

1X 250MW NTPC SAIL POWER COMPANY (P) LTD
ROURKELA POWER PLANT-II EXPANSION

TECHNICAL SPECIFICATION
FOR
ANUBAR

JOB NO. 427	TITLE TECHNICAL SPECIFICATION ANUBAR	DOC. NO. PE-TS-427-145-II05C				
	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA	DEPT	NAME		SIGN	DATE
		CODE	DESN	RK		21.01.17
		I	CHD	MK		21.01.17
			APPD	BS		21.01.17

**TECHNICAL SPECIFICATION
FOR
ANUBAR**

VOLUME II-B

SPECIFICATION No.

PE-TS-427-145-I105C



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT DIVISION
NOIDA, INDIA**

	Technical specification for ANUBAR 1X250MW ROURKELA TPP	SPECIFICATION NO.: PE-TS-427-145-I105C		
		VOLUME	II B	
		SECTION	A	
		REV. NO.	00	DATE: 20.01.17
		SHEET		

SECTION – A

SCOPE OF ENQUIRY

	1 x 250 MW ROURKELA TPP TECHNICAL SPECIFICATION FOR ANUBAR	SPECIFICATION NO.: PE-TS-427-145-I916	
		VOLUME	-
		SECTION	-
		REV. NO.	00
		DATE: 20.01.2017	

SCOPE OF ENQUIRY

1.0 SCOPE

- 1.1 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 1 x 250 MW ROURKELA Coal Based Thermal Power Plant.
- 1.2 The quality plan enclosed, forms the minimum requirement but not limited to be adhered to by the bidder. Bidder to sign and stamp the same and submit along with the offer as an acceptance.
- 1.3 Scope of supply shall be anubar, stub nipples, root valves, spares etc. as indicated in specification.
- 1.4 Following formats to be signed, stamped with company seal and submitted :
 - a) Complete offer including calculation sheets, catalogues etc.
 - b) Quality Plan
 - c) Datasheets A & B, duly filled

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/Customer'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.



**Technical specification for
ANUBAR
1 X 250 MW ROURKELA TPP**

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SECTION – C

SPECIFIC TECHNICAL REQUIREMENTS

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SPECIFIC TECHNICAL REQUIREMENTS

- 1.0** Each Anubar shall be supplied with two sets of gaskets for each Tag as start-up / commissioning spares.
- 2.0** Inspection of Anubar shall be carried out in line with pre-approved drawings/datasheet/QP.
- 3.0** 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.

4.0 DOCUMENTATION:

(A) ALONG WITH THE BIDS:

The following documents to be enclosed:

- Unpriced Format of Schedule of Prices & Schedule of Unit Prices
- Quality Plan duly signed and stamped.
- Data Sheet A & B duly signed and stamped.
- Schedule of submission of drawings/documents, equipment manufacture, inspection and dispatch.
- Compliance Certificate

(B) AFTER AWARD OF CONTRACT :

6 sets of the following documents to be enclosed separately for respective projects.

- Datasheet C completely filled-up.
- Quality plan duly signed and stamped.
- All Differential pressure vs Flow graphs.
- Anubar assembly dimensional drawings.
- GA Drawing.
- Catalogues for the models of Anubar / Accessories offered.
- Inspection Schedule

(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 & As Built Drawings | – 10 sets |



**NTPC SAIL POWER COMPANY (P) LIMITED
ROURKELA POWER PROJECT
(PP – III : 1X250 MW)**



**TECHNICAL SPECIFICATION FOR
IMPACT HEAD TYPE FLOW ELEMENT**

The impact head type element shall be tubular insert type with four impact ports facing upstream direction, located precisely for determination of average flow velocity and shall be of SS 316 L.

Accuracy shall be 1.0% of actual value or better. Repeatability shall be + 0.1% of actual value or better.

The elements shall be supplied complete with mounting hardware; end support plugs and CS valve manifold (1/2" NPT connection) for instrument connections. All pertinent data including Owner's instrument tag no. for the flow element shall be punched on a stainless steel plate and affixed to the element.

Flushing arrangement shall be provided.



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SECTION – D

SPECIFICATION FOR ANUBAR



**Technical specification for
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SECTION – D.1

EQUIPMENT SPECIFICATION

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1.0 SCOPE

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 1 X 250 MW ROURKELA TPP.

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 its accessories shall be suitable for clarified water application and continuous operation under an ambient temperature of 0-60°C and Relative Humidity of 0-95% unless specified elsewhere.

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 pressure 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 **SS-316 L** as per project specific requirement.

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 TEST & INSPECTION

- 4.1 The bidder shall adopt suitable quality assurance plan to ensure that the equipments offered will meet the specification requirements in full.
- 4.2 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.
- 4.3 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.
- 4.4 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.

5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

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

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5.2 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.

5.3 Special Tools & Tackles

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

6.0 DRAWINGS & DOCUMENTS

As mentioned in Section C of Volume IIB.

7.0 FOR INFORMATION

7.1 Storage and Commissioning Instruction

7.2 O&M are to be supplied as specified.

8.0 PACKING & MARKING

8.1 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.

8.2 Each assembly shall be identified with the following information.

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

9.0 APPLICABLE DATA SHEETS

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

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



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SECTION – D.2

ANUBAR GENERAL ARRANGEMENT WITH PURGE AIR SYSTEM



- | ITEM NO. | ITEM DESCRIPTION | QTY. |
|----------|--|----------|
| 1. | CONNECTOR(SWAGELOCK DOUBLE COMPRESSION TYPE),STAINLESS STEEL (SS316),1/2" NPT (M) x TO SUIT 15 Nb SIZE IMPLUSE PIPE AT OTHER END | 2 Nos. |
| 2. | 1/2 " STAINLESS STEEL (SS 316) IMPULSE PIPE | 2 Meter |
| 3. | TEE, STAINLESS STEEL (SS 316) STRAIGHT END SOCKET WELD x 90 DEG END 1/4" NPT (F) | 2 Nos. |
| 4. | GLOBE ISOLATION VALVE, 1/2" SIZE, STAINLESS STEEL (SS316), SOCKET WELD ALONGWITH CONNECTOR | 2 Nos. |
| 5. | CONNECTOR (SWAGELOCK DOUBLE COMPRESSION TYPE), STAINLESS STEEL (SS316, 1/4" NPT(M) x TO SUIT 1/4" SIZE STAINLESS STEEL 316 TUBE AT OTHER END | 9 Nos. |
| 6. | GLOBE ISOLATION VALVE (SS316) , 1/4" SIZE, STAINLESS STEEL, SCREWED END | 2 Nos. |
| 7. | 1/4" OD ANNEALED STAINLESS STEEL 316 | 20 Meter |
| 8. | STAINLESS STEEL 316 TEE, 1/4" NPT (F) | 1 No. |
| 9. | CONNECTOR (SWAGELOCK DOUBLE COMPRESSION TYPE), STAINLESS STEEL TO SUIT 2" ISO. 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. |

ANUBAR GENERAL ARRANGEMENT WITH PURGE AIR SYSTEM
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SECTION – D.3

QUALITY PLAN

 PEM: C&I		QUALITY PLAN FOR ANUBAR							QUALITY PLAN NO.: PE-QP-427-145-I105C			
									VOLUME			
									SECTION			
									REV.NO. 00 DATE: 20.01.17			
									SHEET OF			
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									M	C	N	
A1	RAW MATERIAL											
1	Sensor	Chemical Properties	MA	Lab Analysis	1/batch	BHEL Apprd drgs/ spec.	BHEL Apprd drgs/ spec.	Test Certificate	V	V	V	Relevant compliance certificate shall be verified by BHEL
2	Sensor Tube	Chemical Properties	MA	-do-	-do-	BHEL Apprd drgs/ spec.	BHEL Apprd drgs/ spec.	-do-	V	V	V	
3	Sensor Flange	Chemical Properties	MA	-do-	-do-	BHEL Apprd drgs/ spec.	BHEL Apprd drgs/ spec.	-do-	V	V	V	
4	Interpolating Tube	Chemical Properties	MA	-do-	-do-	BHEL Apprd drgs/ spec.	BHEL Apprd drgs/ spec.	-do-	V	V	V	
5	Mounting Hardware	Chemical Properties	MA	-do-	-do-	BHEL Apprd drgs/ spec.	BHEL Apprd drgs/ spec.	-do-	V	V	V	
B1	IN PROCESS INSPECTION											
1 to 5	Sensor, Sensor Tube, Interpolating	Dimensions	CR	Measurement	100%	BHEL Apprd drgs/ spec.	BHEL 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%	BHEL Apprd drgs/ Spec.	BHEL Apprd drgs/ Spec.	-do-	P	W	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												

PEM: C&I		QUALITY PLAN FOR ANUBAR										QUALITY PLAN NO.: PE-QP-427-145-1105C			
		VOLUME													
		SECTION													
		REV.NO. 00 DATE: 20.01.17													
		SHEET OF													
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks			
									M	C	N				
8	Finished Products	Dimensions	CR	Measurement	100%	BHEL Apprd drgs	BHEL Apprd drgs	Inspection Report	P	V	V				
		Finish	CR	Visual	100%	BHEL Apprd drgs/ Spec.	BHEL 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		P	- Agency Performing the Test.	M	- Manufacturer
		MA	- Major characteristics		W	- Agency Witnessing the Test.	C	- BHEL nominated Inspection agency
		MI	- Minor characteristics		V	- Agency Verifying the Test.	N	- CUSTOMER



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SECTION – D.4

DATA SHEET A&B

	DATA SHEET FOR ANUBAR 1x250 MW ROURKELA TPP		SPECIFICATION NO.: PE-DS-427-145-II05C	
			VOLUME	
			SECTION	
			REV. NO. 00	DATE : 21.01.2017
			SHEET 1	OF 1
Tag No. PCB30BP001 DATA SHEET – A & B				
DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
GENERAL	TAG NO. : QUANTITY SERVICE MAKE : MODEL	PCB30BP001 : ONE CONDENSER COOLING WATER Bidder to indicate		
ELEMENT	TYPE PITOT ASSEMBLY PROBE DIAMETER & SHAPE MATERIAL ACCURACY REPEATABILITY No. OF TAP	DELTA TUBE (AVERAGING PITOT TUBE) Bidder to indicate FLG SIZE & RATING Bidder to indicate SS 316 L +/- 1% OF ACTUAL VALUE +/- 0.1% OF ACTUAL VALUE ONE		
PROCESS DATA	FLUID RATE OF FLOW (m3/hr) UPSTREAM WORKING PRESS (Kg/cm2g) DESIGN PRESS (Kg/cm2g) MAX. ALLOWABLE PRESS LOSS DIFF. PRESS AT MAX FLOW NORMAL TEMP (Deg C) MAXIMUM TEMP (Deg C)	CLARIFIED WATER NORMAL : 35416 m3/hr MAXIMUM : 43200 m3/hr 2.1 Approx. 5.0 0.05 MWC at DESIGN FLOW Bidder to indicate 33 60		
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL AVAILABLE PIPE STRAIGHT LENGTH RESTRICTION LINE ORIENTATION	2335 X 12 CARBON STEEL (IS 2062) AS PER 3589 UPSTREAM : 10D DOWNSTREAM : 5D UPSTREAM : NIL DOWNSTREAM : NIL HORIZONTAL		
END CONNECTION	STUB / NIPPLE SPOOL PIECE WITH FLANGE ROOT VALVES	SIZE: Bidder to indicate RATING: Bidder to indicate Material : SS316 SIZE: Bidder to indicate RATING: Bidder to indicate Material : CARBON STEEL SIZE: 1/2 INCH RATING: CLASS 800 MATERIAL: SS316 END CONNECTION: SW QTY: 02 no's		
NOTES: 1. BIDDER SHALL SPECIFY IN-HOLE SIZE TO BE DRILLED ON PROCESS PIPE FOR MOUNTING ANUBAR. 2. INTERNAL BOTTOM SUPPORT OF SS316 MATERIAL SHALL BE PROVIDED IN PROCESS PIPE BY THE BIDDER 3. ALL WETTED PARTS SHALL BE SS316 MATERIAL 4. FLUSHING ARRANGEMENT SHALL BE PROVIDED BY THE BIDDER				



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DATA SHEET C

	DATA SHEET FOR ANUBAR 1 X 250 MW ROURKELA TPS		SPECIFICATION NO.: PE-DS-427-145-I105C		
			VOLUME		
			SECTION		
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Tag No. DATA SHEET – C					
(TO BE FILLED BY THE CONTRACTOR AFTER AWARD OF CONTRACT)					
GENERAL	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 (m ³ /hr) UPSTREAM WORKING PRESS (Kg/cm ² g) DESIGN PRESS (Kg/cm ² 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 LINE ORIENTATION				
END CONNECTION	STUB / NIPPLE SPOOL PIECE WITH FLANGE ROOT VALVES		SIZE: SIZE: SIZE:	RATING: RATING: RATING:	MATERIAL: MATERIAL: MATERIAL:
NOTES: 1. VENDOR SHALL SPECIFY IN-HOLE SIZE TO BE DRILLED ON PROCESS PIPE FOR MOUNTING ANUBAR. 2. INTERNAL BOTTOM SUPPORT OF SS316 MATERIAL SHALL BE PROVIDED IN PROCESS PIPE BY VENDOR. 3. ALL WETTED PARTS SHALL BE SS316 MATERIAL 4. FLUSHING ARRANGEMENT SHALL BE PROVIDED BY VENDOR					



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SECTION – D.6

BILL OF QUANTITY

	Technical specification for ANUBAR 1X250MW ROURKELA TPP	SPECIFICATION NO.: PE-TS-427-145-I105C	
		VOLUME III	
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BOQ OF ANUBAR

[A] COMPLETE ANUBAR ASSEMBLY including Purge Air System. Charges as per specification & GA drawing. All wetted parts shall be of SS316 as indicated in datasheets

S. No.	ITEM DESCRIPTION	QTY FOR 1 UNIT	UNIT PRICE (Rs)	TOTAL PRICE (Rs)
1	Anubar assembly along with accessories (i.e. Flanges, Spool piece, gaskets, fasteners, nuts, bolts, etc.)	1 nos.		
2	Connector (Swage lock Double Compression Type), Stainless Steel 316, ½" NPT (M) x to suit 15 Nb size impulse pipe at other end.	2 nos.		
3	½" Stainless Steel 316 Impulse pipe	2 meter		
4	TEE, Stainless Steel 316, straight end socket weld x 90 Deg. end ¼" NPT (F)	2 nos.		
5	Globe isolation valve, ½" size, Stainless Steel 316, Socket weld along with suitable connectors.	2 nos.		
6	Connector (Swage lock double compression type), Stainless steel 316, ¼" NPT (M) x to suit ¼" size Stainless Steel tube at other end.	9 nos.		
7	Globe isolation valve, ¼" size, Stainless Steel 316, screwed end.	2 nos.		
8	¼" OD Annealed Stainless Steel Tube 316	20 meter		
9	Stainless steel 316 TEE, ¼" NPT (F)	1 nos.		
10	Connector (Swage lock double compression type), Stainless Steel 316 to suit 2" isolation valve female thread as per IS 554 x to suit ¼" OD Stainless steel tube 316 at other end.	1 nos.		
[B] START-UP/COMMISSIONING SPARES (2 SETS OF GASKET FOR EACH TAG)		2 sets		
TOTAL (Rs)				

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