DIAGRAM & SOLENOID VALVE DETAILS , ACTUATORS, ANY OTHER ELECTRICAL AND C&I BOIS)	12 WEEKS	with in 1 week
D	LAYOUT DRAWINGS				
1		PE-V0-389-166-A401	PIPING LAYOUT DRAWING INCLUDING PIPE SUPPORT DETAILS IN & AROUND OIL UNLOADING AND OIL STORAGE AREA	12 WEEKS	with in 1 week
2		PE-V0-389-166-A402	PIPING LAYOUT DRAWING INCLUDING PIPE SUPPORT DETAILS IN & AROUND UNLOADING/ TRANSFER PUMP HOUSE	11 WEEKS	with in 1 week
5		PE-V0-389-166-A405	LAYOUT DRAWING FOR CCOE APPROVAL	8 WEEKS	with in 1 week
6		PE-V0-389-166-A406	FOHS- ELECTRICAL AND C&I ITEM LAYOUT & CABLE ROUTING	11 WEEKS	with in 1 week
E	GA & FABRICATION DRAWINGS				
1		PE-V0-389-166-A501	GA OF LDO STORAGE TANKS INCLUDING GA OF ROOF STRUCTURE	10 WEEKS	with in 1 week
2		PE-V0-389-166-A502	NOZZLE OREINTAITON FOR LDO STORAGE TANK	18 WEEKS	with in 1 week
3		PE-V0-389-166-A503	FABRIACTION DWG FOR LDO STORAGE TANKS	18 WEEKS	with in 1 week
H	CIVIL INPUT DRAWINGS				
1		PE-V0-389-166-A601	FOPH GA, EQUIPMENT FOUNDATION,LOAD DETAILS PIPE SUPPORT & TRENCH DETAILS	16 WEEKS	with in 1 week
2		PE-V0-389-166-A602	TANK FARM AREA- EQUIPMENT FOUNDATION,LOAD DETAILS, PIPE SUPPORT & TRENCH DETAILS	16 WEEKS	with in 1 week
3		PE-V0-389-166-A603	UNLOADING AREA- EQUIPMENT FOUNDATION,LOAD DETAILS, PIPE SUPPORT & TRENCH DETAILS	16 WEEKS	with in 1 week
G	QUALITY ASSURANCE PLANS				

1		PE-V0-389-166-A701	Q A PLANS FOR , PLATES & STRUCTURES, PIPES & FITTINGS,	9 WEEKS	with in 1 week
4		PE-V0-389-166-A704	Q A PLAN FOR VLAVES	13 WEEKS	with in 1 week
5		PE-V0-389-166-A705	QA PLANS OF FLAME ARRESTOR, HOSES & ANY OTHER MECHANICAL BOI AS APPLICABLE FOR THE PROJECT	15WEEKS	with in 1 week
6		PE-V0-389-166-A706	QA PLANS FOR ELECTRICAL AND C&I ITEMS (ALL GAUGES, INDICAOTRS, SWITCHES, TRANSMITTERS, JUNCTION BOXES, TEMPERATURE CONTROL VALVES, ACTUATORS, ANY OTHER ELECTRICAL AND C&I BOIs)	13 WEEKS	with in 1 week
9		PE-V0-389-166-A709	QA PLAN FOR MOTORS	14 WEEKS	with in 1 week
1	MISC.DOCUMENTS				
1		PE-V0-389-166-A801	VALVE , INSTRUMENT ,PIPES & JUNCTION BOX SCHEDULE.	20 WEEKS	with in 1 week
2		PE-V0-389-166-A802	POWER & CONTROL CABLE SCHEDULE.	18 WEEKS	with in 1 week
3		PE-V0-389-166-A803	ELECTRICAL LOAD DATA.	16 WEEKS	with in 1 week
4		PE-V0-389-166-A804	ISOMETRIC DRAWINGS WITH COMPLETE BOQ	10 WEEKS	with in 1 week
5		PE-V0-389-166-A805	SUB-VENDOR LIST WITH INSPECTION CATAGORISATION PLAN.	4 WEEKS	with in 1 week
6		PE-V0-389-166-A806	INSTRUMENT INSTALLATION/ HOOK UP DIAGRAM	20 WEEKS	with in 1 week
7		PE-V0-389-166-A807	HAZARDOUS AREA CLASSIFICATION DWG	10 WEEKS	with in 1 week
8		PE-V0-389-166-A808	STRESS ANALYSIS FOR PROVISION OF EXPANSION JOINTS & ANCHOR POINTS IN LDO LINES	10 WEEKS	with in 1 week
13		PE-V0-389-166-A813	COMMISSIONG PROCEDURE	20 WEEKS	with in 1 week
14		PE-V0-389-166-A814	PG TEST PROCEDURE	16 WEEKS	with in 1 week
15		PE-V0-389-166-A815	O& M MANUAL	20 WEEKS	with in 1 week
16		PE-V0-389-166-A816	COMPLETE BOQ- DRAWING WISE	20 WEEKS	with in 1 week
1		--	Handling Over Protocal	--	--
2		--	Erection Manual	3 months before schedule of erection	--
NOTES					
1. Finally approved documents/drawings to be provided in editable format(micro soft office /Autocad format) for onword submission to end customer.					
2. Bidder to note that during detailed engineering, drg/doc will be submitted through web based document management system in addition to hard copies to be submitted as per drawing /document distribution schedule .procedure for the same will be informed after award oof contract.					
COMPANY SEAL			SIGNATURE: _____		
			NAME: _____		
			DESIGNATION: _____		
			COMPANY: _____		
			DATE: _____		



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C'-
ANNEXURE-VIII

REVISION 00

DATE:

ANNEXURE-VIII

GENERAL TECHNICAL REQUIREMENT

**VINDHYACHAL STPP-V (1X500 MW)
STEAM GENERATOR WITH
ELECTROSTATIC PRECIPITATOR PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-2260-101-2**

GENERAL TECHNICAL REQUIREMENTS

PART - C

CONTENTS

Clause No.	Description	Page No.
1.00.00	Introduction	1
2.00.00	Brand Name	1
3.00.00	Base Offer & Alternate Proposals	1
4.00.00	Completeness of Facilities	1
5.00.00	Codes & Standards	2
6.00.00	Equipment Functional Guarantee	4
7.00.00	Design of Facilities / Maintenance & Availability Considerations	4
8.00.00	Documents, Data and Drawings to be Furnished by Contractor	5
9.00.00	Technical Co-ordination Meeting	15
10.00.00	Design Improvements	16
11.00.00	Training of Employer's Personnel	16
12.00.00	Equipment Bases	17
13.00.00	Protective Guards	17
14.00.00	Lubricants, Servo Fluids and Chemicals	18
15.00.00	Lubrication	18
16.00.00	Material of Construction	18
17.00.00	Rating Plates, Name Plates & Labels	18
18.00.00	Tools and Tackles	19
19.00.00	Welding	20

20.00.00	Colour Code for all Equipments/ Pipings / Pipe Services	20
21.00.00	Protection and Preservative Shop Coating	20
22.00.00	Project Manager's Supervision	21
23.00.00	Quality Assurance Programme	22
24.00.00	This clause is not used	31
25.00.00	This clause is not used	31
26.00.00	Pre-commissioning and Commissioning Facilities	31
27.00.00	Taking over	33
28.00.00	Guarantee Tests	34
29.00.00	Noise Level	34
30.00.00	Packaging and Transportation	35
31.00.00	Electrical Enclosure	35
32.00.00	Electrical Noise Control	35
33.00.00	Instrumentation and Control	35
34.00.00	Instrument Air System	36
35.00.00	Tapping Points for Measurements	36
36.00.00	Electronic Module / Component Details	37
37.00.00	Safety Aspects During Construction and Erection	37

- Annexure - I
- Annexure - II
- Annexure-III
- Annexure-IV
- Annexure-V
- Annexure-VI
- Annexure-VII

1.00.00

INTRODUCTION

This part covers technical requirements which will form an integral part of the Contract. The following provisions shall supplement all the detailed technical requirements brought out in the Technical Specifications and the Technical Data Sheets.

2.00.00

BRAND NAME

Whenever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific item mentioned shall be understood to be indicative of the function and quality desired, and not restrictive; other manufacturer's products may be considered provided sufficient information is furnished to enable the Employer to determine that the products proposed are equivalent to those named.

3.00.00

BASE OFFER & ALTERNATE PROPOSALS

The Bidder's proposal shall be based upon the use of equipment and material complying fully with the requirements specified herein. It is recognized that the Contractor may have standardized on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice may also be considered, provided the base offer is in line with technical specifications and such proposals meet the specified design standards and performance requirement and are acceptable to the Employer. Sufficient amount of information for justifying such proposals shall be furnished to Employer alongwith the bid to enable the Employer to determine the acceptability of these proposals.

4.00.00

COMPLETENESS OF FACILITIES

4.01.00

Bidders may note that this is a Contract inclusive of the scope as indicated elsewhere in the specification. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure that a completely engineered plant is provided.

4.02.00

All equipments furnished by the Contractor shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation & maintenance of the equipment and for the safety of the operating personnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions.

All similar standard components/ parts of similar standard equipment provided, shall be interchangeable with one another.

5.00.00

CODES & STANDARDS

5.01.00

In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India, NTPC rules/codes of practices as well as of the locality where they will be installed, including the following:

- (a) Bureau of Indian Standards (BIS)
- (b) Indian electricity act
- (c) Indian electricity rules
- (d) Indian Explosives Act
- (e) Indian Factories Act and State Factories Act
- (f) Indian Boiler Regulations (IBR)
- (g) Regulations of the Central Pollution Control Board, India
- (h) Regulations of the Ministry of Environment & Forest (MOEF), Government of India
- (i) Pollution Control Regulations of Department of Environment, Government of India
- (j) State Pollution Control Board.
- (k) Rules for Electrical installation by Tariff Advisory Committee (TAC).
- (l) Building and other construction workers (Regulation of Employment and Conditions of services) Act, 1996
- (m) Building and other construction workers (Regulation of Employment and Conditions of services) Central Rules, 1998
- (n) Explosive Rules, 1983
- (o) Petroleum Act, 1984
- (p) Petroleum Rules, 1976,
- (q) Gas Cylinder Rules, 1981
- (r) Static and Mobile Pressure Vessels (Unified) Rules, 1981



- (s) Workmen's Compensation Act, 1923
- (t) Workmen's Compensation Rules, 1924
- (u) NTPC Safety Rules for Construction and Erection
- (v) NTPC Safety Policy
- (w) Any other statutory codes / standards / regulations, as may be applicable.

5.02.00

Unless covered otherwise by Indian codes & standards and in case nothing to the contrary is specifically mentioned elsewhere in the specifications, the latest editions (as applicable as on date of bid opening), of the codes and standards given below shall also apply:

- (a) Japanese Industrial Standards (JIS)
- (b) American National Standards Institute (ANSI)
- (c) American Society of Testing and Materials (ASTM)
- (d) American Society of Mechanical Engineers (ASME)
- (e) American Petroleum Institute (API)
- (f) Standards of the Hydraulic Institute, U.S.A.
- (g) International Organisation for Standardization (ISO)
- (h) Tubular Exchanger Manufacturer's Association (TEMA)
- (i) American Welding Society (AWS)
- (j) National Electrical Manufacturers Association (NEMA)
- (k) National Fire Protection Association (NFPA)
- (l) International Electro-Technical Commission (IEC) / European Norm (EN)
- (m) Expansion Joint Manufacturers Association (EJMA)
- (n) Heat Exchange Institute (HEI)

5.03.00

Other International/ National standards such as DIN, VDI, BS, GOST etc. shall also be accepted for only material codes and manufacturing standards, subject to the Employer's approval, for which the Bidder shall furnish, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned else where in the specification together

	<p>with the complete word to word translation of the standard that is normally not published in English.</p>
5.04.00	<p>In the event of any conflict between the codes and standards referred to in the above clauses and the requirement of this specification, the requirement of Technical Specification shall govern.</p>
5.05.00	<p>Two (2) English language copies of all national and international codes and/or standards used in the design of the plant, equipment, and structural works shall be provided by the Contractor to the Employer within two calendar months from the date of the Notification of Award.</p>
5.06.00	<p>In case of any change in codes, standards & regulations between the date of bid opening and the date when vendors proceed with fabrication, the Employer shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Contractor to bring to the notice of the Employer such changes and advise Employer of the resulting effect.</p>
6.00.00	<p>EQUIPMENT FUNCTIONAL GUARANTEE</p>
6.01.00	<p>The functional guarantees of the equipment under the scope of the Contract is given elsewhere in the technical specification. These guarantees shall supplement the general functional guarantee provisions covered under General Conditions of Contract.</p>
6.02.00	<p>Liquidated damages for shortfall in meeting functional guarantee(s) during the performance and guarantee tests shall be assessed and recovered from the Contractor as specified elsewhere in this specification.</p>
7.00.00	<p>DESIGN OF FACILITIES/ MAINTENANCE & AVAILABILITY CONSIDERATIONS</p>
7.01.00	<p>Design of Facilities</p> <p>All the design procedures, systems and components proposed shall have already been adequately developed and shall have demonstrated good reliability under similar conditions elsewhere.</p> <p>The Contractor shall be responsible for the selection and design of appropriate equipments to provide the best coordinated performance of the entire system. The basic requirements are detailed out in various clauses of the Technical Specifications. The design of various components, assemblies and subassemblies shall be done so that it facilitates easy field assembly and dismantling. All the rotating components shall be so selected that the natural frequency of the complete unit is not critical or close to the operating range of the unit.</p>

7.02.00

Maintenance and Availability Considerations

Equipment/facilities offered shall be designed for high availability, low maintenance and ease of maintenance. The Bidder shall specifically state the design features incorporated to achieve high degree of reliability/ availability and ease of maintenance. The Bidder shall also furnish details of availability records in the reference plants stated in his experience list.

Bidder shall state in his offer the various maintenance intervals, spare parts and man-hour requirement during such operation. The intervals for each type of maintenance namely inspection of the turbine and equipments, inspection of the steam path and the minor and major overhauls shall be specified in terms of fired hours, clearly defining the spare parts and man-hour requirement for each stage.

Lifting devices i.e. hoists and chain pulley jacks, etc. shall be provided by the Contractor for handling of any equipment or any of its part having weight in excess of 500 Kgs during erection and maintenance activities.

Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist / crane shall be provided by the Contractor for lifting the equipment and accessories covered under the specification.

8.00.00

DOCUMENTS, DATA AND DRAWINGS TO BE FURNISHED BY CONTRACTOR

8.01.00

Contractor may note that this is a Contract inclusive of the scope as indicated elsewhere in the specification. Each of the plant and equipment shall be fully integrated, engineered and designed to perform in accordance with the technical specification. All engineering and technical services required ensuring a completely engineered plant shall be provided in respect of mechanical, electrical, control & instrumentation, civil & structural works as per the scope.

Each main and auxiliary equipment/item of the plant including instruments shall be assigned a unique tag number. The assignment of tag numbers shall be in accordance with KKS system. In all drawings/documents/data sheet etc. KKS tag number of the equipment/item/instrument etc. shall be indicated.

The Contractor shall furnish engineering data/drgs. in accordance with the schedule of information as specified in Technical Specification and data sheet.

8.02.00

The number of copies/prints/floppy discs/CD-ROMs/manuals to be furnished for various types of documents is given in Annexure-I.

8.03.00

The documentation that shall be provided by the Contractor is indicated in the various sections of specification. This documentation shall include but not be limited to the following :

(a) **Basic Engineering Documentation**

Prior to commencement of the detailed engineering work, the Contractor shall furnish a Plant Definition Manual within 12 weeks from the date of the Notification of Award. This manual shall contain the following as a minimum:

- (i) System description of all the mechanical, electrical, control & instrumentation & civil systems.
- (ii) Technology scan for each system / sub-system & equipment.
- (iii) Selection of appropriate technology / schemes for various systems/ subsystems including techno-economic studies between various options.
- (iv) Optimization studies including thermal cycle optimization.
- (v) Sizing criteria of all the systems, sub-systems including various piping systems/ equipments/ structures/ equipment foundations along with all calculations justifying and identifying the sizing and the design margins.
- (vi) Schemes and Process & Instrumentation diagrams for the various systems/ sub-system with functional write-ups.
- (vii) Operation Philosophy and the control philosophy of the equipments / system covered under the scope.
- (viii) General Layout plan of the power station incorporating all facilities in Contractor's as well as those in the Employer's scope. This drawing shall also be furnished in the form of floppy discs to the Employer for engineering of areas not included in Contractor's scope.
- (ix) Basic layouts and cross sections of the Main Plant Building (various floor elevations), and other areas included in the scope of the Contractor.
- (x) Documentation in respect of Quality Assurance System as listed out elsewhere in this specification.
- (xi) The successful bidder shall furnish within three (3) weeks from the date of Notification of Award, a list of contents of the Plant Definition Manual (PDMs) including techno-economic studies, which shall then be mutually discussed & finalised with the Employer.

(b) **Detailed Engineering Documents**

- (i) General layout plan of the station.



- (ii) Layouts, general arrangements, elevations and cross-sections drawings for all the equipment and facilities of the plant.
- (iii) Flow diagrams, Process & Instrumentation Diagrams along with write-up and system description.
- (iv) Start-up curves for boiler, for various start-ups, viz. cold, warm and hot start-up including combined start up curves for boiler & turbine under cold, warm & hot up start up conditions.
- (v) Piping isometric, composite layout and fabrication drawings.
- (vi) Piping engineering diagrams, pipe and fittings schedules, valve schedules, hanger and support schedules, insulation schedules.
- (vii) Technical data sheets for all bought out and manufactured items. Contractor shall use the NTPC specifications as a base for placement of orders on their sub-vendors.
- (viii) Detailed design calculations for components, system/sub-system,, piping etc., wherever applicable including sizing calculations for all auxiliaries as per criteria specified elsewhere in specification.
- (ix) Boiler pressure part schedule and sizing calculations. Boiler performance data and boiler design dossier.
- (x) Transient, hydraulic and thermal stress analysis of piping and system wherever applicable & input and output data along with stress analysis isometrics showing nodes.
- (xi) Thermal cycle information (heat balance diagrams, boiler performance calculations, thermal calculations etc.).
- (xii) Characteristic Curves/ Performance Correction Curves. Hydraulic & Mechanical design calculations for equipment like pumps, compressors, other heat exchangers & equipments covered under the package.
- (xiii) Comprehensive list of all terminal points which interface with Employer's facilities giving details of location, terminal pressure, temperature, fluid handled & end connection details, forces, moments etc.
- (xiv) Power supply single line diagram, block logics, control schematics, electrical schematics, etc.
- (xv) Protection system diagrams and relay settings.



- (xvi) Interconnection diagrams.
- (xvii) Cable routing plan.
- (xviii) Instrument schedule, measuring point list, I/O list, Interconnection & wiring diagram, functional write-ups, installation drawings for field mounted instruments, logic diagrams, control schematics, wiring and tubing diagrams of panels and enclosures etc. Drawings for open loop and close loop controls (both hardware and software). Motor list and valve schedule including type of actuator etc.
- (xix) Alarm and annunciation list and alarms & trip set points.
- (xx) Sequence and protection interlock schemes.
- (xxi) Type test reports and power system stability study report.
- (xxii) Control system configuration diagrams and maintenance details.
- (xxiii) Detailed software manuals & source software listing.
- (xxiv) Detailed flow chart for digital control system.
- (xxv) Man Machine Interface application engineering drawings & documents.
- (xxvi) Civil & Structural works drawings and documents for all structures, facilities, foundations, underground and overground works and super-structural works as included in the scope of the Bidder.
- (xxvii) Model study reports wherever applicable.
- (xxviii) Functional & Guarantee test procedures and test reports.
- (xxix) Documentation in respect of Quality Assurance System as listed out elsewhere in this specification.
- (xxx) Documentation in respect of commissioning as listed out elsewhere in this specification.
- (xxxi) Maintenance schedule for boiler & auxiliaries & ESP clearly indicating interval, duration if shutdown required, man hours required and tools & tackles required for the maintenance.

8.03.01

The Contractor while submitting the above documents / drawings for approval / reference as the case may be, shall mark on each copy of submission the reference letter along with the date vide which the submissions are made.

8.03.02

Instruction Manuals

The Contractor shall submit to the Employer, draft Instruction Manuals for all the equipments covered under the Contract by the end of one year from the date of his acceptance of the Letter of Award. The Instruction manuals shall contain full details required for erection, commissioning, operation and maintenance of each equipment. The manual shall be specifically compiled for this project. After finalization and approval of the Employer the Instruction Manuals shall be submitted as indicated in Annexure-I. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals have been supplied to the Employer. The Instruction Manuals shall comprise of the following:

(a) Erection Manuals

The erection manuals shall be submitted at least three (3) months prior to the commencement of erection activities of particular equipment/system. The erection manual should contain the following as a minimum.

- (i) Erection strategy.
- (ii) Sequence of erection.
- (iii) Erection instructions.
- (iv) Critical checks and permissible deviation/tolerances.
- (v) List of tool, tackles, heavy equipments like cranes, dozers, etc.
- (vi) Bill of Materials
- (vii) Procedure for erection.
- (viii) General safety procedures to be followed during erection/installation.
- (ix) Procedure for initial checking after erection.
- (x) Procedure for testing and acceptance norms.
- (xi) Procedure / Check list for pre-commissioning activities.
- (xii) Procedure / Check list for commissioning of the system.
- (xiii) Safety precautions to be followed in electrical supply distribution during erection

(b) Operation & Maintenance Manuals

- (i) The operating and maintenance instructions together with drawings (other than shop drawings) of the equipment, as completed, shall be in sufficient detail to enable the Employer to operate, maintain,

dismantle, reassemble and adjust all parts of the equipment. They shall give a step by step procedure for all operations likely to be carried out during the life of the plant / equipment including, operation, maintenance, dismantling and repair including periodical activities such as chemical cleaning of the generator. Each manual shall also include a complete set of drawings together with performance/rating curves of the equipment and test certificates wherever applicable. The Contract shall not be considered to be completed for purposes for taking over until these manuals have been supplied to the Employer.

- (ii) If after the commissioning and Trial operation of the plant, the manuals require any modification / additions / changes, the same shall be incorporated and the updated final instruction manuals shall be submitted to the Employer for records.
- (iii) A separate section of the manual shall be for each size/ type of equipment and shall contain a detailed description of construction and operation, together with all relevant pamphlets and drawings.
- (iv) The manuals shall include the following :
 - (a) List of spare parts along with their drawing and catalogues and procedure for ordering spares.
 - (b) Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation.
 - (c) Where applicable, fault location charts shall be included to facilitate finding the cause of mal operation or break down.
- (v) Detailed specifications for all the consumables including lubricant oils, greases, chemicals etc.system/equipment/assembly/sub-assembly - wise required for the complete plant.
- (vi) On completion of erection, a complete list of bearings / equipment giving their location, and identification marks etc. shall also be furnished to the Employer indicating lubrication method for each type/category of bearing.

8.03.03

Plant Handbook

The Contractor shall submit to the Employer a preliminary plant hand book preferably in A-4 size sheets which shall contain the design and performance data of various plants, equipments and systems covering the complete project including

- (1) Design and performance data.
- (2) Process & Instrumentation diagrams.
- (3) Single line diagrams.
- (4) Sequence & Protection Interlock Schemes.
- (5) Alarm and trip values.
- (6) Performance Curves.
- (7) General layout plan and layout of main plant building and auxiliary buildings
- (8) Important Dos & Don'ts

The plant handbook shall be submitted within twelve (12) months from the date of award of Contract. After the incorporation of Employer's comments, the final plant handbook complete in all respects shall be submitted three (3) months before start-up and commissioning activities.

8.03.04

Project Completion Report

The Contractor shall submit a Project Completion Report at the time of handing over the plant.

8.03.05

Drawings

- (a) (i) All the plant layouts shall be made in computerised 3D modelling system. The Employer reserves the right to review the 3D model at different stages during the progress of engineering. The layout drawings submitted for Employer's review shall be fully dimensioned and extracted from 3D model after interference check.
- (ii) All documents submitted by the Contractor for Employer's review shall be in electronic form (soft copies) along with the desired number of hard copies as per Annexure-I of Part-C. The soft copies to be supplied shall be uploaded by the vendor in c-folder, a web based system of NTPC ERP, for which a username and password will be allotted to the new vendor by NTPC.

Similarly the vendor can download the drawings/documents, approved/commented by NTPC, through above site.

The soft copies of identified drawings/documents shall be in pdf format, whereas the attachments/reply to the submitted document(s) can be in .doc, .xls, pdf, .dwg or .std formats.

- (iii) Final copies of the approved drawings along with required number of hard copies shall be submitted as per Annexure-I of Part-C.
- (iv) The completed plant documentation including integrated 3D model with equipment drawings, data sheets, P&ID, BOQ, schematics, logic diagrams, test reports and quality plan, etc. attached to the respective equipments / systems in the 3D model shall be furnished to Employer, along with the design review software which shall include interference check and walk-through animation, loaded on suitable hardware (server and work station). The software shall include facility for obtaining hard copies of all the drawings/documents on standard plotter / printer. The requisite hardware and software shall be supplied and commissioned by the Contractor at Employer's Engineering Office Complex at Noida as per mutually agreed schedule.
- (b) All documents/text information shall be in latest version of MS Office and MS Excel as applicable.
- (c) All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail indicating the type, size, arrangement, weight of each component for packing and shipment, the external connection, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearance and spaces required between various portions of equipment and any other information specifically requested in the drawing schedules.
- (d) Each drawing submitted by the Contractor (including those of subvendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, notings, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.
- (e) The drawings submitted by the Contractor (or their sub-vendors) shall bear Employer's drawing number in addition to Contractor's (their sub-vendor's) own drawing number. Employer's drawing numbering system shall be made available to the successful bidder so as to enable him to assign Employer's drawing numbers to the drawings to be submitted by him during the course of execution of the Contract.
- (f) The Contractor shall also furnish a "Master Drawing List" which shall be a comprehensive list of all drawings/ documents/ calculations envisaged to be furnished by him during the detailed engineering to the Employer. Such list should clearly indicate the purpose of submission of these drawings i.e. "FOR APPROVAL" or "FOR INFORMATION ONLY".



- (g) Similarly, all the drawings/ documents submitted by the Contractor during detailed engineering stage shall be stamped "FOR APPROVAL" or "FOR INFORMATION" prior to submission.
- (h) The furnishing of detailed engineering data and drawings by the Contractor shall be in accordance with the time schedule for the project. The review of these documents/ data/ drawings by the Employer will cover only general conformance of the data/ drawings/ documents to the specifications and Contract, interfaces with the equipments provided by others and external connections & dimensions which might affect plant layout. The review by the Employer should not be construed to be a thorough review of all dimensions, quantities and details of the equipments, materials, any devices or items indicated or the accuracy of the information submitted. The review and/ or approval by the Employer / Project Manager shall not relieve the Contractor of any of his responsibilities and liabilities under this Contract.
- (i) After the approval of the drawings, further work by the Contractor shall be in strict accordance with these approved drawings and no deviation shall be permitted without the written approval of the Employer.
- (j) All manufacturing, fabrication and execution of work in connection with the equipment / system, prior to the approval of the drawings, shall be at the Contractor's risk. The Contractor is expected not to make any changes in the design of the equipment /system, once they are approved by the Employer. However, if some changes are necessitated in the design of the equipment/system at a later date, the Contractor may do so, but such changes shall promptly be brought to the notice of the Employer indicating the reasons for the change and get the revised drawing approved again in strict conformance to the provisions of the Technical Specification.
- (k) Drawings shall include all installations and detailed piping layout drawings. Layout drawings for all piping of 65 mm and larger diameter shall be submitted for review/ approval of Employer prior to erection. Small diameter pipes shall however be routed as per site conditions in consultation with site authority / representative of Employer based on requirements of such piping indicated in approved / finalized Flow Scheme / Process & Instrumentation Diagrams and/or the requirements cropping up for draining & venting of larger diameter piping or otherwise after their erection as per actual physical condition for the entire scope of work of this package.
- (l) Assessing & anticipating the requirement and supply of all piping and equipment shall be done by the Contractor well in advance so as not to hinder the progress of piping & equipment erection, subsequent system charging and its effective draining & venting arrangement as per site suitability.



- (m) **As Built Drawings**
After final acceptance of individual equipment /system by the Employer, the Contractor will update all original drawings and documents for the equipment/ system to "as built" conditions.
- (n) Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to Engineering schedule prior to submission to the Employer. In case drawings are found to be submitted without proper endorsement for checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission. The Contractor shall make a visit to site to see the existing facilities and understand the layout completely and collect all necessary data / drawings at site which are needed as an input to the engineering. The Contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same.
- (o) The Contractor shall submit adequate prints of drawings / data / documents for Employer's review and approval. The Employer shall review the drawings and return one (1) copy to the Contractor authorizing either to proceed with manufacture or fabrication, or marked to show changes desired. When changes are required, drawings shall be re-submitted promptly, with revisions clearly marked, for final review. Any delays arising out of the failure of the Contractor to submit/rectify and resubmit in time shall not be accepted as a reason for delay in the Contract schedule.
- (p) All engineering data submitted by the Contractor after final process including review and approval by the Project Manager/ Employer shall form part of the Contract documents and the entire works covered under these specification shall be performed in strict conformity with technical specifications unless otherwise expressly requested by the Project Manager in writing.

8.04.00

Engineering Information Submission Schedule

Prior to the award of Contract, a Detailed Engineering Information Submission Schedule shall be tied up with the Employer. For this, the bidder shall furnish a detailed list of engineering information along with the proposed submission schedule. This list would be a comprehensive one including all engineering data / drawings / information for all bought out items and manufactured items. The information shall be categorized into the following parts.

- (a) Information that shall be submitted for the approval of the Employer before proceeding further, and
- (b) Information that would be submitted for Employer's information only.



The Engineering Information Schedule shall be updated month wise.

The schedule should allow adequate time for proper review and incorporation of changes/ modifications, if any, to meet the Contract without affecting the equipment delivery schedule and overall project schedule. The early submission of drawings and data is as important as the manufacture and delivery of equipment and hardware and this shall be duly considered while determining the overall performance and progress.

8.05.00 Engineering Progress and Exception Report

8.05.01 The Contractor shall submit every month an Engineering progress and Exception Report giving the status of each engineering information including

- (a) A list of drawings/engineering information which remains unapproved for more than four (4) weeks after the date of first submission
- (b) Drawings which were not submitted as per agreed schedule.

8.05.02 The draft format for this report shall be furnished to the Employer within four (4) weeks of the award of the Contract, which shall then be discussed and finalised with the Employer.

8.05.03 Bidder to update Master Drawing List (MDL) monthly and shall be submitted to the Employer in every first week of month.

9.00.00 TECHNICAL CO-ORDINATION MEETING

9.01.00 The Contractor shall be called upon to organize and attend monthly Design/ Technical Co-ordination Meetings (TCMs) with the Employer/Employer's representatives and other Contractors of the Employer during the period of Contract. The Contractor shall attend such meetings at his own cost at NEW DELHI / NOIDA or at mutually agreed venue as and when required and fully co-operate with such persons and agencies involved during the discussions.

9.02.00 The Contractor should note that Time is the essence of the Contract. In order to expedite the early completion of engineering activities, the Contractor shall submit all drawings as per the agreed Engineering Information Submission Schedule. The drawings submitted by the Contractor will be reviewed by the Employer as far as practicable within three (3) weeks from the date of receipt of the drawing .The comments of the Employer shall then be discussed across the table during the above Technical Co-ordination Meeting (s) wherein best efforts shall be made by both sides to ensure the approval of the drawing.

9.03.00 The Contractor shall ensure availability of the concerned experts / consultants/ personnel who are empowered to take necessary decisions during these meetings. The Contractor shall be equipped with necessary tools and facilities so that the

drawings/documents can be resubmitted after incorporating necessary changes and approved during the meeting itself.

9.04.00 Should any drawing remain unapproved for more than six (6) weeks after it's first submission, this shall be brought out in the monthly Engineering Progress and Exception Report with reasons thereof.

9.05.00 Any delays arising out of failure by the Contractor to incorporate Employer's comments and resubmit the same during the TCM shall be considered as a default and in no case shall entitle the Contractor to alter the Contract completion date.

10.00.00 DESIGN IMPROVEMENTS

The Employer or the Contractor may propose changes in the specification of the equipment or quality thereof and if the parties agree upon any such changes the specification shall be modified accordingly.

If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any changing the price and/or schedule of completion before the Contractor proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.

11.00.00 TRAINING OF EMPLOYER'S PERSONNEL

11.01.00 Training for Employers O&M Personnel

The scope of service under training of Employer's engineers shall include a training module covering upto thirty five (35) man months in the areas of Operation & Maintenance.

Such training should cover the following areas as a minimum in order to enable these personnel to individually take the responsibility of operating and maintaining the power station in a manner acceptable to the Employer:

- (a) Training for Steam Generator & ESP Equipment & Auxiliaries.
- (b) Training for Electric Systems including VFD.
- (c) Training for other SG related C&I systems/equipments.
- (d) Training for special packages for various PC based systems specified elsewhere in Part-B of Technical Specification, Section-VI.
- (e) Training for DDCMIS as detailed in Part-B of Technical Specification, Section-VI.
- (f) Training for power cycle piping/critical piping.



11.02.00

Training for Employers Engineering Personnel

The scope of services under training shall also necessarily include training of Employer's Engineering personnel covering a training module of upto 15 man months. This shall cover all disciplines viz, Mechanical, Electrical, C&I , QA etc. and shall include all the related areas like Design familiarization, training on product design features and product deign software of major equipment and systems, engineering, manufacturing, erection, commissioning, training on operating features of equipment, quality assurance and testing, plant visits and visits to manufacturer's works, exposure to various kinds of problems which may be encountered in fabrication, manufacturing erection, welding etc. An indicative module of the training requirement of Employer's Engineering personnel is attached as Annexure-II.

11.03.00

Bidder shall furnish in his offer, details of training module(s) covering above requirements which shall be subject to Employer's approval. Consolidated training period included above (i.e. 35 & 15 months respectively for O&M and Engineering) is indicative only. Employer reserves the right to reappropriate the training period between O&M and engineering depending upon the details of training module proposed by the Bidder.

11.04.00

Exact details, extent of training and the training schedule shall be finalized based on the Bidder's proposal within two (2) months from placement of award.

11.05.00

In all the above cases, wherever the training of Employer's personnel is arranged at the works of the manufacturer's it shall be noted that the lodging and boarding of the Employer's personnel shall be at the cost of Contractor. The Contractor shall make all necessary arrangements towards the same.

11.06.00

Take off prices (product wise) should be indicated by the Bidder in the Bid Proposal Sheets. Employer reserves the right to include or exclude these item(s) during placement of Award.

Note: For training purposes, one (1) man month implies 30 working days (excluding all intervening holidays) per person.

12.00.00

EQUIPMENT BASES

A cast iron or welded steel base plate shall be provided for all rotating equipment which is to be installed on a concrete base, unless otherwise specifically agreed to by the Employer. Each base plate which support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have threaded drain connections.

13.00.00

PROTECTIVE GUARDS

Suitable guards shall be provided for protection of personnel on all exposed rotating and/or moving machine parts. All such guards shall be designed for easy installation and removal for maintenance purpose.

14.00.00 LUBRICANTS, SERVO FLUIDS AND CHEMICALS

14.01.00 The Contractor's scope includes all the first fill and one year's topping, requirements of consumables such as oils, lubricants including grease, servo fluids, gases and essential chemicals etc. Consumption of all these consumables during the Trial operation and final filling after the Trial operation shall also be included in the scope of the Bidder. Bidder shall also supply a quantity not less than 10% of the full charge of each variety of lubricants, servo fluids, gases, chemicals etc. used which is expected to be utilised during the first year of operation. This additional quantity shall be supplied in separate Containers.

14.02.00 As far as possible lubricants marketed by the Indian Oil Corporation shall be used. The variety of lubricants shall be kept to a minimum possible.

Detailed specifications for the lubricating oil, grease, gases, servo fluids, control fluids, chemicals etc. required for the complete plant covered herein shall be furnished. On completion of erection, a complete list of bearings/ equipment giving their location and identification marks shall be furnished to the Employer along with lubrication requirements.

15.00.00 LUBRICATION

Equipment shall be lubricated by systems designed for continuous operation. Lubricant level indicators shall be furnished and marked to indicate proper levels under both standstill and operating conditions.

16.00.00 MATERIAL OF CONSTRUCTION

All materials used for the construction of the equipment shall be new and shall be in accordance with the requirements of this specification. Materials utilised for various components shall be those which have established themselves for use in such applications.

17.00.00 RATING PLATES, NAME PLATES & LABELS

17.01.00 Each main and auxiliary item of plant including instruments shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturer's name, equipment, tag number, type or serial number together with details of the ratings, service conditions under which the item of plant in question has been designed to operate, and such diagram plates as may be required by the Employer.

17.02.00 Each item of plant shall be provided with nameplate or label designating the service of the particular equipment. The inscriptions shall be approved by the Employer or as detailed in appropriate section of the technical specifications.

17.03.00 Such nameplates or labels shall be of white non hygroscopic material with engraved black lettering or alternately, in the case of indoor circuit breakers, starters, etc. of transparent plastic material with suitably coloured lettering engraved on the back. The name plates shall be suitably fixed on both front and rear sides.

17.04.00 Items of plant such as valves, which are subject to handling, shall be provided with an engraved chromium plated nameplate or label with engraving filled with enamel. The name plates for valves shall be marked in accordance with MSS standard SP-25 and ANSI B 16.34 as a minimum.

17.05.00 Hanger/ support numbers shall be marked on all pipe supports, anchors, hangers, snubbers and restraint assemblies. Each constant and variable spring support shall also have stamped upon it the designed hot and cold load which it is intended to support. Suitable scale shall also be provided to indicate load on support/hanger.

17.06.00 Valves, steam traps and strainers shall be identified by Employer's tag number of a metal tap permanently attached to non pressure parts such as the yoke by a stainless steel wire. The direction of flow shall also be marked on the body.

17.07.00 Safety and relief valves shall be provided with the following :

- (a) Manufacturer's identification.
- (b) Nominal inlet and outlet sizes in mm.
- (c) Set pressure in Kg/cm² (abs).
- (d) Blowdown and accumulation as percentage of set pressure.
- (e) Certified capacity in Kg of saturated steam per hour or in case of liquid certified capacity in liters of water per minute.

17.08.00 All such plates, instruction plates, etc. shall be bilingual with Hindi inscription first, followed by English. Alternatively, two separate plates one with Hindi and the other with English inscriptions may be provided.

17.09.00 All segregated phases of conductors or bus ducts, indoor or outdoor, shall be provided with coloured phase plates to clearly identify the phase of the system

18.00.00 TOOLS AND TACKLES

The Contractor shall supply with the equipment one complete set of all special tools and tackles and other instruments required for the erection, assembly, disassembly and proper maintenance of the plant and equipment and systems (including software). These special tools will also include special material handling equipment, jigs and fixtures for maintenance and calibration / readjustment, checking and measurement aids etc. A list of such tools and tackles shall be submitted by the Bidder along with the offer.



The price of each tool / tackle shall be deemed to have been included in the total bid price. These tools and tackles shall be separately packed and sent to site. The Contractor shall also ensure that these tools and tackles are not used by him during erection, commissioning and Trial operation. For this period the Contractor should bring his own tools and tackles. All the tools and tackles shall be of reputed make acceptable to the Employer.

19.00.00

WELDING

If the manufacturer has special requirements relating to the welding procedures for welds at the terminals of the equipments to be performed by others the requirements shall be submitted to the Employer in advance of commencement of erection work.

20.00.00

COLOUR CODE FOR ALL EQUIPMENTS/ PIPINGS/ PIPE SERVICES

All equipment/ piping/ pipe services are to be painted by the Contractor in accordance with Employer's standard colour coding scheme, which will be furnished to the Contractor during detailed engineering stage.

21.00.00

PROTECTION AND PRESERVATIVE SHOP COATING

21.01.00

Protection

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either metallic or a nonmetallic protection device. All ends of all valves and piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. All primers/paints/coatings shall take into account the hot humid, corrosive & alkaline, subsoil or over ground environment as the case may be. The requirements for painting specification shall be complied with as detailed out in Part-A & B of the Technical Specification.

21.02.00

Preservative Shop Coating

21.02.01

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall be treated beforehand and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scales, oxides and other coatings and prepared in the shop. The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted as per the requirements covered in the relevant part of the Technical Specification.

21.02.02

Transformers and other electrical equipments if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colors shall be as per manufacturer's standards, to be selected and specified by the Employer at a later date.

21.02.03

Shop primer for all steel surfaces which will be exposed to operating temperature below 95 degrees Celsius shall be selected by the Contractor after obtaining specific approval of the Employer regarding the quality of primer proposed to be applied. Special high temperature primer shall be used on surfaces exposed to temperature higher than 95 degrees Celsius and such primer shall also be subject to the approval of the Employer.

21.02.04

All other steel surfaces which are not to be painted shall be coated with suitable rust preventive compound subject to the approval of the Employer.

21.02.05

All piping shall be cleaned after shop assembly by shot blasting or other means approved by the Employer. Lube oil piping or carbon steel shall be pickled.

21.02.06

Painting for Civil structures and equipment/system covered under this package shall be done as specified under technical requirements on civil works in relevant part of this specifications.

22.00.00

PROJECT MANAGER'S SUPERVISION

22.01.00

To eliminate delays and avoid disputes and litigation, it is agreed between the parties to the Contract that all matters and questions shall be referred to the Project Manager and without prejudice to the provisions of 'Arbitration' clause in Section GCC of Vol.I, the Contractor shall proceed to comply with the Project Manager's decision.

22.02.00

The work shall be performed under the supervision of the Project Manager. The scope of the duties of the Project Manager pursuant to the Contract, will include but not be limited to the following:

- (a) Interpretation of all the terms and conditions of these documents and specifications:
- (b) Review and interpretation of all the Contractor's drawing, engineering data, etc:
- (c) Witness or his authorised representative to witness tests and trials either at the manufacturer's works or at site, or at any place where work is performed under the contract :
- (d) Inspect, accept or reject any equipment, material and work under the contract:
- (e) Issue certificate of acceptance and/or progressive payment and final payment certificates
- (f) Review and suggest modifications and improvement in completion schedules from time to time, and

(g) Supervise Quality Assurance Programme implementation at all stages of the works.


23.00.00

QUALITY ASSURANCE PROGRAMME

23.01.00

The Contractor shall adopt suitable quality assurance programme to ensure that the equipment and services under the scope of Contract whether manufactured or performed within the Contractor's works or at his sub-Contractor's premises or at the Employer's site or at any other place of work are in accordance with the specifications. Such programmes shall be outlined by the Contractor and shall be finally accepted by the Employer/authorised representative after discussions before the award of the Contract. The QA programme shall be generally in line with ISO-9001-2000/IS-14001. A quality assurance programme of the Contractor shall generally cover the following:

- (a) His organisation structure for the management and implementation of the proposed quality assurance programme
- (b) Quality System Manual
- (c) Design Control System
- (d) Documentation and Data Control System
- (e) Qualification data for bidder's key personnel.
- (f) The procedure for purchase of materials, parts, components and selection of sub-Contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.
- (g) System for shop manufacturing and site erection controls including process, fabrication and assembly.
- (h) Control of non-conforming items and system for corrective actions and resolution of deviations.
- (i) Inspection and test procedure both for manufacture and field activities.
- (j) Control of calibration and testing of measuring testing equipment.
- (k) System for Quality Audits.
- (l) System for identification and appraisal of inspection status.
- (m) System for authorising release of manufactured product to the Employer.
- (n) System for handling, storage and delivery.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	(o) System for maintenance of records, and (p) Quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component as per enclosed formats no. QS-01-QAI-P09/F1-R1 and QS-01-QAI-P09/F2-R1.			
23.02.00	General Requirements - Quality Assurance			
23.02.01	<p>All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the Contractor for some of the major items is given in the respective technical specification. This is, however, not intended to form a comprehensive programme as it is the Contractor's responsibility to draw up and implement such programme duly approved by the Employer. The detailed Quality Plans for manufacturing and field activities shall be drawn up by the Bidder and will be submitted to Employer for approval. Schedule of finalisation of such quality plans will be finalised before award as per enclosed format No. QS-01-QAI-P01/F3-R0. Monthly progress reports on MQP/FQP submission/approval shall be furnished as per enclosed format No. QS-01-QAI-P-02/F1-R0.</p>			
23.02.02	<p>Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Contractor's/ Sub-Contractor's/ sub-supplier's Quality Control Organisation, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing. The Quality Plan shall be submitted through c-folder, a web based system of NTPC ERP, in addition to hard copy, for review and approval. After approval the same shall be submitted in compiled form on CD-ROM.</p>			
23.02.03	<p>Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's "Site Quality Control Organisation", during various stages of site activities starting from receipt of materials/equipment at site.</p>			
23.02.04	<p>The Contractor shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans along with Quality Plans. These Quality Plans and reference documents/standards etc. will be subject to Employer's approval without which manufacturer shall not proceed. These approved documents shall form a part of the Contract. In these approved Quality Plans, Employer shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the Employer's Project Manager or his authorised representative and beyond which the work will not proceed without consent of Employer in writing. All deviations to this</p>			
VINDHYACHAL STPP-V (1X500 MW) STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOCUMENT NO.: CS-2260-101-2	PART-C (GTR)	PAGE 23 OF 37 Page 124 of 278	

	<p>specification, approved quality plans and applicable standards must be documented and referred to Employer along with technical justification for approval and dispositioning.</p>
23.02.05	<p>The Contractor shall submit to the Employer Field Welding Schedule for field welding activities in the enclosed format No.: QS-01-CQA-W-11/F1. The field welding schedule shall be submitted to the Employer along with all supporting documents, like welding procedures, heat treatment procedures, NDT procedures etc. at least ninety days before schedule start of erection work at site.</p>
23.02.06	<p>The Contractor shall have suitable Field Quality Organisation with adequate manpower at Employer's site, to effectively implement the Field Quality Plan (FQP) and Field Quality Management System for site activities. The contractor shall submit the details of proposed FQA setup (organisational structure and manpower) for employer's approval. The FQA setup shall be in place at least one month before the start of site activities.</p>
23.02.07	<p>No material shall be dispatched from the manufacturer's works before the same is accepted, subsequent to predispach final inspection including verification of records of all previous tests/inspections by Employer's Project Manager/Authorised representative and duly authorised for dispatch by issuance of Material Dispatch Clearance Certificate (MDCC).</p>
23.02.08	<p>All material used for equipment manufacture including casting and forging etc. shall be of tested quality as per relevant codes/standards. Details of results of the tests conducted to determine the mechanical properties; chemical analysis and details of heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or agreed details.</p>
23.02.09	<p>All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the Employer.</p> <p>All welding/brazing procedures shall be submitted to the Employer or its authorised representative for approval prior to carrying out the welding/brazing.</p>
23.02.10	<p>All brazers, welders and welding operators employed on any part of the Contract either in Contractor's/sub-Contractor's works or at site or elsewhere shall be qualified as per ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the Employer.</p>
23.02.11	<p>Welding procedure qualification & Welder qualification test results shall be furnished to the Employer for approval. However, where required by the Employer, tests shall be conducted in presence of Employer/authorised representative.</p>



- 23.02.12 For all pressure parts and high pressure piping welding, the latest applicable requirements of the IBR (Indian Boiler Regulations) shall also be essentially complied with. Similarly, any other statutory requirements for the equipment/systems shall also be complied with. On all back-gauged welds MPI/LPI shall be carried before seal welding.
- 23.02.13 Unless otherwise proven and specifically agreed with the Employer, welding of dissimilar materials and high alloy materials shall be carried out at shop only.
- 23.02.14 No welding shall be carried out on cast iron components for repair.
- 23.02.15 All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.
- 23.02.16 All non-destructive examination shall be performed in accordance with written procedures as per International Standards. The NDT operator shall be qualified as per SNT-TC-IA (of the American Society of non-destructive examination). NDT shall be recorded in a report, which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job.

All plates of thickness above 40mm & all bar stock/Forging above 40mm dia shall be ultrasonically tested. For pressure parts, plate of thickness equal to or above 25mm shall be ultrasonically tested.
- 23.02.17 The Contractor shall list out all major items/ equipment/ components to be manufactured in house as well as procured from sub-Contractors (BOI). All the sub-Contractors proposed by the Contractor for procurement of major bought out items including castings, forging, semi-finished and finished components/equipment etc., list of which shall be drawn up by the Contractor and finalised with the Employer, shall be subject to Employer's approval as per enclosed format No. QS-01-QAI-P-01/F3-R0. The Contractor's proposal shall include vendor's facilities established at the respective works, the process capability, process stabilization, QC systems followed, experience list, etc. along with his own technical evaluation for identified sub-Contractors enclosed and shall be submitted to the Employer for approval within the period agreed at the time of pre-awards discussion and identified in "DR" category prior to any procurement. Monthly progress reports on sub-Contractor detail submission / approval shall be furnished as per enclosed format no. QS-01-QAI-P-02/F1-R0. Such vendor approval shall not relieve the Contractor from any obligation, duty or responsibility under the Contract.
- 23.02.18 For components/equipment procured by the Contractors for the purpose of the Contract, after obtaining the written approval of the Employer, the Contractor's purchase specifications and inquiries shall call for quality plans to be submitted by the suppliers. The quality plans called for from the sub-Contractor shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor's quality control organisation, the relevant

	<p>reference documents/standards used, acceptance level, inspection of documentation raised, etc. Such quality plans of the successful vendors shall be finalised with the Employer and such approved Quality Plans shall form a part of the purchase order/Contract between the Contractor and sub-Contractor. With in three weeks of the release of the purchase orders /Contracts for such bought out items /components, a copy of the same without price details but together with the detailed purchase specifications, quality plans and delivery conditions shall be furnished to the Employer on the monthly basis by the Contractor along with a report of the Purchase Order placed so far for the Contract.</p>
23.02.19	<p>Employer reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their sub-Contractor's quality management and control activities. The Contractor shall provide all necessary assistance to enable the Employer carry out such audit and surveillance.</p>
23.02.20	<p>The Contractor shall carry out an inspection and testing programme during manufacture in his work and that of his sub-contractor's and at site to ensure the mechanical accuracy of components, compliance with drawings, conformance to functional and performance requirements, identity and acceptability of all materials parts and equipment. Contractor shall carry out all tests/inspection required to establish that the items/equipment conform to requirements of the specification and the relevant codes/standards specified in the specification, in addition to carrying out tests as per the approved quality plan.</p>
23.02.21	<p>Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the Employer to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets, drawings, etc.</p>
23.02.22	<p>For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.</p>
23.02.23	<p>Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Employer/ authorised representative.</p>
23.02.24	<p>Environmental Stress Screening</p> <p>All solid state electronic system / equipment / sub assembly shall be free from infant mortile components. For establishing the compliance to this requirement, the contractor / sub – contractor should meet the following.</p> <p>(1) The Contractor / Sub – contractor shall furnish the established procedure being followed for eliminating infant mortile components. The procedure followed by the Contractor / Sub – contractor should be substantiated along with the statistical figures to validate the procedure being followed. The necessary details as required under this clause shall be furnished at the stage of QP finalization.</p>



Or

In case the Contractor / Sub – contractor do not have any established procedure to eliminate infant mortile components then two or 10% which ever is less, most densely populated Panels shall be tested for Elevated Temperature Cycle Test as per the following procedure.

Elevated Temperature Test Cycle

During the elevated temperature test which shall be for 48 hours, the ambient temperature shall be maintained at 50°C. The equipment shall be interconnected with devices and kept under energized conditions so as to repeatedly perform all operations it is expected to perform in actual service with load on various components being equal to those which will be experienced in actual service.

During the elevated temperature test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature at 50° C.

In case of any failure during the test cycle, the further course of action should be mutually discussed for demonstrating the intent of the above requirement.

(2) Burn in Test Cycle

The test shall be conducted on all the panels fully assembled and wired including the panels having undergone the above mentioned elevated temperature test.

The period of Burn in Test Cycle shall be 120 hrs and process shall be similar to the elevated temperature test as above except that the temperature shall be reduced to the ambient temperature prevalent at that time.

During the above tests, the process I/O and other load on the system shall be simulated by simulated inputs and in the case of control systems; the process which is to be controlled shall also be simulated. Testing of individual components or modules shall not be acceptable.

During the Burn in Test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature.

The Contractor / Sub-contractor shall carry out routine test on 100% item at contractor / sub-contractor's works. The quantum of check / test for routine & acceptance test by employer shall be generally as per criteria / sampling plan defined in referred standards. Wherever standards have not been mentioned

quantum of check / test for routine / acceptance test shall be as agreed during detailed engineering stage.

23.03.00

QA Documentation Package

The Contractor shall be required to submit the QA Documentation in two hard copies and two CD ROMs, as identified in respective quality plan with tick (☐) mark.

23.03.01

Each QA Documentation shall have a project specific Cover Sheet bearing name & identification number of equipment and including an index of its contents with page control on each document.

The QA Documentation file shall be progressively completed by the Supplier's sub-supplier to allow regular reviews by all parties during the manufacturing.

The final quality document will be compiled and issued at the final assembly place of equipment before dispatch. However CD-Rom may be issued not later than three weeks.

23.03.02

Typical contents of QA Documentation is as below:-

- (a) Quality Plan
- (b) Material mill test reports on components as specified by the specification and approved Quality Plans.
- (c) Manufacturer / works test reports/results for testing required as per applicable codes and standard referred in the specification and approved Quality Plans.
- (d) Non-destructive examination results /reports including radiography interpretation reports. Sketches/drawings used for indicating the method of traceability of the radiographs to the location on the equipment.
- (e) Heat Treatment Certificate/Record (Time- temperature Chart)
- (f) All the accepted Non-conformance Reports (Major/Minor) / deviation, including complete technical details / repair procedure).
- (g) CHP / Inspection reports duly signed by the Inspector of the Employer and Contractor for the agreed Customer Hold Points.
- (h) Certificate of Conformance (COC) wherever applicable.
- (i) MDCC

23.03.03

Similarly, the Contractor shall be required to submit two sets (two hard copies and two CD ROMs), containing QA Documentation pertaining to field activities as per



23.03.04

Approved Field Quality Plans and other agreed manuals/ procedures, prior to commissioning of individual system.

Before dispatch / commissioning of any equipment, the Supplier shall make sure that the corresponding quality document or in the case of protracted phased deliveries, the applicable section of the quality document file is completed. The supplier will then notify the Inspector regarding the readiness of the quality document (or applicable section) for review.

- (a) If the result of the review carried out by the Inspector is satisfactory, the Inspector shall stamp the quality document (or applicable section) for release.
- (b) If the quality document is unsatisfactory, the Supplier shall endeavor to correct the incompleteness, thus allowing to finalize the quality document (or applicable section) by time compatible with the requirements as per contract documents. When it is done, the quality document (or applicable section) is stamped by the Inspector.
- (c) If a decision is made dispatch, whereas all outstanding actions cannot be readily cleared for the release of the quality document by that time. The supplier shall immediately, upon shipment of the equipment, send a copy of the quality document Review Status signed by the Supplier Representative to the Inspector and notify of the committed date for the completion of all outstanding actions & submission. The Inspector shall stamp the quality document for applicable section when it is effectively completed. The submission of QA documentation package shall not be later than 3 weeks after the dispatch of equipment.

23.03.05

Transmission of QA Documentation

On release of QA Documentation by Inspector, one set of quality document shall be forwarded to Corporate Quality Assurance Department and other set to respective Project Site of Employer.

For the particular case of phased/part derivatives of equipment, the complete quality document of that particular equipment to the Employer shall be issued not later than 3 weeks after the date of the last delivery of equipment.


23.04.00

Inspection, Testing and Inspection Certificates

23.04.01

The word 'Inspector' shall mean the Project Manager and/or his authorised representative and/or an outside inspection agency acting on behalf of the Employer to inspect and examine the materials and workmanship of the works during its manufacture or erection.

<p>23.04.02</p>	<p>The Project Manager or his duly authorised representative and/or an outside inspection agency acting on behalf of the Employer shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Project Manager and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.</p>
<p>23.04.03</p>	<p>The Contractor shall give the Project Manager/Inspector fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector's. The Project Manager/Inspector, unless the witnessing of the tests is virtually waived and confirmed in writing, will attend such tests within fifteen (15) days of the date on which the equipment is noticed as being ready for test/inspection failing which the contractor may proceed with test which shall be deemed to have been made in the inspector's presence and he shall forthwith forward to the inspector duly certified copies of test reports in two (2) copies.</p>
<p>23.04.04</p>	<p>The Project Manager or Inspector shall within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the Project Manager/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.</p>
<p>23.04.05</p>	<p>When the factory tests have been completed at the Contractor's or sub-contractor's works, the Project Manager /Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Project Manager /Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Project Manager /Inspector. Project Manager /Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests or the issue of the certificates shall not bind the Employer to accept the equipment should it, on further tests after erection be found not to comply with the contract.</p>
<p>23.04.06</p>	<p>In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, material, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Project Manager /Inspector or his authorised representatives to carry out effectively such tests on the equipment in accordance with the Contractor and shall give facilities to the Project Manager/Inspector or to his authorised representative to accomplish testing.</p>

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
23.04.07	The inspection by Project Manager / Inspector and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the contract.			
23.04.08	To facilitate advance planning of inspection in addition to giving inspection notice as specified at clause no 22.05.03 of this chapter, the Contractor shall furnish quarterly inspection programme indicating schedule dates of inspection at Customer Hold Point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.			
23.04.09	All inspection, measuring and test equipment used by contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by NTPC. Wherever asked specifically, the contractor shall re-calibrate the measuring/test equipment in the presence of Project Manager / Inspector.			
23.05.00	Associated Document for Quality Assurance Programme:			
23.05.01	List of items requiring Quality Plan & Sub-supplier approval. Format No.	:	QS-01-QAI-P-01/F3-R0 (Annexure-III)	
23.05.02	Status of Quality Plan and Sub-supplier approval Format No.	:	QS-01-QAI-P-02/F1-R0 (Annexure-IV)	
23.05.03	Field Welding Schedule Format No.	:	QS-01-CQA-W-11/F1-R0 (Annexure-V)	
23.05.04	Manufacturing Quality Plan Format No.	:	QS-01-QAI-P-09/F1-R1 (Annexure-VI)	
23.05.05	Field Quality Plan Format No.	:	QS-01-QAI-P-09/F2-R1 (Annexure-VII)	
24.00.00	This clause is not used.			
25.00.00	This clause is not used.			
26.00.00	PRE-COMMISSIONING AND COMMISSIONING FACILITIES			
26.01.00	(a) As soon as the facilities or part thereof has been completed operationally and structurally and before start-up, each item of the equipment and systems forming part of facilities shall be thoroughly cleaned and then inspected jointly by the Employer and the Contractor for correctness of and completeness of facility or part thereof and acceptability for initial pre-commissioning tests, commissioning and start-up at Site. The list of pre-			
VINDHYACHAL STPP-V (1X500 MW) STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOCUMENT NO.: CS-2260-101-2	PART-C (GTR)	PAGE 31 OF 37 Page 132 of 275	

commissioning tests to be performed shall be as mutually agreed and included in the Contractor's quality assurance programme as well as those included elsewhere in the Technical Specifications.

- (b) The Contractor's pre-commissioning/ commissioning/start-up engineers, specially identified as far as possible, shall be responsible for carrying out all the pre-commissioning tests at Site. On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over, the commissioning of the complete facilities shall be commenced during which period the complete facilities, equipments shall be operated integral with sub-systems and supporting equipment as a complete plant.
- (c) All piping system shall be flushed, steam blown, air blown as required and cleanliness demonstrated using acceptable industry standards. Procedures to accomplish this work shall be submitted for approval to the Employer six months prior to the respective implementations. The Employer will approve final verification of cleanliness.
- (d) The time consumed in the inspection and checking of the units shall be considered as a part of the erection and installation period.
- (e) The check outs during the pre - commissioning period should be programmed to follow the construction completion schedule. Each equipment/system, as it is completed in construction and turned over to Employer's commissioning (start-up) Engineer(s), should be checked out and cleaned. The checking and inspection of individual systems should then follow a prescribed commissioning documentation [SCL (Standard Check List) / TS (Testing Schedule) / CS (Commissioning Schedule)] approved by the Employer.
- (f) The Contractor during Trial operation and performance testing shall conduct vibration testing to determine the 'base line' of performance of all plant rotating equipment. These tests shall be conducted when the equipment is running at the base load, peak load as well as lowest sustained operating condition as far as practicable.
- (g) Contractor shall furnish the commissioning organization chart for review & acceptance of employer at least eighteen months prior to the schedule date of synchronization of 1st unit. The chart should contain :
 - (1) Biodata including experience of the Commissioning Engineers.
 - (2) Role and responsibilities of the Commissioning Organisation members.
 - (3) Expected duration of posting of the above Commissioning Engineers at site.



26.02.00

Trial Operation

- (a) On completion of all pre-commissioning activities / tests and as a part of commissioning the complete facilities shall be put on 'Trial Operation' during which period all necessary adjustments shall be made while operating over the full load range enabling the facilities to be made ready for the Guarantee Tests.
- (b) The 'Trial Operation' of the complete facility as an integral unit, comprising of SG, Turbine, Generator along with their associated systems / sub systems, shall be conducted for 720 continuous hours. During the above period of Trial Operation, the unit shall generate 342 million KWHrs, as measured at generator terminals. During the period of Trial operation of 720 hours, the unit shall operate continuously at full rated load for a period not less than 72 hours.
- (c) The Trial Operation shall be considered successful, provided that each item/ part of the facility can operate continuously at the specified operating characteristics, for the period of Trial Operation with all operating parameters within the specified limits and at or near the predicted performance of the equipment/ facility.
- (d) The Contractor shall intimate the Employer about the commencement of Trial operation and shall furnish adequate notice to the Employer in this respect.
- (e) Any loss of generation due to constraints attributable to the Employer shall be construed as Deemed Generation.
- (f) A Trial Operation report comprising of observations and recordings of various parameters to be measured in respect of the above Trial Operation shall be prepared by the Contractor. This report, besides recording the details of the various observations during Trial operation shall also include the dates of start and finish of the Trial Operation and shall be signed by the representatives of both the parties. The report shall have sheets, recording all the details of interruptions occurred, adjustments made and any minor repairs done during the Trial Operation. Based on the observations, necessary modifications/repairs to the plant shall be carried out by the Contractor to the full satisfaction of the Employer to enable the latter to accord permission to carry out the Guarantee tests on the facilities. However, minor defects which do not endanger the safe operation of the equipment, shall not be considered as reasons for with holding the aforesaid permission.

27.00.00

TAKING OVER

Upon successful completion of Trial Operations and all the tests, other than Guarantee Tests conducted to the Employer's satisfaction, the Employer shall issue to the Contractor a Taking over Certificate as a proof of the final acceptance of the

equipment. Such certificate shall not unreasonably be withheld nor will the Employer delay the issuance thereof, on account of minor omissions or defects which do not affect the commercial operation and/or cause any serious risk to the equipment. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of the Contract after issuance of such certificate.

28.00.00

GUARANTEE TESTS

- (a) The final test as to prove the Functional Guarantees shall be conducted at Site by the Contractor in presence of the Employer. The contractor's Commissioning, Start-up Engineer shall make the unit ready to conduct such test. Such test will be commenced, within a period of **three (3) months** after the successful completion of Trial Operations. Any extension of time beyond the above **three (3) months** shall be mutually agreed upon.
- (b) These tests shall be binding on both the parties of the Contract to determine compliance of the equipment with the functional guarantee.
- (c) For performance/ demonstration tests instrumentations, of accuracy class, to the approval of the Employer shall be used. The numbers and location of the instruments shall be as per the specified test codes. In addition the values of parameters shall be logged from the information system provided under Employer's Distributed Digital Control Monitoring and Information system. Test will be conducted at specified load points.
- (d) Any special equipment, tools and tackles required for the successful completion of the Guarantee Tests shall be provided by the Contractor, free of cost.
- (e) The Guarantee tests and specific tests to be conducted on equipments have been brought out in detail elsewhere in the specification.

29.00.00

NOISE LEVEL

The equivalent 'A' weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment / machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA except for

- (a) Safety valves and associated vent pipes for which it shall not exceed 105 dBA.
- (b) Regulating drain valves in which case it shall be limited to 90 dBA.
- (c) For HP-LP bypass valves and other intermittently operating control valves, the noise level shall be within the limit of 85 dBA.



30.00.00

PACKAGING AND TRANSPORTATION

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. While packing all the materials, the limitation from the point of view of the sizes of railway wagons available in India should be taken account of. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. The Contractor shall ascertain the availability of Railway wagon sizes from the Indian Railways or any other agency concerned in India well before effecting dispatch of equipment. Before dispatch it shall be ensured that complete processing and manufacturing of the components is carried out at shop, only restricted by transport limitation, in order to ensure that site works like grinding, welding, cutting & preassembly to bare minimum. The Employer's Inspector shall have right to insist for completion of works in shops before dispatch of materials for transportation.

31.00.00

ELECTRICAL ENCLOSURE

All electrical equipments and devices, including insulation, heating and ventilation devices shall be designed for ambient temperature and a maximum relative humidity as specified elsewhere in the specification,

32.00.00

ELECTRICAL NOISE CONTROL

The equipment furnished by the Contractor shall incorporate necessary techniques to eliminate measurement and control problems caused by electrical noise. Areas in Contractor's equipment which are vulnerable to electrical noise shall be hardened to eliminate possible problems. Any additional equipment, services required for effectively eliminating the noise problems shall be included in the proposal. The equipment shall be protected against ESD as per IEC-61000. Radio Frequency interference (RFI) and Electro Magnetic Interference (EMI) protection against hardware damage and control system mal-operations/errors shall be provided for all systems as per EN-50082-2 (1995).

33.00.00

INSTRUMENTATION AND CONTROL

All instrumentation and control systems/ equipment/ devices/ components, furnished under this contract shall be in accordance with the requirements stated herein, unless otherwise specified in the detailed specifications.

33.01.00

All instrument scales and charts shall be calibrated and printed in metric units and shall have linear graduation. The ranges shall be selected to have the normal reading at 75% of full scale.

All scales and charts shall be calibrated and printed in Metric Units as follows:

- (a) Temperature - Degree centigrade (deg C)



- (b) Pressure - Kilograms per square centimetre (Kg/cm²). Pressure instrument shall have the unit suffixed with 'a' to indicate absolute pressure. If nothing is there, that will mean that the indicated pressure is gauge pressure.
- (c) Draught - Millimetres of water column (mm wc).
- (d) Vacuum - Millimeters of mercury column (mm Hg) or water column (mm Wcl).
- (e) Flow (Gas) - Tonnes/ hour
- (f) Flow (Steam) - Tonnes/ hour
- (g) Flow (Liquid) - Tonnes / hour
- (h) Flow base - 760 mm Hg. 15 deg.C
- (i) Density - Grams per cubic centimetre.

33.02.00 All instruments and control devices provided on panels shall be of miniaturized design, suitable for modular flush mounting on panels with front draw out facility and flexible plug-in connection at rear.

33.03.00 All electronic modules shall have gold plated connector fingers and further all input and output modules shall be short circuit proof. These shall also be tropicalised & components shall be of industrial grade or better.

34.00.00 INSTRUMENT AIR SYSTEM

The instrument air supply system as supplied by the Contractor for various pneumatic control & instrumentation devices like pneumatic actuators, power cylinders, E/P converters, piping / tubing etc. shall be as per the details furnished elsewhere.

Each pneumatic instrument shall have an individual air shut - off valve. The pressure regulating valve shall be equipped with an internal filter, a 50 mm pressure gauge and a built-in filter housing blow down valve.

35.00.00 TAPPING POINTS FOR MEASUREMENTS

Tapping points shall include probes, wherever applicable, for analytical measurements and sampling.

For direct temperature measurement of all working media, one stub with internal threading of approved pattern shall be provided along with suitable plug and washer. The Contractor will be intimated about thread standard to be adopted.



The following shall be provided on equipment by the Contractor. The standard which is to be adopted, will be intimated to the Contractor.

- (a) Temperature test pockets with stub and thermowell
- (b) Pressure test pockets

36.00.00

ELECTRONIC MODULE/COMPONENT DETAILS

The Bidder shall have to furnish all technical details including circuit diagrams, specifications of components, etc., in respect of each and every electronic card/module as employed on the various solid state as well as microprocessor based systems and equipment including conventional instruments, peripherals etc.


It is mandatory for the Bidder to identify clearly the custom built ICs used in the package. The Bidder shall also furnish the details of any equivalents of the same.

37.00.00

SAFETY ASPECTS DURING CONSTRUCTION AND ERECTION

In addition to the requirements given in Erection Conditions of Contract (ECC) the following shall also cover:

- (a) Working platforms should be fenced and shall have means of access.
- (b) Ladders in accordance with Employer's safety rules for construction and erection shall be used. Rungs shall not be welded on columns. All the stairs shall be provided with handrails immediately after its erection.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	ANNEXURE-1			
	S.NO.	DESCRIPTION OF MANUALS	NO OF PRINTS	NO. OF CD-ROMs
	1.	PLANT DEFINITION MANUAL- Drawings "FOR APPROVAL"	2 sets	4 CD-ROMs
	2.	i) Layout drawings/P&IDs	6	2 CD-ROMs
		ii) Other drawings	2	2 CD-ROMs
	3.	Drawings "FOR INFORMATION"	2	2 FLOPPIES
	4.	Drawings "FINAL DRAWING"	15	4 CD-ROMs
	5.	Drawings "AS BUILT "	15	4 CD-ROMs
	6.	DATASHEETS, DESIGN CALCULATIONS, PURCHASE SPECIFICATIONS, etc. and Other type of documents		
		i) For Approval	2	2 CD-ROMs
		ii) FINAL	15	4 CD-ROMs
		iii) Analysis reports of equipments/ piping/ structures components/ systems employing software packages as detailed in the specifications	2	2 CD-ROMs
	7.	Erection manual "DRAFT"	4 sets	2 CD-ROMs
	8.	Erection manual "FINAL"	4 sets	4CD ROMS
	9.	Operation & Maintenance manual "IST SUBMITTIOM"	4 sets	2 CD-ROMs
	10.	Operation & Maintenance manual "FINAL"	4 sets	4CD ROMS
	11.	Plant Hand Book "IST SUBMITTIOM"	4 sets	2 CD-ROMs
	12.	Plant Hand Book "FINAL"	4 sets	4CD ROMS
	13.	Commissioning and Performance "IST SUBMITTIOM"	4 sets	2 CD-ROMs
	14.	Commissioning and Performance "FINAL"	4 sets	4 CD-ROMs
	15.	Performance and Functional guarantees test report	4 sets	4 CD ROMS
	16.	Project completion report	15	4CD ROMS
	17.	QA programme including Organization for implementation and QA system manual (with revision-servicing)	1	1 CD ROM
	18.	Vendor details in respect of proposed vendors including contractor's evaluation report.	1	1 CD ROM
	19.	Manufacturing QPs, Field QPs, Field welding schedules and their reference documents like test procedures, WPS, PQR etc.		

VINDHYACHAL STPP-V (1X500 MW)
STEAM GENERATOR WITH
ELECTROSTATIC PRECIPITATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-2260-101-2

PART-C
(GTR)
ANNEXURE-I

PAGE
1 OF 2