








RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD.


2X660 MW SURATGARH STPP

TECHNICAL SPECIFICATION  
FOR  
ANUBAR

VOLUME IIB & III

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JOB NO. 392	TITLE TECHNICAL SPECIFICATION FOR ANUBAR	DOC. NO. PE-TS-392-145-IB16																				
	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA, INDIA	<table><tr><th>DEPT</th><th></th><th>NAME</th><th>SIGN</th><th>DATE</th></tr><tr><td>DESN</td><td>UM</td><td></td><td></td><td>17.4.2014</td></tr><tr><td>CHD</td><td>MK</td><td></td><td></td><td>17.4.2014</td></tr><tr><td>APPD</td><td>BS</td><td></td><td></td><td>17.4.2014</td></tr></table>	DEPT		NAME	SIGN	DATE	DESN	UM			17.4.2014	CHD	MK			17.4.2014	APPD	BS			17.4.2014
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	<b>SURATGARH T.P.S. (2 X 660 MW)</b>  <b>TECHNICAL SPECIFICATION FOR ANUBAR</b>	SPECIFICATION NO.PE-TS-392-145-I816
		DATE: 17.04.14
		REV NO. 00
		SHEEE 1 OF 1

## PREAMBLE

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

1.1 **Volume-I** (CONDITIONS OF CONTRACT)

This consists of four parts as below :-

- Volume-IA : This part contains instructions to bidders for making bids to BHEL.
- Volume-IB : This part contains general commercial conditions of the tender & includes provision that vendor is responsible for the quality of item supplied by their sub-vendors.
- Volume-IC : This part contains special conditions of contract.
- Volume-ID : This part contains commercial conditions for erection & commissioning site work, as applicable.

1.2 **Volume-II** TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume-II which comprises of :-

- Volume-IIA : General Technical Conditions
- Volume-IIB : Technical Specification including Drawings, if any.

1.2.1 **Volume-IIB**

This volume is sub-divided into following sections :-

- Section-A : This section outlines the scope of enquiry.
- Section-B : This section provides "Project Information".
- Section-C : This section indicates technical requirements specific to the contract, not covered in Section-D.
- Section-D : This section comprises of technical specifications of equipments complete with data sheet A, B and C.

**Data Sheet - A** specifies data and other requirements pertaining to the Equipment.

**Data Sheet - B** Specifies data to be filled by the bidder

**Data Sheet - C** Indicates data/documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).

1.2.2 **Volume-III** TECHNICAL SCHEDULES

This volume contains technical schedules, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per instructions given in Volume-III.

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



**SURATGARH T.P.S. (2 X 660 MW)  
TECHNICAL SPECIFICATION  
FOR  
ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME -

SECTION -

REV. NO. 00

DATE: 17.04.14

SHEET 01

OF 01


## CONTENTS

### VOLUME- II B

SECTION	TITLE	NO. OF SHEET(s)
<b>A</b>	Scope of Enquiry	1
<b>B</b>	Project Information	3
<b>C</b>	Specific Technical Requirements	2
<b>D</b>	- Specification for Anubar	2
	- Data sheets A & B for Anubar	4
	- Data sheets C for Anubar	4
	- Anubar General Arrangement with Purge Air System	1
	- Quality Plan for Anubar	2
	- SCHEDULE OF SUBMISSION OF DRAWINGS / DOCUMENTS, EQUIPMENT MANUFACTURE, INSPECTION AND DESPATCH	1

### VOLUME III

<b>1.</b>	COMPLIANCE CERTIFICATES	1
<b>2.</b>	Schedule of Drawings, Data sheets, Documents, Catalogues submitted with the bid	1
<b>3.</b>	Schedule of prices	1
<b>4.</b>	Schedule of unit prices	1
<b>5.</b>	Inspection Schedule	1

	<b>SURATGARH T.P.S. (2 X 660 MW)</b> <b>TECHNICAL SPECIFICATION</b> <b>FOR</b> <b>ANUBAR</b>	SPECIFICATION NO.: PE-TS-392-145-I816	
		VOLUME II B	
		REV. NO. 00	DATE: 17.04.14
		SHEET 01	OF 01

**VOLUME IIB**



**SURATGARH T.P.S. (2 X 660 MW)**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION A

REV. NO. 00

DATE: 17.04.14

SHEET 01

OF 02

**SECTION – A**  
**SCOPE OF ENQUIRY**



**SURATGARH T.P.S. (2 X 660 MW)  
TECHNICAL SPECIFICATION  
FOR  
ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION A

REV. NO. 00

DATE: 17.04.14

SHEET 02

OF 02

## SCOPE OF ENQUIRY

### 1.0 SCOPE

This specification covers the Design, Manufacture, Inspection and Testing at manufacturer's works, proper packing for transportation and delivery to site of the Anubar with accessories as mentioned in different sections of this specification for **SURATGARH T.P.S. (2 X 660 MW)**

1.2 The quality plan enclosed, forms the minimum requirement but not limited to be adhered to by the bidder.

1.3 The enquiry shall be operated in '**COMPLIANCE MODE**' means bidder to comply with the requirement of specification, quality plan, delivery schedule, quantities, start-up/commissioning spares, mandatory spares, recommended spares etc. as a token of acceptance of the same.

Following formats to be signed, stamped with company seal and submitted :

- a). Compliance Certificate
- b). Quality Plan
- c). Schedule of submission of drawings/documents, equipment manufacture inspection and dispatch.
- d). Schedule of price, unit prices, inspection schedule.

1.4 No separate technical offer, data sheets to be submitted with the bid. Any such document shall not be taken cognizance of, and document (Compliance Certificate) enclosed in Volume –III shall be final and binding. Data sheets shall be furnished by the successful bidder(vendor), only after the award of contract.

### 2.0 GENERAL TECHNICAL INSTRUCTIONS

2.1 It is not the intent here to specify all the details of design and manufacture. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the customer / consultant, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in his judgment is not in full accordance herewith.

2.2 The omission of specific reference to any component / accessory necessary for the proper performance of the equipments shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

2.3 BHEL's representative shall be given access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.

2.4 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL.



**SURATGARH T.P.S. (2 X 660 MW)**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION B

REV. NO. 00

DATE: 17.04.14

SHEET 01

OF 01

## SECTION – B

## PROJECT INFORMATION

SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>		VOLUME II SECTION – B
	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> GENERAL PROJECT INFORMATION		SHEET 1 OF 3

1.0	Owner	Rajasthan Rajya Vidyut Utpadan Nigam Ltd., Jaipur
2.0	Consulting Engineer	TATA Consulting Engineers Ltd. 73/1, St. Marks Road, Bangalore – 560 001  Tel : 080 – 6622 6000 Fax : 080 – 22274874
3.0	Location of the plant	Prabat Nagar, Suratgarh Sriganganagar district, Rajasthan.
4.0	Latitude and longitude	Latitude : 29 deg. 10 min. N Longitude : 74 deg.01 min. E
5.0	Elevation above mean sea level	186 m (approximate)
6.0	<b>Climatic conditions</b>	
6.1	Temperatures : Monthly basis	
	Mean of daily max.	32.8 deg.C (in the month of May)
	Mean of daily min.	17.6 deg.C (in the month of Jan)
6.2	Temperatures : Annual basis	
	Mean of daily max.	32.3 deg.C
	Mean of daily min.	19.6 deg.C
	Highest temperature recorded	50 deg.C
	Lowest temperature recorded	(-) 2.8 deg.C
	Design Ambient Temperature for Electrical Equipment design	50 deg C
6.3	Relative humidity	Varies between 21% and 81%
6.4	Annual average rain fall	312 mm
6.5	Annual mean wind speed :	4 km / hr.
7.0	Wind load	

ISSUE R1
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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>		VOLUME II SECTION – B
	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> GENERAL PROJECT INFORMATION		SHEET 2 OF 3

	Calculations for wind effect shall be in accordance with IS:875-1987(Part-3) taking into account the following:	
	a) Basic wind speed = 47 m/sec	
	b) Factor K1 = 1.07	
	c) Category of terrain = Category 2	
	d) K3 – as per IS 875	
8.0	Seismic data (As per IS: 1893 latest issue)	
	a) Zone	Zone II
	Designs & design coefficients shall be based on IS 1893:2002	
	Design condenser cooling water inlet temperature	33 Deg C
9.0	Auxiliary power supply:	
	Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following system:	
	a) For motors rated 160 kW and below.	415V AC, 3-phase, 3-wire effectively earthed.
	b) For motors rated above 160 kW and up to 1500 kW	6600V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
	c) For motors rated above 1500kW	11000V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
	d) For motor control centres	415V AC, 3-phase, 3/4-wire effectively earthed.
	e) DC motor starters, DC solenoids, DC alarm control and protection	220 V DC, 2-wire unearthed
	f) AC control & protective devices	110 V 1 phase, 50Hz, 2 wire AC supply. The single phase 110V AC supply shall be derived by VENDOR by providing 415V / 110 V Control transformers of adequate rating with MCCB / MCB on both the primary and secondary sides.
	g) Uninterrupted power supply	230 V, 1-phase, 50 Hz, 2-wire, AC

ISSUE R1
-------------

SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>		VOLUME II SECTION – B
	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> GENERAL PROJECT INFORMATION		SHEET 3 OF 3

		supply (For all instrumentation and control system equipment and solenoid valves)
--	--	-----------------------------------------------------------------------------------

g) Lighting fixtures and space heaters    240 V, 1 phase, 2 wire, 50Hz, solidly earthed system

h) Construction supply    415 V, 3 phase, 4 wire, 50Hz AC supply with neutral lead solidly earthed.

i) The above voltages may vary as follows :

All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance.

AC supply	Voltage variation $\pm 10\%$ Frequency variation $\pm 5\%$
DC supply	Combined voltage & frequency variation 10% Voltage variation $+10\%$ , $-15\%$

j) For instrument and control system of steam generator and steam turbine generator.    230 V  $\pm 5\%$  AC UPS, 1-phase, 50 Hz, 2-wire. The 24 V DC required for control system shall be generated from this UPS.

10.0    All the electrical equipment shall be designed for 50° C reference ambient temperature.

ISSUE  
R1



**SURATGARH T.P.S. (2 X 660 MW)**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION C

REV. NO. 00

DATE: 17.04.14

SHEET 01

OF 01

**SECTION – C**

**SPECIFIC TECHNICAL**  
**REQUIREMENTS**



**SURATGARH T.P.S. (2 X 660 MW)  
TECHNICAL SPECIFICATION  
FOR  
ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION C

REV. NO. 00

DATE: 17.04.14

Page 1 of 2

### SPECIFIC TECHNICAL REQUIREMENTS

The technical requirements in this section are specific for this project and shall override the specification under Section-D in case of any contradiction.

- 1.0** Bidder to note that duly filled up documents as mentioned in clause 4.0 (A) enclosed in Section-D of Volume IIB, to be signed and stamped and submitted with the bid. COMPLIANCE CERTIFICATE enclosed in Volume-III should be furnished duly signed and stamped.
- 2.0** Each Anubar shall be supplied with two sets of gaskets for each Tag as start-up / commissioning spares.
- 3.0** The Data sheets enclosed is for Unit #1 only. The same shall be applicable for Unit #2 as well.

#### **4.0 DOCUMENTATION:**

**(A) Along with the bids:** 4 sets of the following documents to be enclosed with the bids:

- a) Compliance Certificate
- b) Quality plan duly signed and stamped.
- c) All relevant catalogues for the models of the Anubar offered.
- d) Schedule of prices and unit prices
- e) Schedule of submission of drawings/documents, equipment manufacture, inspection and dispatch.

**(B) After the award of contract:** 6 sets of the following documents to be enclosed along with the contract documents for approval:

- a) Datasheet C completely filled-up.
- b) Quality plan duly signed and stamped.
- c) All Differential pressure vs Flow graphs.
- d) Anubar assembly dimensional drawings.
- e) GA Drawing.



**SURATGARH T.P.S. (2 X 660 MW)  
TECHNICAL SPECIFICATION  
FOR  
ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION C

REV. NO. 00

DATE: 17.04.14

Page 2 of 2

**(C) Final documentation:** The documentation as listed below shall be submitted as a part of final documentation.

- |                                               |                          |
|-----------------------------------------------|--------------------------|
| 1. Approved final drawings/data sheets,       | – 10 sets with 2 CD-ROMS |
| 2. All Test certificates                      | – 10 sets.               |
| 3. Operation & Maintenance Manuals for Anubar | – 10 sets                |
| 4. Assembly drawings and QP for approval      | – 10 sets.               |
| 5. "As built" drawings                        | – 10 sets.               |

**5.0** In case during erection/commissioning of the Anubar, any spares are required which have not been specified in the Start-up/commissioning spares list, the same will have to be supplied by the vendor free of cost.

SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME V SECTION : D5.4
Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 5 OF 42
<p>1.14      Magnetic Flowmeter</p> <p>Inline type with indicating top mounted transmitter with flange connection. Accuracy: 0.5% of flow rate or volume flow. Repeatability 0.1% of flow rate/volume flow. Transmitter shall be smart with LCD display and superimposed HART on 4-20mA DC output. Data storage shall be in EEPROM. Shall have diagnostic capabilities. Touch control facility on the indicator for checking the rate/volume and diagnostic messages. Material: Case-Al.alloy with corrosion resistant, flow tube and extension pipe- Stainless steel (SS 304) and Lining-fluro carbon. The flow rate shall be available in DCS/PLC and flow integration shall be implemented in DCS/PLC to indicate volume flow.</p> <p>1.15      Anubar ( Impact Head Type)</p> <p>Element shall be tubular, insert type with minimum four impact ports facing upstream direction, located precisely for measurement of average flow velocity. The material of the sensor shall be SS 316. Accuracy shall be +/- 1% of the actual value or better. Repeatability shall be + /- 0.1 of actual value or better. <del>Online retracting facility and</del> flushing arrangement shall be provided. The sensor shall be supplied with complete mounting hardware and support plugs and valve manifolds ( 1/2" NPT) for DP transmitter connection. The specification of DP transmitter is specified elsewhere.</p> <p>1.16      SWAS system (Wet Panel and dry panel)</p> <p>Sampling racks include sample filtering, primary and final sampling cooling and temperature control. Pressure regulating device shall be capable of regulating the output pressure, irrespective of upstream fluctuations. Flow rate control shall be with glass tube purge rotometer with built in regulating valve. The system shall have the following features: automatic temperature compensation in the range of 0-100deg.c,flow indicators, sample coolers, flow and pressure regulators and gauges, SS tubing and fittings within the system, Isolation and drain valves. Provision for Grab sample shall be provided for all sample streams. A backpressure regulator shall be used before the grab sample valve to ensure priority flow to analysers. The wet panel shall be open frame freestanding type construction. The sheet steel shall be 2mm thick. All internal piping, tubing and system components shall be shop installed and tested prior to shipment. The piping material shall be as follows: Sample tubing: SS, ASTM A 213,type 316 20 SWG tubing Blow down header: SS, ASTM A 312,Type 316,Sch-80 Various drains and Cooling water headers: Carbon Steel, ASTM A 106,Gr.A sch-40</p> <p>Dry panel shall house analysers whose output shall include continuous monitoring of various parameters using indicators with isolated 4-20mA DC to moniyo from DCS. All the analysers shall be from a single vendor and should work with sample temperature of 40-45 deg.c. without chilled water requirement.</p>		
		ISSUE R1



**SURATGARH T.P.S. (2 X 660 MW)**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION D

REV. NO. 00

DATE: 17.04.14

SHEET 01

OF 01

**SECTION – D**

**EQUIPMENT SPECIFICATION**  
**DATA SHEET / DRGS / CALCULATION**  
**QUALITY PLAN**



**SURATGARH T.P.S. (2 X 660 MW)**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION D

REV. NO. 00

DATE: 17.04.14

SHEET 01

OF 01

## EQUIPMENT SPECIFICATIONS





**SURATGARH T.P.S. (2 X 660 MW)  
TECHNICAL SPECIFICATION  
FOR  
ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION D

REV. NO. 00

DATE: 17.04.14

Page 1 of 2

**1.0 SCOPE**

- 1.1 This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site of Anubar for use in **SURATGARH T.P.S. (2 X 660 MW)**

**2.0 CODES AND STANDARDS**

- 2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant National and International standards.
- 2.2 The Design and Materials used for the components shall also comply with the relevant National and International standards.

**3.0 TECHNICAL REQUIREMENT**

The anubar and the accessories shall be suitable for **sea water application** and continuous operation under an ambient temperature of 0-55°C and Relative Humidity of 0-95% unless specified otherwise in volume IIB Section-B or Section-C.

**3.1 DP flow measurement**

The flow devices producing a differential pressure signal, or DP having a high accuracy & reliability with rigid structure & shall be suitable for larger diameter pipe. The sensor comprises of a signal outer tube & an inner tube. The inner tube conveys the high-pressure signal & outer conveys the low press signal. The sensor can also be provided with dual averaging chambers with circular / pear shaped profile, which will convey the high pressure & low-pressure signal. This shall be suitable for online mounting.

**3.2 Element / Probe**

This shall be constructed of stainless steel, SS-316.

**3.3 Assembly**

Flow devices shall be complete with stub, flanged end, isolating valve with counter flanges, nipple, elbow, packing, etc. and shall be terminated with root valves for remote measurement. Each device shall also be provided with SS nameplate with tag number.

**4.0 GUARANTEE AND PERFORMANCE**

The guarantee of flow measuring assembly shall be 18 months from the date of dispatch or 12 months from commissioning whichever is earlier.

**5.0 TEST & INSPECTION**

- 5.1 The bidder shall adopt suitable quality assurance plan to ensure that the equipments offered will meet the specification requirements in full.
- 5.2 The Quality Plan shall be discussed and finalized with the technically accepted bidders before opening the price bid. The purchaser in the Quality Plan before approval would indicate the stages where the purchaser would like to be associated for witnessing or verification.
- 5.3 Quality Plan/Quality Assurance programme shall be submitted for owner approval. The following tests are to be included & test certificate/report shall be furnished.
1. Material Test Certificate
  2. Hydro Test
  3. Visual/Dimensional inspection report.
- 5.4 BHEL and/or their authorized representatives as per the agreed inspection schedule will conduct inspection. The bidder for BHEL's approval at contract stage will submit the inspection schedule. The cost of all tests and inspections will be deemed to have been included in the bid. For all the type tests "Type Test Certificates" as per agreed Quality Plan shall be furnished. In the absence of the same, such Type Tests shall be arranged at the Vendor's works in the presence of BHEL and/or their authorized representatives or in independent Test House/Laboratory approved by BHEL.



**SURATGARH T.P.S. (2 X 660 MW)  
TECHNICAL SPECIFICATION  
FOR  
ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION D

REV. NO. 00

DATE: 17.04.14

Page 2 of 2

**6.0 SPARES AND CONSUMABLES****6.1 Commissioning Spares and consumables**

As part of the main equipment supply, the bidder shall supply all commissioning spares and consumables required during Start-up,

**6.2 Recommended Spares**

The bidder shall furnish a list of Recommended Spares along with the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation along with unit rate against each item to enable BHEL/BHEL's Customer to place a separate order later, if required.

**6.3 Special Tools & Tackles**

The bidder shall furnish a list of Special Tools & Tackles included in the bid.

**7.0 DRAWINGS & DOCUMENTS**

As mentioned in Section C of Volume IIB.

**8.0 FOR INFORMATION****8.1 Storage and Commissioning Instruction****8.2 O&M are to be supplied as specified.****9.0 PACKING & MARKING****9.1 Each item shall be properly packed with adequate protection against friction, stresses, vibration & shock during transportation. Each packing box shall have marking as per Purchase Order.****9.2 Each assembly shall be identified with the following information.**

- Tag No.
- Service.
- Line size & thickness.
- Direction of flow.

**10.0 APPLICABLE DATA SHEETS**

This document shall be read in conjunction with following data sheets.

1. Data Sheet - A & B
2. Data Sheet - C.

**2 x 660 MW SURATGARH TPS  
DATA SHEET FOR ANUBAR**

SPECIFICATION NO.:PE-TS-392-145-I816

VOLUME IIB


SECTION D


REV. NO. 00


DATE : 17.04.14

SHEET 1 OF 5

**DATA SHEETS A&B  
FOR  
ANUBAR**

	<b>2 x 660 MW SURATGARH TPS DATA SHEET FOR ANUBAR</b>		SPECIFICATION NO.:PE-TS-392-145-I816	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17.04.14
			SHEET 2	OF 5
Tag No.:70GAA03BP001, 80GAA03BP001  <b>DATA SHEET – A &amp; B</b>				
<b>DATA SHEET – A (TO BE FILLED BY PURCHASER)</b>			<b>DATA SHEET – B (TO BE FILLED UP BY BIDDER)</b>	
GENERAL	PROJECT	<b>2X660 MW SURATGARH TPS</b>	.....	
	OFFER REFERENCE	Bidder to indicate	.....	
	TAG NO. : QUANTITY	70GAA03BP001/80GAA03BP001: One Per Unit (Total 2 Nos.)	..... .....	
	SERVICE	<b>River Water Intake</b>	..... .....	
	MAKE : MODEL	Bidder to indicate		
ELEMENT	TYPE	<b>DELTA TUBE(AVERAGING PITOT TUBE)</b>	.....	
	PITOT ASSEMBLY	Bidder to indicate FLG SIZE & RATING	.....	
	PROBE DIAMETER & SHAPE	Bidder to indicate	.....	
	MATERIAL	SS316	.....	
	ACCURACY	±1% OF ACTUAL VALUE	.....	
	REPEATABILITY	±0.1% OF ACTUAL VALUE	.....	
	No. OF TAP	ONE	.....	
PROCESS DATA	FLUID	<b>RAW WATER</b>	.....	
	RATE OF FLOW (m3/hr)	NORMAL: 4300 M3/HR MAXIMUM: 56000 M3/HR	.....	
	UPSTREAM WORKING PRESS (Kg/cm2g)	5.0 (Approx.)	.....	
	DESIGN PRESS (Kg/cm2g)	10.0	.....	
	MAX. ALLOWABLE PRESS LOSS	0.1 MWC AT DESIGN FLOW	.....	
	DIFF. PRESS AT MAX FLOW	BIDDER TO INDICATE	.....	
	NORMAL TEMP (Deg C)	36	.....	
	MAXIMUM TEMP (Deg C)	60	.....	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm	<b>914 x 10</b>	.....	
	PIPE MATERIAL	CARBON STEEL (IS 2062) CONFORMING TO IS 3589	.....	
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 10 D DOWNSTREAM: 5 D	.....	
	RESTRICTION	NIL	.....	
	LINE ORIENTATION	<b>HORIZONTAL</b>	.....	


	<b>2 x 660 MW SURATGARH TPS DATA SHEET FOR ANUBAR</b>			SPECIFICATION NO.:PE-TS-392-145-I816	
				VOLUME IIB	
				SECTION D	
				REV. NO. 00	DATE : 17.04.14
			SHEET 3 OF 5		
Tag No. :70GAA03BP001, 80GAA03BP001					
<b>DATA SHEET – A &amp; B</b>					
DATA SHEET – A (TO BE FILLED BY PURCHASER)				DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
END CONNECTION	STUB / NIPPLE		SIZE:                      RATING: (Bidder to indicate) MATERIAL:SS316		.....
	SPOOL PIECE WITH FLANGE		SIZE:                      RATING: (Bidder to indicate) MATERIAL:CARBON STEEL		.....
	ROOT VALVES		SIZE: ½”                      RATING: Class 800 MATERIAL:SS316		.....
			END CONNECTION:SW QTY:02 nos.		.....
		BIDDER TO SPECIFY IN HOLE SIZE TO BE DRILLED ON PROCESS PIPE FOR MOUNTING ANUBAR			
NAME  SIGN  DATE	PRPED BY	CHKD BY	APPD BY		COMPANY SEAL   NAME  SIGN  DATE
NOTE: 1. INTERNAL BOTTOM SUPPORT OF SS316 MATERIAL SHALL BE PROVIDED IN PROCESS PIPE. 2. ALL WETTED PARTS SHALL BE SS316. 3. FLUSHING ARRANGEMENT SHALL BE PROVIDED. 4. NON-RETRACTABLE TYPE ANUBAR SHALL BE PROVIDED.					


	<b>2 x 660 MW SURATGARH TPS DATA SHEET FOR ANUBAR</b>		SPECIFICATION NO.: PE-TS-392-145-1816	
			VOLUME	IIB
			SECTION	D
			REV. NO.	00
			DATE	17.04.14
		SHEET	4	OF 5

Tag No. 70PAB10BP011,80PAB10BP011

**DATA SHEET – A & B**

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	2X660 MW SURATGARH TPS	.....
	OFFER REFERENCE	Bidder to indicate	.....
	TAG NO. : QUANTITY	PAB10BP011: One Per Unit (Total 2 Nos.)	.....
	SERVICE	CONDENSER COOLING WATER	.....
ELEMENT	MAKE : MODEL	Bidder to indicate	.....
	TYPE	DELTA TUBE (AVERAGING PITOT TUBE)	.....
	PITOT ASSEMBLY	Bidder to indicate FLG SIZE & RATING	.....
	PROBE DIAMETER & SHAPE	Bidder to indicate	.....
PROCESS DATA	MATERIAL	SS 316	.....
	ACCURACY	± 1% OF ACTUAL VALUE	.....
	REPEATABILITY	± 0.1% OF ACTUAL VALUE	.....
	No. OF TAP	ONE	.....
PIPE LINE DATA	FLUID	COOLING WATER	.....
	RATE OF FLOW (m3/hr)	NORMAL: 68780 M3/HR MAXIMUM: 82540 M3/HR	.....
	UPSTREAM WORKING PRESS (Kg/cm2g)	2.3 (Approx.)	.....
	DESIGN PRESS (Kg/cm2g)	5.0	.....
PIPE LINE DATA	MAX. ALLOWABLE PRESS LOSS	0.01 MWC AT DESIGN FLOW	.....
	DIFF. PRESS AT MAX FLOW	BIDDER TO INDICATE	.....
	NORMAL TEMP (Deg.C)	33	.....
	MAXIMUM TEMP (Deg.C)	60	.....
PIPE LINE DATA	PIPE SIZE (OD x THK) mm	3540 x 20	.....
	PIPE MATERIAL	CARBON STEEL (IS 2062) CONFORMING TO IS 3589.	.....
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 10D DOWNSTREAM : 5D	.....
	RESTRICTION	UPSTREAM : NIL DOWNSTREAM : NIL	.....
PIPE LINE DATA	LINE ORIENTATION	HORIZONTAL	.....
			.....


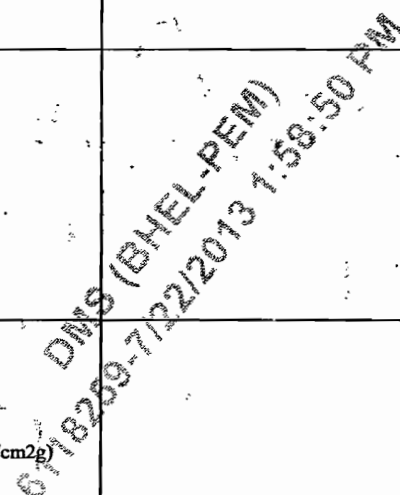
	<b>2 x 660 MW SURATGARH TPS</b> <b>DATA SHEET FOR ANUBAR</b>		SPECIFICATION NO.: PE-TS-392-145-I816	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE: 17.04.14
			SHEET 5	OF 5
Tag No. 70PAB10BP011,80PAB10BP011 <b>DATA SHEET – A &amp; B</b>				
<b>DATA SHEET – A</b> (TO BE FILLED BY PURCHASER)			<b>DATA SHEET – B</b> (TO BE FILLED UP BY BIDDER)	
END CONNECTION	STUB / NIPPLE	SIZE: _____ RATING: _____ (Bidder to indicate) MATERIAL: SS 316	_____ _____ _____	
	SPOOL PIECE WITH FLANGE	SIZE: _____ RATING: _____ (Bidder to indicate) MATERIAL: CARBON STEEL	_____ _____ _____	
	ROOT VALVES	SIZE: 1/2" RATING: Class 800 MATERIAL: SS 316 END CONNECTION: SW   QTY.: 02 nos.	_____ _____ _____	
BIDDER TO SPECIFY IN HOLE SIZE TO BE DRILLED ON PROCESS PIPE FOR MOUNTING ANUBAR				
NAME  SIGN  DATE	PRPED BY	CHKD BY	APPD BY	COMPANY SEAL   NAME  SIGN  DATE
NOTE: 1. INTERNAL BOTTOM SUPPORT OF SS316 MATERIAL SHALL BE PROVIDED IN PROCESS PIPE. 2. ALL WETTED PARTS SHALL BE SS316. 3. FLUSHING ARRANGEMENT SHALL BE PROVIDED. 4. NON- RETRACTABLE TYPE ANUBAR SHALL BE PROVIDED.				



	<b>SURATGARH T.P.S. (2 X 660 MW)</b> <b>TECHNICAL SPECIFICATION</b> <b>FOR</b> <b>ANUBAR</b>	SPECIFICATION NO.: PE-TS-392-145-I816	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 17.04.14
		SHEET 1	OF 3

**DATA SHEETS C**

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	<b>SURATGARH T.P.S. (2 X 660 MW)</b> <b>TECHNICAL SPECIFICATION</b> <b>FOR</b> <b>ANUBAR</b>		SPECIFICATION NO.: PE-TS-392-145-1816	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17.04.14
		SHEET 2	OF 3	
Tag No. 70PAB10BP011,80PAB10BP011,70GAA03BP001,80GAA03BP001 <b>DATA SHEET - C</b>				
<b>DATA SHEET - C FOR ANUBAR (DELTA TUBE)</b> <b>(TO BE FILLED BY THE CONTRACTOR AFTER AWARD OF CONTRACT)</b>				
GENERAL	PROJECT TAG NO. : QUANTITY SERVICE MAKE : MODEL			
ELEMENT	TYPE PITOT ASSEMBLY PROBE DIAMETER & SHAPE MATERIAL ACCURACY REPEATABILITY No. OF TAP			
PROCESS DATA	FLUID RATE OF FLOW (T/HR) UPSTREAM WORKING PRESS (Kg/cm <sup>2</sup> g) DESIGN PRESS (Kg/cm <sup>2</sup> g) MAX. ALLOWABLE PRESS LOSS DIFF. PRESS AT MAX FLOW NORMAL TEMP (Deg C) MAXIMUM TEMP (Deg C)			
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL AVAILABLE PIPE STRAIGHT LENGTH RESTRICTION			

	<b>SURATGARH T.P.S. (2 X 660 MW)</b> <b>TECHNICAL SPECIFICATION</b> <b>FOR</b> <b>ANUBAR</b>		SPECIFICATION NO.: PE-TS-392-145-I816	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17.04.14
			SHEET 3	OF 3
Tag No: 70PAB10BP011,80PAB10BP011,70GAA03BP001,80GAA03BP001 <b>DATA SHEET – C</b>				
<b>DATA SHEET C FOR ANUBAR (DELTA TUBE)</b> <b>(TO BE FILLED BY THE CONTRACTOR AFTER AWARD OF CONTRACT)</b>				
END CONNECTION	STUB / NIPPLE	SIZE :	RATING :	
	SPOOL PIECE WITH FLANGE	MATERIAL :		
	ROOT VALVES	SIZE :	RATING :	
		MATERIAL :		
		SIZE :	RATING :	
		MATERIAL :		
		SIZE :	RATING :	
		MATERIAL :		
		END CONNECTION :	QTY. :	
BIDDER TO SPECIFY IN HOLE SIZE TO BE DRILLED ON PROCESS PIPE FOR MOUNTING ANUBAR				
NAME				
SIGN				
DATE				



- | ITEM NO. | ITEM DESCRIPTION                                                                                                                                                  | QTY.     |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1.       | CONNECTOR(SWAGELOCK DOUBLE COMPRESSION TYPE),STAINLESS STEEL(SS-316),1/2" NPT (M) x TO SUIT 15 Nb SIZE IMPLUSE PIPE AT OTHER END                                  | 2 Nos.   |
| 2.       | 1/2 " SS-316 IMPULSE PIPE                                                                                                                                         | 2 Meter  |
| 3.       | TEE, SS-316 STRAIGHT END SOCKET WELD x 90 DEG END 1/4" NPT (F)                                                                                                    | 2 Nos.   |
| 4.       | GLOBE ISOLATION VALVE, 1/2" SIZE, SS-316, SOCKET WELD ALONGWITH CONNECTOR                                                                                         | 2 Nos.   |
| 5.       | CONNECTOR (SWAGELOCK DOUBLE COMPRESSION TYPE), SS-316, 1/4" NPT (M) x TO SUIT 1/4" SIZE SS-316 TUBE AT OTHER END                                                  | 9 Nos.   |
| 6.       | GLOBE ISOLATION VALVE, 1/4" SIZE, SS-316, SCREWED END                                                                                                             | 2 Nos.   |
| 7.       | 1/4" OD ANNEALED SS-316                                                                                                                                           | 20 Meter |
| 8.       | STAINLESS STEEL (SS-316) TEE, 1/4" NPT (F)                                                                                                                        | 1 No.    |
| 9.       | CONNECTOR (SWAGELOCK DOUBLE COMPRESSION TYPE), SS-316 TO SUIT1/2" ISOLATION VALVE FEMALE THREAD AS PER IS 554 x TO SUIT 1/4" OD STAINLESS STEEL TUBE AT OTHER END | 1 No.    |
| 10.      | SERVICE AIR ISOLATION VLV (SS-316).                                                                                                                               | 1 No.    |



refer data sheet

	<b>SURATGARH T.P.S. (2 X 660 MW)</b> <b>TECHNICAL SPECIFICATION</b> <b>FOR</b> <b>ANUBAR</b>	SPECIFICATION NO.: PE-TS-392-145-I816	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE: 17.04.14
		SHEET 01	OF 01
<div>QUALITY PLAN</div>			

# RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD.

## SURATGARH T.P.S. (2 X 660 MW)

### QUALITY PLAN FOR ANUBAR

JOB NO.		392		 <b>BHARAT HEAVY ELECTRICALS LTD</b> POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA		DEPT CODE		NAME		SIGN		DATE	
STATUS		CONTRACT				I	DRN	MG					17.07.13
DISTRIBUTION							DESN	MG					
TO				CHD	SK							17.07.13	
No. OF				APPD	ABS							17.07.13	
REV.	DATE	ALTD	CHD	APPD									
					TITLE								
					QUALITY PLAN FOR ANUBAR								
									DEPT.	SCALE	DRAWING NO.		
									SIGN		PE-QP-392-145-044		
				DATE		SHEET 00 OF 02							
								REV. 00					



PEM: C&I

**QUALITY PLAN  
FOR  
ANNUBAR  
SURATGARH T.P.S. (2 X 660 MW)**

QUALITY PLAN NO.: **PE-QP-392-145-044**

VOLUME I IB

SECTION D

REV. NO. 01 DATE: 17.07.2013

SHEET 1 OF 2

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency <sup>\$</sup>			Remarks
									M	C	N	
A1	<b><u>RAW MATERIAL</u></b>											
1	Sensor	Chemical Properties	MA	Lab Analysis	1/batch	ANSI-316	ANSI-316	Test Certificate	V	V	V	Relevant compliance certificate shall be verified by BHEL
2	Sensor Tube	Chemical Properties	MA	-do-	-do-	ANSI-316	ANSI-316	-do-	V	V	V	
3	Sensor Flange	Chemical Properties	MA	-do-	-do-	ANSI-316	ANSI-316	-do-	V	V	V	
4	Interpolating Tube	Chemical Properties	MA	-do-	-do-	ANSI-316	ANSI-316	-do-	V	V	V	
5	Mounting Hardware	Chemical Properties	MA	-do-	-do-	ANSI-316	ANSI-316	-do-	V	V	V	
B1	<b><u>IN PROCESS INSPECTION</u></b>											
1 to 5	Sensor, Sensor Tube, Interpolating	Dimensions	CR	Measurement	100%	Apprd drgs/ spec.	Apprd drgs/ spec.	Inspection Report	P	W	V	
6	Welding	Die Penetration Test	CR	Visual	100%	ASTM-E-165	ASTM-E-165	-do-	P	W	V	
7		Pressure Test	CR	Hydraulic Pressure Test	100%	Apprd drgs/ Spec.	Apprd drgs/ Spec.	-do-	P	W	V	

LEGEND: \* CR - Critical characteristics  
MA - Major characteristics  
MI - Minor characteristics

<sup>\$</sup> P - Agency Performing the Test.  
W - Agency Witnessing the Test.  
V - Agency Verifying the Test.

M - Manufacturer  
C - BHEL nominated Inspection agency  
N - CUSTOMER



PEM: C&I

**QUALITY PLAN  
FOR  
ANNUBAR  
SURATGARH T.P.S. (2 X 660 MW)**

QUALITY PLAN NO.: **PE-QP-392-145-044**

VOLUME I IB

SECTION D

REV. NO. 01 DATE: 17.07.2013

SHEET 2 OF 2

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency <sup>\$</sup>			Remarks
									M	C	N	
8	Finished Products	Dimensions	CR	Measurement	100%	Apprd drgs	Apprd drgs	Inspection Report	P	V	V	
		Finish	CR	Visual	100%	Apprd drgs/ Spec.	Apprd drgs/ Spec.	-do-	P	V	V	
9	Packing	Soundness of Packing	MA	-do-	100%	BHEL Spec.	BHEL Spec.	Log Book	P	V	-	

LEGEND: \* CR - Critical characteristics  
MA - Major characteristics  
MI - Minor characteristics

P - Agency Performing the Test.  
W - Agency Witnessing the Test.  
V - Agency Verifying the Test.

M - Manufacturer  
C - BHEL nominated Inspection agency  
N - CUSTOMER



**SURATGARH T.P.S. (2 X 660 MW)  
TECHNICAL SPECIFICATION  
FOR  
ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME II B

SECTION D

REV. NO. 00

DATE: 17.04.14

SHEET 01

OF 01

**SCHEDULE OF SUBMISSION OF DRAWINGS / DOCUMENTS, EQUIPMENT MANUFACTURE  
INSPECTION AND DESPATCH**

- |    |                                                                                                                                                                 |                              |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| 1. | Zero Date                                                                                                                                                       | Date of LOI / FOI / TOI      |
| 2. | Submission of Data Sheets / documents / catalogues / Valve sizing calculations / Noise calculations for approval.                                               | 1 Weeks from the Zero date.  |
| 3. | Technical finalization, freezing of inputs of manufacture by way of vetting of documents and technical discussions and resubmissions of documents (if required) | 4 Weeks from the Zero date.  |
| 4. | Inspection of Equipment as per Approved (Category-I) drawings / documents.                                                                                      | 16 Weeks from the Zero date. |
| 5. | Release of MDCC by BHEL                                                                                                                                         | 18 Weeks from the Zero date. |
| 6. | Dispatch (Packaging & Dispatch)                                                                                                                                 | 18 Weeks from the Zero date. |
| 7. | Final documents submission as per Contract                                                                                                                      | 18 Weeks from the Zero date. |

**NOTE:** Delays due to non-fulfillment of the requirements of approved Quality Plan and approved Data sheets; Drawings, Catalogues and Sizing Calculations observed during inspection shall be to the Vendor's account.

Delays due to INCOMPLETE (Partly) submission of Data sheets, Drawings, Catalogues and Sizing Calculations also be considered as '**DOCUMENTS NOT SUBMITTED**'.

**(Signature and Stamp of the Bidder)**





**SURATGARH T.P.S. (2 X 660 MW)**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME III

REV. NO. 00

DATE: 17.04.14

Page 1 of 6

## VOLUME-III



**SURATGARH T.P.S. (2 X 660 MW)**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME III

REV. NO. 00

DATE: 17.04.14

Page 2 of 6

## CONTENTS

1. COMPLIANCE CERTIFICATE
2. SCHEDULE OF DRAWINGS, DATA SHEETS, DOCUMENTS, CATALOGUES SUBMITTED WITH THE BID.
3. SCHEDULE OF PRICES
4. SCHEDULE OF UNIT PRICES
5. INSPECTION SCHEDULE

## COMPLIANCE CERTIFICATE

For  
ANUBAR

**(To be Signed & Stamped by the Bidder)**

**Project : SURATGARH T.P.S. (2 X 660 MW)**

**Specification no. : PE-TS-392-145-I816**

**We shall comply with the following:-**

1. All the requirements as stated in Technical Specification / Specific Technical requirement / Data sheets / BHEL quality plan etc. as enclosed in the tender, shall be fully complied **without any deviation**.
2. BHEL Quality Plan (enclosed with the specification) duly signed and stamped is submitted herewith **without any deviation**.
3. Sizing Calculations, Data sheet-C in line with Data sheet-A of specification, dimensional drawings etc. shall be submitted for BHEL/Customer review and approval, to reach BHEL within 15 days after receipt of LOI.
4. Any change in Sizing calculations, QP etc., if desired by BHEL / Customer during approval of the documents after award of contract, without major changes in process parameters as per tender Specification, shall be carried out without any commercial implication and time delay.
5. The offered Flanges, Nipples, Tee, Connectors, isolation valves as required, impulse pipe etc. are suitable for the applicable process parameters.

Signature with date	
Name	
Company seal	



**SURATGARH T.P.S. (2 X 660 MW)  
TECHNICAL SPECIFICATION  
FOR  
ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME III

REV. NO. 00

DATE: 17.04.14

Page 3 of 6

**SCHEDULE OF DRAWINGS, DATASHEETS, DOCUMENTS, CATALOGUES  
SUBMITTED WITH THE BID**

**PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE**

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	<b>SURATGARH T.P.S.(2X660 MW)</b> <b>TECHNICAL SPECIFICATION</b> <b>FOR</b> <b>ANUBAR</b>	SPECIFICATION NO. <b>PE-TS-392-145-I 816</b>	
		VOLUME <b>III</b>	
		SECTION	
		REV. NO. 00	DATE: 17.04.14
		SHEET	

## SCHEDULE OF PRICES

**[A]. COMPLETE ANUBAR ASSEMBLY including Purge Air System Specification & GA drawing.(70GAA03BP001, 80GAA03BP001, 70PAB10BP011; 80PAB10BP011,)**

S.NO	ITEM DESCRIPTION	QTY PER UNIT	QTY FOR 2 UNIT	TOTAL PRICE (Rs) (Ex-works)
1	Anubar assembly along with accessories (i.e, Flanges, Spool piece, gaskets, fasteners, nuts , bolts, etc.)	2 no.	4 no.	
2.	Connector(Swage lock Double Compression Type),stainless steel (SS_316),1/2" NPT(M) x to suit 15 Nb size impulse pipe at other end.	4 nos.	8 nos.	
3.	1/2" SS-316 impulse pipe	4 meter	8 nos.	
4.	TEE,SS-316, straight end socket weld x 90 Deg. end 1/4" NPT (F)	4 nos.	8 nos.	
5.	Globe isolation valve, 1/2" size, SS-316, Socket weld along with suitable connectors.	4 nos.	8 nos.	
6.	Connector (Swage lock double compression type), Stainless steel (SS-316), 1/4" NPT (M) x to suit 1/4" size SS-316 tube at other end.	18 nos.	36 nos.	
7.	Globe isolation valve, 1/4" size, SS-316, screwed end.	4 nos.	8 nos.	
8.	1/4" OD Annealed SS-316 Tube	40 meter	80 nos.	
9.	Stainless steel (SS-316) TEE, 1/4" NPT (F)	2 no.	4 nos.	
10.	Connector (Swage lock double compression type), SS-316 to suit 1/2" isolation valve female thread as per IS 554 x to suit 1/4" OD Stainless steel tube at other end.	2 no.	4 nos.	
[B] START-UP/COMMISSIONING SPARES (2 SETS OF GASKET FOR EACH TAG)		4 sets	8 sets	
TOTAL(Rs) (A+B)				

### C] RECOMMENDED SPARES

FOR THREE (3) YEARS OF OPERATION (ITEM WISE BREAK-UP TO BE ATTACHED BY THE BIDDER)

PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



**SURATGARH T.P.S. (2 X 660 MW)  
TECHNICAL SPECIFICATION  
FOR  
ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME III

REV. NO. 00

DATE: 17.04.14

Page 5 of 6

## SCHEDULE OF UNIT PRICES

**[A] COMPLETE ANUBAR ASSEMBLY including Purge Air System . Charges as per specification & GA drawing.**

S. No.	ITEM DESCRIPTION	UNIT PRICE (Rs)
1	Anubar assembly along with accessories (i.e. Flanges, Spool piece, gaskets, fasteners, nuts, bolts, etc.)	
2	Connector (Swage lock Double Compression Type), Stainless Steel (SS-316) , ½" NPT (M) x to suit 15 Nb size impulse pipe at other end.	
3	½" SS-316 impulse pipe	
4	TEE, SS-316, straight end socket weld x 90 Deg. end ¼" NPT (F)	
5	Globe isolation valve, ½" size, SS-316, Socket weld along with suitable connectors.	
6	Connector (Swage lock double compression type), Stainless steel (SS-316), ¼" NPT (M) x to suit ¼" size SS-316 tube at other end.	
7	Globe isolation valve, ¼" size, SS-316, screwed end.	
8	¼" OD Annealed SS-316 Tube	
9	Stainless steel (SS-316) TEE, ¼" NPT (F)	
10	Connector (Swage lock double compression type), SS-316 to suit ½" isolation valve female thread as per IS 554 x to suit ¼" OD Stainless steel tube at other end.	
11	Price change due to change of length of Spool piece per 6" over and above specified length.	
<b>[B] START-UP/COMMISSIONING SPARES (1 SET OF GASKET OF EACH TYPE)</b>		
<b>TOTAL (Rs)</b>		

**[C] RECOMMENDED SPARES**  
FOR THREE (3) YEARS OF OPERATION (ITEM WISE BREAK-UP TO BE ATTACHED BY THE BIDDER)

**PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE**

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



**SURATGARH T.P.S. (2 X 660 MW)  
TECHNICAL SPECIFICATION  
FOR  
ANUBAR**

SPECIFICATION NO.: PE-TS-392-145-I816

VOLUME III

REV. NO. 00

DATE: 17.04.14

Page 6 of 6

**INSPECTION SCHEDULE**

(PLACE & ADDRESS OF TESTING/ INSPECTION AND ITS SCHEDULE DATE & DURATION IN  
NUMBER OF DAYS ITEM/COMPONENTWISE TO BE LISTED)

**PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE**

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL