
TECHNICAL SPECIFICATION

FOR

OXIDATION BLOWER

CONFIDENTIAL

CUSTOMER : NATIONAL THERMAL POWER CORPORATION (NTPC)
PROJECT : NORTH KARANPURA 3x660MW
APPLICATION : FLUE GAS DESULPHURIZATION SYSTEM



BHARAT HEAVY ELECTRICALS LIMITED
(A GOVT OF INDIA UNDERTAKING)
Flue Gas Desulphurization Group
Ranipet

	TECHNICAL SPECIFICATION OF OXIDATION BLOWER - : NORTH KARANPURA 3x660MW
	NKP:FGD:AOB:R01

TECHNICAL SPECIFICATION FOR OXIDATION BLOWERS

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REVISION :

Rev No	Date	Comments
00	28.02.2019	Fresh Issue.
01	30.04.2019	1. Blower capacity revised from 14500 m3/hr to 15000 m3/hr 2. P&ID revised 3. Clause No 6.8: sub clause 11 added.

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3x660MW**

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1.0 PROJECT INFORMATION:

North Karanpura Super Thermal Power Project (3x660 MW) is located in Hazaribagh and Chatra districts of Jharkhand State. The capacity of the project is 1980 MW comprising of three (3) units of 660 MW each

a.	Owner	NTPC
b.	Buyer	BHEL, Ranipet
c.	Process/Application	Flue Gas Desulphurization

A) SITE CONDITIONS

Guarantee point

1.	Ambient Temperature and Relative Humidity		
	Ambient Temperature	:	27 deg C
	Relative Humidity	:	60 %

Design point

2.	Ambient Temperature and Relative Humidity		
	Ambient Temperature (Design)	:	45 deg C
	Relative Humidity	:	60 %

Note :

- 1.Guarantee point site condition shall apply for the guarantee value as well as for guarantee values as well as for guarantee test/ performance test.
- 2.Equipment and material must be suitable for the range of ambient conditions.

B) PROJECT LOCATION AND APPROACH

a.	State/Division	Jharkhand
b.	District	Chatra



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2.0 APPLICABLE CODES & REGULATIONS

The design and materials shall conform to the requirements of applicable codes and regulations of the latest edition. The design, manufacture, installation and testing of the Oxidation Blower shall follow the latest applicable Indian/International (AISI / ASME/EN) Standards. GB standards are not applicable.

3.0 INTENT OF SPECIFICATION

This specification covers the minimum requirements for the complete design, material, manufacturing, shop inspection, testing at the manufacturer's works, supervision of erection & commissioning and performance testing of Oxidation blower along with accessories which is to be furnished in the Flue Gas Desulphurization plant of NORTH KARNPURA 3x660MW project. The following points may be noted.

- a. There are three units of 660 MW and each unit is envisaged with one FGD system. Each FGD system will be provided with 2 numbers of Oxidation Blower (1 working + 1 standby) which are located inside the Recirculation Pump & Oxidation Blower shed.
- b. Bidder shall assume full unit responsibility for the entire equipment assembly and make all possible efforts to comply strictly with the requirements of this specification and other specifications/attachments to inquiry/order.
- c. The Bidder shall offer only proven design which meets the Provenness criteria indicated in **Annexure-I**. Necessary document evidences as per **Attachment-3K** for qualification shall be submitted along with the bid. If the Bidder doesn't meet the specified proven ness criteria, then the Bidder will not be allowed to participate in the Tender.
- d. In case, deviations are considered essential by the Bidder (after exhausting all possible efforts), the same shall be separately listed in the Bidder's proposal under separate section, titled as "List of Deviations/Exceptions to the Enquiry Document (**Annexure-IV**)".
- e. Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable.
- f. No deviation or exception shall be permitted without the written approval of the purchaser.
- g. Compliance to this specification shall not relieve the Bidder of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.
- h. In case, the Bidder considers requirement of additional instrumentation, controls, safety devices and any other accessories/auxiliaries essential for safe and satisfactory operation of the equipment, the same shall be recommended along with reasons in a separate section and include the same in scope of supply.
- i. All accessories, items of work, though not indicated but required to make the system complete for its safe, efficient, reliable and trouble free operation and maintenance shall also be in supplier's scope unless specifically excluded.



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4.0 PROVENNESS CRITERIA:

The Bidders are required to meet the Qualification Requirement (QR) for Oxidation Blower as per Annexure-I & submit the Annexure to qualification requirement (Attachment-3K) along with necessary supporting documents. Bidder's offer will be rejected if the bidder fails to meet the Qualification criteria.

5.0 TECHNICAL INFORMATION

Sl. No	Description	Requirement		
1.	Quantity	2 Nos (1 Working + 1 standby) per unit .Total 6 Nos.		
2.	Parameters			
	Operating Points	(1) Design Point -1	(2) Design point -2	(3) Guarantee Point
	Blower capacity	15000 Nm ³ /hr-wet.	8840 Nm ³ /hr-wet.	6138 Nm ³ /hr-wet.
	Discharge pressure	8500 mmWC	8500 mmWC	6600 mmWC
	Efficiency required	-	-	72.5 %
	Relative humidity	60 %		
	Suction temperature	45.0° C		
	Atmospheric pressure	938 hPa		
	Discharge temperature	<100° C		
	Type of Blower	Single stage, integrally geared, single or dual vane centrifugal type oxidation blowers complete with integral gearbox, lube oil system, instrumentation and accessories. The blower will be used for supplying a variable volume of air to the absorber reaction tank.		
	Duty	Continuous		
3.	Cooling water			
	Inlet temperature	38° C		
	Outlet temperature	43° C		
	Pressure loss	0.15 MPa		
	Supply pressure	0.4 MPa		
4.	Air Composition (Wet)	Design point		Guaranty point
	H ₂ O	6.06 vol%		2.28%
	O ₂	19.73 vol%		20.52%
	N ₂	Balance		
5.	Material of construction			
	Casing	Vendor to provide		
	Shaft	Vendor to provide		
	Impeller	Vendor to provide		
6.	Voltage level for Motors	a) Up to 0.2KW – Single phase 240V AC/		



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Sl. No	Description	Requirement
		3phase 415V AC b) Above 0.2 KW and up to 200 KW- 3phase 415V AC c) Above 200 KW and up to 1500 KW- 3phase 3.3kV AC d) Above 1500KW-11 kV
7.	Air filter filtering efficiency	Vendor to provide
8.	Blower Driver	Motor
9.	Cooling system for reducing the temperature of air at the blower outlet to <100 deg Celsius	Quenching/Cooling arrangement with water injection arrangement to be provided. Heat exchanger should not be provided.
10.	Inspection & Testing	Testing will be done as per approved Quality plan.
11.	Service Engineer Site visit	There will be one visit per Unit. Vendor shall include No. of working days per visit in the offer.(pl refer Cl. 9)
12.	Surface Preparation	SSPC SP3 Finish
13.	Painting(tentative)	PRIMER COAT: Red Oxide Zinc Phosphate Primer to IS: 12744 (Two coats) DFT 60 μm min FINISH COAT: Synthetic Enamel to IS 2932 Shade: Grey white RAL 9002 (Two coats) DFT 60 μm min Total DFT : 120 micron.
14.	Guarantee & Warranty	• Vendor shall furnish Performance Guarantee for the design, manufacture, material, safe and trouble-free operation of the unit and its accessories. • The noise level shall not exceed 85 dBA overall sound pressure level reference 0.0002 microbar (the standard pressure reference for air sound measurement) at a distance of 1m from the equipment surface.
15.	Defect Liability Period	• The Defect Liability Period shall be eighteen (18) months from the date of successful Completion of the Facilities or twelve (12) months from the date of



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Sl. No	Description	Requirement
		Operational Acceptance of the Facilities.
16.	Vibration	The overall vibration level shall be as per ISO 10816-1. Balance quality requirement shall be G-6.3 confirming to ISO 1940 /1 vibration dampening pads if required, shall be provided.
17.	POWER SUPPLY	
	The following voltage levels shall apply:	
	3.3 kV $\pm 6\%$, 50 Hz	Voltage for motors equal to / bigger than 200 KW and for power distribution within the plant.
	415 V $\pm 10\%$, 50Hz	Standard voltage for power supplies to small electric power consumers and motors below 200 KW lighting and domestic power outlets
	Bidder shall design and supply the equipment suitable for satisfactory operation under above mentioned power supply condition.	

5.1 WATER ANALYSIS

The following water to be used for quenching the Oxidation air discharge temperature <100 deg C.

S.No	Constituents	Unit	Water quality
1.	Total Dissolved Solids	ppm	330
2.	Total Cations as CaCO ₃	ppm	209
3.	Total Anions as CaCO ₃	ppm	209
4.	Calcium as CaCO ₃	ppm	65
5.	Magnesium as CaCO ₃	ppm	41
6.	Sodium as CaCO ₃	ppm	98
7.	Potassium as CaCO ₃	ppm	5
8.	Iron as Fe	ppm	1.2
9.	Total Alkalinity as CaCO ₃	ppm	150
10.	Chlorides as CaCO ₃	ppm	25
11.	Sulphate as CaCO ₃	ppm	34
12.	Silica	ppm	9
13.	pH		7.6 – 8.2
14.	Turbidity	NTU	200



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6.0 SCOPE OF SUPPLY

Scope for the bidders shall include Design, Supply, and Supervision of Erection & Commissioning

Design: Includes basic engineering, detail engineering, preparation and submission of engineering drawings/calculations/datasheets/quality assurance documents/field quality plans, storage instructions commissioning procedures, operation & maintenance manuals, performance guarantee test procedures and assisting BHEL in obtaining time bound approval from NTPC.

Supply: Includes manufacturing/fabrication, shop floor testing, stage inspections, final inspections, painting & packing

Supervision of Erection & commissioning: Includes supervision of erection & commissioning, supervision of trial operation, training of customer's O&M Personnel and handing over to customer.

Supplier's scope shall cover complete air blower unit including sub-systems, start-up spares and special tools (typically) as given below. The scope of supply for air blower shall include but not limited to the following:

Sl. No	Scope
1.	Blower complete with
	i. Casing
	ii. Rotor and Shaft assembly
	iii. Common base frame and shock absorber
	iv. Suction filter, throttler
	v. Suction & Discharge silencers
	vi. Lubrication system
	vii. Accessory piping within the skid
	viii. Safety Valves , Gate valve, butterfly valve, Check valves as per specification and P&ID
	ix. Acoustic Enclosure to meet specified Noise Level
	x. Coupling with guards
	xi. Expansion joints at Discharge
	xii. Companion flanges with gaskets and fasteners
	xiii. Bearing cooling
	xiv. Cooling arrangement to reduce the discharge air temperature to <100 deg C
	xv. Foundation bolts for supplied items
	xvi. Instruments like Pressure switch, Pressure gauge, Temperature gauge, Bearing Temperature gauge/ sensor, Flow Meter , Differential pressure gauges in filters etc. as required and as per specification enclosed & as per P&ID.
	xvii. Mechanical Running and Performance test at shop
	xviii. Painting and Rust Prevention during shipment and construction
	xix. Supervision of Erection & commissioning at site
	xx. Proper Packing
	xxi. Special tools & tackles as applicable
	xxii. Mandatory spares
	xxiii. Erection and start-up spares as applicable
	xxiv. Installation, operation and maintenance manuals
	xxv. Any other items required for completeness of the equipment except the items covered in the exclusions.



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Sl. No	Scope
	Bidder shall refer to the P&ID enclosed in Annexure – X.

6.1	CONSTRUCTION FEATURES
a.	Each blower shall be a complete unit with casing, rotor, shaft and drive unit etc.
b.	The Blowers shall be Centrifugal type Single stage, integrally geared, single or dual vane centrifugal type oxidation blowers complete with integral gearbox, lube oil system, instrumentation and accessories. It shall be compact and simple in design requiring minimum number of spares.
c.	The oxidation blowers should be complete with drive arrangement consisting of coupling, coupling guard, base frame shock absorbers, mounting bolts, air filter, Acoustic enclosures, silencers, safety valves and check valves etc.
d.	The Oxidation Blowers shall be designed for continuous operation along with suitable cooling arrangement to meet the exit temperature < 100 deg C. The Bidder shall specify the cooling water requirement for reducing the temperature of discharge air.
e.	The rotor shall be ground all over and accurately machined. The Rotor along with other rotating parts shall be statically balanced and then dynamically balanced as per ISO 1940 to ensure efficiency, vibration, performance and long bearing life.
f.	The air intake filter cum silencer, preferably dry type, to prevent dust and other atmospheric impurities from entering the blower shall be provided for each blower. Air filter shall have better filtering efficiency.
6.2	COOLING ARRANGEMENT
a.	The discharge air temperature <100 Deg C may be obtained by Quenching arrangement with water injection at the common discharge
b.	The vendor to provide the following along with cooling arrangement ▪ Scheme and arrangement drawing ▪ Required pipe fittings within the scope of terminal points ▪ Required number of spray nozzles ▪ Water quantity required



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c.	Allowed pressure drop of water at oxidation air quenching arrangement shall be $\leq 2.0 \text{ kg/cm}^2(\text{g})$. Bidder to provide quenching water requirement in their offer.
6.3	CASING
a)	Casing shall be of robust construction. It shall be made from Casting or fabricated from heavy gauges steel sheets or plates or bidder's proven design standard meeting the provenness criteria as stipulated in Annexure-I.
b)	In case of castings, the casing will be of Gray Cast Iron confirming to IS: 210 grade 25 or equivalent, designed for the duty conditions or proven design standard meeting the provenness criteria as stipulated in Annexure-I. Castings shall be free from all defects and blowholes and shall be machined to close tolerance. In case of fabricated casings, it shall be rigidly reinforced and supported by structural members. Weld seams shall be continuous to have air-tight enclosure.
c)	Casings shall also have smooth interior to avoid accumulation of dense particles. Inlet shall be spun to have a smooth contour.
d)	If necessary, provision for ready access to the interiors of casings and other possible trouble points shall be made by means of readily removable, bolted on plates or by hinged and latched doors.
e)	Any connections shall be flanged. Flange diameter and drilling shall conform to ANSI B16.5 Class 150
6.4	ROTORS & Impellers
a)	The rotor shall be made of Cast iron or forged steel or proven design standard meeting the provenness criteria as stipulated in Annexure-I.
b)	Rotor assemblies shall be statically balanced and then dynamically balanced as per ISO 1940.
c)	In case of centrifugal blowers the Impellers shall be made of high strength aluminum alloy impellers or bidder's proven design standard meeting the provenness criteria as stipulated in Annexure-I.
6.5	SHAFT, SHAFT SEALS AND BEARINGS:
a)	The shaft shall be made of alloy steel or bidder's proven design standard meeting the provenness criteria as stipulated in Annexure-I.
b)	Shafts shall be conservatively designed to transmit maximum power required and to assure rigidity. Shafts shall be machined and ground to close tolerances and shall be tapered to permit easy removal of the seals and bearings.
c)	Shaft shall run in high precision heavy duty bearings. Lubrication system provided shall be such



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	that visual checking of lubricant level is possible
d)	The shaft shall be finished to close tolerance at the rotor, coupling, pulley and bearing diameters. The size of shaft shall be calculated on the basis of maximum combined shear stress. This shear stress shall not exceed 30 percent of the elastic limit in tension or 18 percent of ultimate tensile strength.
e)	The design of shaft shall also take into consideration the critical speed of the shaft, which shall be at least 20% above the operating speed or 60 to 75% of the operating speed to minimize vibrations. Shafts shall be tapered to permit easy removal of the seals and bearings
f)	Shaft seals shall be provided to seal rotating shafts. Shaft seals shall be of the labyrinth type, of non-sparking material and shall be horizontally split to facilitate maintenance. The housing shall be of cast iron or fabricated steel construction and shall be horizontally split to provide access to all bearings and shafts.
g)	The bearings may be ball, roller or sleeve bearing. If sleeve bearings are used these shall be machined for close running fit. The bearings shall be designed to take the necessary radial load as well as the net axial thrust. Bearings shall be lubricated properly and sized for an operating life of 50,000 hours on the basis of maximum load.
h)	Blower induced vibration due to flow pulsations shall be avoided through suitable design.
i)	Bearing temperature sensor shall be provided for remote monitoring of the bearing metal temperature of blowers. 3 Nos of RTD shall be provided to measure bearing temperature at DE and NDE ends.
6.6	COUPLING
a)	The HT drive motor is excluded from the scope of supply. However, the bidder shall supply coupling for secondary transmission.
b)	Coupling shall be of flexible type. The Bidder shall furnish both halves of the coupling. Both the Coupling halves shall be bored and keyed to fit shafts of the blower and the motor by bidder.
c)	All rotating parts such as coupling shall be covered with suitable protective guards. Guards shall be easily removable type.
6.7	BASE PLATE
a.	A common base plate shall be provided for Blower assembly & Motor and the same shall be rigidly constructed, adequately braced and provided with finish pads for mounting blower.
b.	Suitable holes shall be provided for grouting and these shall be so located that the base plate can be grouted in place without disturbing the blower and motor.
	Common base plate for Blower and Motor shall be in the scope of the bidder and the details of the Motor will be furnished to the bidder to provide Motor mounting bolts.
6.8	ACCESSORIES:



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1.	Lube Oil Unit : (If applicable)
a)	Each blower shall be furnished with an integral lubricating oil package. Each package shall be complete with single water to oil heat exchanger, full flow oil filter and oil pump. The oil pump shall be direct driven from the blower shaft. The complete package shall be factory wired, assembled and mounted on the base plate. Air cooled LO System shall be applied. If cooling water is required, bidder shall provide the supply requirements(flow, pressure) and the return conditions(temperature, pressure drop)
b)	Emergency power supply is not available. The Lubricating oil system shall be designed that will satisfy the required lubrication for bearing at the time of electric power failure also.
c)	Oil Bath System for Lubrication shall also be provided instead of Lube oil system.
2.	Coupling Guards- All rotating parts outside casing such shall be covered by the guard.
3.	Timing Gears
a)	Timing gears shall be of the wide faced spur or helical type, hardened & ground to DIN Class V or better accuracy.
b)	Bearings shall be of anti-friction type only. The bidder shall provide the countermeasure for the fretting corrosion on the fitting surface of the thrust disc and separated outer race of anti-friction bearings.
c)	Lubrication is required for Timing gear pair and bearings.
4.	Intake Air Filter Silencers:
a)	Each blower shall be provided with an inlet filter silencer of dry type and a conical shaped screen ahead of the filter. Filters shall be capable of removing minimum 82 Percent of all particles 10 microns and larger. Suitable filter area shall be provided for air suction. The suction area shall be minimum of twice the inlet pipe area. Differential pressure gauges shall be provided in filters to monitor any clogging in filters. Silencers shall be provided in discharge also.
5.	Expansion Joints:
a)	Expansion Joints shall be provided at the discharge of each blower
6.	Safety Valves:
a)	Each blower shall be provided with a safety relief valve on its discharge.
b)	The valve, valve operator and controller shall be remotely mounted to prevent vibration damage. The valve shall be mounted in an easily accessible location to allow for maintenance and testing
c)	The safety valve discharge piping shall be routed to a location such that personal exposure to the discharge is prevented.



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7.	Piping and Valves:
a)	All interconnecting piping whichever is necessary for operation of each unit shall be provided complete with shut off valves, check valves, strainers and fittings. Details of Oxidation blower piping : diameter=450mm, Material: A53-B, Thickness: Sch -20
b)	Details of valves are given below: i) BUTTERFLY VALVE Rating: CL 150, Body: A216WCB, Trim:13CR, Lining: EPDM, Connection: WAFER, Operation: Electrically operated with hand wheel integral starter type(non-intrusive with SIL2). ii)CHECK VALVE: Rating: CL 150, Body:A395, Trim: 13CR, connection: RF Type: BC,SWING. iii)GATE VALVE: Rating: CL 150, Body: A105, Trim:13CR, Lining: Seat STL, Connection: SW, Operation: Hand wheel, Bonnet: BB,OS&Y
8.	Blower control:
a)	Each blower shall be furnished with required instrumentation and electrical accessory devices mounted and connected in a control cabinet.
b)	Provisions shall be made for the interface between the local cabinet and the DCS such that the operation of the forced oxidation system can be controlled from the control console in the FGD Control room
9.	Blower Shut Down:
a)	Following is a typical list of abnormal conditions which might require blower shut down/Alarm. The contractor shall propose the exact conditions which require shutdown/alarm Blower shutdown signals: a) Discharge air temperature high b) Discharge pressure low or high. Temperature transmitter for initiating Shutdown of blower during when "Discharge air temperature high" shall be supplied by BHEL. Pressure Switch for initiating Shutdown of blower during when "Discharge pressure low or high" shall be supplied by Bidder.
b)	In addition to the Instrumentation & Control devices, sensing conditions which require shut down an emergency stop push button shall be provided. The push button shall be wired to the terminal blocks in the control cabinet for external connection to the blower controller.
c)	Provision shall be made to shut off the blower automatically should the level of lubricating oil falls below the design value. Suitable provision shall be made to take the signal to PLC / DCS



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	system. In case of water cooling, the blower shall be shut off automatically whenever the pressure of the cooling water supply line falls below preset value.
10.	PROVISSION FOR VIBRATION MONITERING:
i.	Provision for vibration sensor, key phase sensor shall be provided. There shall be provided for X axis & Y axis vibration measurement in bearing housing. Provision shall be in line AP1670, 15 th editions .Provision shall be covered suitably.
11	INSTRUMENTS AND ACTUATORS:
	All instruments & actuators shall be connected to DDCMIS through fieldbus i.e. FOUNDATION Fieldbus/PROFIBUS PA protocol complying to IEC 61158. All electric actuators shall be with integral starters (non-intrusive with SIL2 certification).

7.0 GENERAL REQUIREMENTS:

S.No	Description
1.	Metric unit shall be used in the drawings and in the any displays on the equipment's. Special attention should be taken that the unit of pressure shall be in dual scales of kPa and kg/cm ² G. For instance the pressure gauges should have dual units indication.
2.	Descriptions in the drawings, in the documents, and in the displays shall be in English
3.	All rotating parts such as coupling shall be covered with suitable protective guards. Guards shall be easily removable type.
4.	The equipment shall be designed to withstand the corrosive and moist environment in which these are proposed to operate.
5.	Noise level produced shall not exceed 85 dB measured at a distance of 1.0 meters from the source in any direction and 1.5m above operating floor. Predicted sound pressure levels for the blower drive assemblies shall be submitted as part of the proposal data. The Acoustic enclose should be suitably designed to meet the required Noise Level.
6.	The overall vibration level shall be as per ISO 10816.
7.	Suitable drain connections shall be provided.
8.	The equipment shall be suitable for stable operation continuously.
9.	Limit of connection: The buyer (BHEL) has an intention to minimize interface for utilities as much as possible. The bidder shall consider this requirement in the planning stage of layout for the equipment. The bidder shall provide the header piping for utilities and branch piping to each nozzle. Terminal points for all utilities shall be located at skid edge. The bidder shall specify all terminal points with tie-in number in the P&ID and submit it in the proposal to confirm the scope of supply.



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S.No	Description
10.	Service life: Entire equipment except wearing parts shall be designed and fabricated for a minimum service life of 30 years of operation or 200,000 full load operating hours whichever is longer.
11.	Corrosion allowance: Corrosion allowance for entire equipment shall be in accordance with latest applicable international standard.
12.	Unless otherwise specified , flanges shall be in accordance with ANSI B16.5 Class 150
13.	Name plate: All equipment shall be provided with nameplates indicating the item number and service name. Name plates shall be of 304 Stainless steel plate and placed at a readily visible location. Nameplate of main equipment shall have enough information, which will be confirmed during engineering phase. Stainless steel nameplates for all instruments and valves shall be provided.
14.	Rotation arrows shall be cast in or attached with stainless steel plate on each item of rotation equipment at a readily visible location.
15.	Unless otherwise specified, all equipment items where the weight exceeds 15 kg shall be provided with suitable lifting lugs, ears or ring bolts or tapped holes for lifting rings. Minimum shock factor for lifting lugs shall be minimum 2.0. The position of lifting lugs and reference dimension shall be shown on GA and/or outline drawings. NDT shall be conducted for lifting lugs. When any spreader bars are required for lifting and laydown, the bidder shall provide spreader bar with equipment.
16.	Skid Mount/Transportation: Equipment shall be fabricated as skid mount design as much as practical to minimize erection at the site.
17.	Two pieces of stainless steel earth lugs shall be provided with equipment diagonally. The position of earth lugs shall be shown on each GA and/or outline drawing.
18.	Provide double nuts for anchor bolts
19.	Bidder shall provide allowable vibration level on foundation in foundation drawings and/or general arrangement drawings.
20.	If the driver/driven equipment train is in the resonance condition or any vibration problems occur, the bidder shall solve the problems in a timely manner.
21.	The bidder shall have full responsibility for vibration control of the equipment train at the site and the unit's satisfactory performance, even if the foundation and drivers are provided by the BHEL.
22.	Bidder shall provide the mating flanges with the necessary gaskets.
23.	All the surfaces of the carbon steel should be rust prevented before shipment for the period of at least 12 months for storage and construction.
24.	Bidder to provide capacity of crane or hoist required for material handling and the details of heaviest component to be handled.
25.	The list of all Bought out items with makes and country of origin to be mentioned along with offer to be submitted.



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S.No	Description
26.	Quality Plan to be submitted along with the offer.
27.	During entire period of the equipment / project erection, commissioning & operation, the bidders shall strictly follow and adhere to the guidelines for effective Health & Safety Management. Supply of safety gears/PPE for bidder's/bidder's sub vendor personnel deputed at site for Supervision of E&C, PG tests etc. shall be in bidder's scope.
28.	Cost towards the participation in discussions/meetings, providing technical assistance during technical discussions/meetings with customer for approval of drawing/documents etc. TA/DA, boarding and lodging to attend these meetings shall be borne by the bidder and shall be inclusive in supply portion.
29.	Material of construction for all equipment/components shall be subject to BHEL/NTPC approval during detail engineering. Accordingly bidder shall consider MOC for all equipment/component as per best engineering practice, global standard and global references.
30.	Bidder to provide sub vendor list and Bidder shall strictly adhere to BHEL/NTPC approved vendor list.
31.	It shall be the complete responsibility of the successful bidders to obtain "Sub Vendor Approval" from NTPC for all equipments & components. Any delay in sub vendor's approval should not affect the project schedule. If any of the sub vendors does not have the approval of NTPC, the same may be replaced with another NTPC approved sub-vendor only, without any price implications to BHEL.
32.	The modalities of inspection (Stage, Final, In-process) shall be finalized during detail engineering after submission of quality assurance plan (QAP). It shall be reviewed by the NTPC and BHEL. Bidder shall follow the procedures of inspection as per the approved QAP. Bidder has to submit the following documents along with inspection call and if any other documents required as per approved QAP. - Raw material inspection certificate - Internal test reports - Statutory certificates as required. - All inspection & testing shall be carried out based on the following documents: a. Relevant Standards b. Specifications c. Approved drawings d. Data Sheets e. Calibration certificate for all the measuring instruments f. Bidder should also coordinate in getting the MDCC's (Material Dispatch clearance certificate) and all types of IC's (Inspection Certificates) from the customer/customer's consultant along with BHEL.



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S.No	Description
33.	Minor Chipping i.e. up to 50 mm thk, micro leveling and providing shim plates for erection of equipment / item at site shall be in the scope of bidder.
34.	During detail engineering, bidder to strictly adhere to BHEL/ NTPC drawing formats, document numbering, quality plan & FQP formats.
35.	The identification and numbering of equipment, systems, items, etc. of supply, as well as of all documents and drawings shall be in accordance with the VGB guideline RDS-PP (Reference Designation System for Power Plants - KKS system).
36.	Complete detail engineering drawings, calculations, selection of components etc. shall be reviewed & subject to approval of BHEL/NTPC during detail engineering
37.	Bidder shall furnish necessary inputs & drawings of all equipment in editable Auto CAD/ MS-Word /Excel format.
38.	During detail engineering, successful bidder shall ensure flow of drawings/documents as per schedule. Any comments from BHEL/NTPC should be addressed timely by the bidder.
39.	Bidder to note that list above is not exhaustive and any work /items required for completing the smooth operation and ensuring satisfactory running of the machines till final hand over to the end user shall also be in the scope of the bidder.
40.	Bidder shall submit the signed and stamped copy of all the pages which constitutes this technical enquiry specification signed by authorized signatory and clearly mentioning each clause under following two categories to avoid any ambiguity in scope understanding & the scope division along with technical offer. a. "Accepted without deviation and considered in scope of work" b. "Not considered in scope of work"
8.0	PACKING INSTRUCTIONS
1.	Proper packing to be ensured. Indigenous Supply: Oxidation Blower & sub system assembly shall be wrapped in polythene bags & packed in a strong rigid wooden crate. Rain water should not enter into the Oxidation Blower internals during storage in the outer yard of power plant. Imported Supply: All imported supply should be packed as per Sea worthy packing standards Annexure - VII. All imported items should have Sea worthy packing. Liberal packing materials and struts shall be provided to arrest rolling and to protect from transit damages.
2.	Equipment and process materials shall be packed and semi-knocked down, to the extent possible, to facilitate handling and storage and to protect bearings and other machine surfaces from oxidation. Each container, box, crate or bundle shall be reinforced with steel strapping in such a manner that breaking of one strap will not cause complete failure of packaging. The packing shall be of best standard to withstand rough handling and to provide suitable protection from tropical weather while in transit and while awaiting erection at the site.
3.	Equipment and materials in wooden cases or crates shall be properly cushioned to withstand the abuse of handling, transportation and storage. Packing shall include preservatives suitable to tropical conditions. All machine surfaces and bearings shall be coated with oxidation



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	preventive compounds. All parts subject to damage when in contact with water shall be coated with suitable grease and wrapped in heavy asphalt or tar impregnated paper.
4.	Crates and packing material used for shipping will become the property of owner.(NTPC)
5.	Packaging or shipping units shall be designed within the limitations of the unloading facilities of the receiving ports and the ship will be used. It shall be the bidder's responsibility to investigate these limitations and to provide suitable packaging and shipping to permit transportation to site.
6.	Packing (tare) shall be part of the equipment cost and shall not be subject to return. The packing should ensure integrity and cohesiveness of each delivery batch of equipment during transportation. In case of equipment assemblies and unit's delivery in the packing of glass, plastics or paper the specification of packing with the material and weight characteristics are to be indicated.
7.	Each package should have the following inscriptions and signs stenciled with an indelible ink legibly and clearly: a. Destination b. Package Number c. Gross and Net Weight d. Dimensions e. Lifting places f. Handling marks and the following delivery marking
8.	Each package or shipping units shall be clearly marked or stenciled on at least two sides as follows. NORTH KARANPURA TPP, 3 X 660 MW, NATIONAL THERMAL POWER CORPORATION, CHATRA DISTRICT, JHARKHAND, INDIA EPC CONTRACTOR: BHARAT HEAVY ELECTRICALS LIMITED, INDIA In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.
9.	Each part of the equipment which is to be shipped as a separate piece or smaller parts packed within the same case shall be legibly marked to show the unit of which it is part, and match marked to show its relative position in the unit, to facilitate assembly in the field. Unit marks and match marks shall be made with steel stamps and with paint.
10.	Each case shall contain a packing list showing the detailed contents of the package. When any technical documents are supplied together with the shipment of materials no single package shall contain more than one set of such documents. Shipping papers shall clearly indicate in which packages the technical documents are contained.



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11.	The case number shall be written in the form of a fraction, the numerator of which is the serial number of the case and the denominator the total number of case in which a complete unit of equipment is packed.
12.	Wherever necessary besides usual inscriptions the cases shall bear special indication such as "Top", "Do not turn over", "Care", "Keep Dry" etc. as well as indication of the center of gravity (with red vertical lines) and places for attaching slings (with chain marks)
13.	Marking for Safe handling: To ensure safe handling, packing case shall be marked to show the following: a. Upright position b. Sling position and center of Gravity position c. Storage category d. Fragile components (to be marked properly with a clear warning for safe handling)
14.	Each crate or package is to contain a packing list in a waterproof envelope. All items are to be clearly marked for easy identification against the packing List. All cases, packages etc. are to be clearly marked on the outside to indicate the total weight where the weight is bearing and the correct position of the slings are to bear an identification mark relating them to the appropriate shipping documents. All stencil marks on the outside of cases are either to be made in waterproof material or protected by shellac or varnish to prevent obliteration in transit.
15.	The packing slip shall contain the following information: - Customer name, Name of the equipment, Purchase Order number with Date, Address of the delivery site, Name and Address of the Sender, Serial Number of Blower & accessories, BHEL item Code, Gross Weight and Net weight of Supplied items.
16.	Prior to transport from manufacturer's work to destination, components of the unit shall be completely cleaned to remove any foreign particles. Flange faces and other machined surfaces shall be protected by an easily removable rust preventive coating followed by suitable wrapping.
17.	All necessary painting, corrosion protection & preservation measures shall be taken as specified in painting schedule. Supplier shall consider the coastal environment zone which is defined as "very severe" during final finishing/shipping.
18.	Successful bidder shall furnish the detail packing /shipment box details with information like packing box size, type of packing, weight of each consignment, sequence no. of dispatch, no. of consignment for each deliverable item against each billing break up units/ billable blocks. Without these details the BBU shall not be approved during detail engineering. Also, complete billing break-up with above mentioned details shall be submitted within 10days of LOI.
19.	All items/equipment shall be dispatched in properly packed condition (i.e. no item shall be dispatched in loose condition such that it becomes difficult to store/identify its location at site at a later stage).



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S.No	Description
20.	Cases which cannot be marked as above shall have metal tags with the necessary markings on them. The metal tags shall be securely attached to the packages with strong steel binding wire. Each piece, Skid, Case or package shipped separately shall be labelled or tagged properly.
9.0	SUPERVISION OF ERECTION, TESTING AND COMMISSIONING
1.	The erection of Oxidation Blower will be done by owner as per Erection Manual and check List. However, the bidder shall make one visit per boiler for the supervision of erection, pre-commissioning & post-commissioning check-up, start-up, testing and trial runs of all the items covered under the scope of supply.
2.	There will be one visit per FGD and totally there will be three visits for three FGDs. The bidder will be informed well in advance for the visit. Bidder shall include 6 working days per visit in the offer with minimum 3 visits.
3.	TA/DA, boarding and lodging shall be borne by the bidder and shall be inclusive in supply portion.
10.0	EXCLUSION
	The following work associated with the air blower will be by others: a. Supply of main drive HT motor b. Civil foundations c. Walkways, platforms and ladders d. Element handling hoists
11.0	INSPECTION AND TESTING
	The General inspection requirements to be considered are as below:
1.	Bidder shall furnish written copies of shop production, fabrication and quality test procedures and drawings to be used on the Blowers for review by BHEL/NTPC prior to manufacture.
2.	The Bidder shall furnish performance test procedure along with standard. The test procedure will be reviewed and approved by the BHEL/NTPC.
3.	Out of 6 Oxidation Blower, 1 No will be inspected at the Bidder's works before dispatch or where the test facilities are available. However, the quantum of check may vary as per approved quality plan.
4.	The Bidder shall conduct performance test for the remaining blowers and submit the reports.
5.	Final inspection and release by BHEL / NTPC is a mandatory requirement unless specially waived.
6.	A dynamic balancing certificate stating that the rotating assembly has been balanced dynamically shall be sent to BHEL/NTPC within one (1) week of the successful completion of



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	balancing.
7.	Acceptance tolerance of actual versus guaranteed performance for capacity, Static head, efficiency and power absorbed shall be as per applicable standard.
8.	Vibration levels shall be measured during shop running/performance tests.
9.	Contract shaft seals shall be used during shop tests, unless the seal design is unsuitable for the shop-test condition.
10.	Blower shall not be released for shipment, until shop tests data and performance tests curves have been approved by Owner.
11.	Bidder should furnish performance guarantee as per applicable standard guarantee for the design, manufacture, material and safe operation of the equipment's.
12.	BHEL/NTPC shall witness the test at Bidder's works and a notice of minimum three (3) weeks shall be given for attending the inspection.
13.	Bidder shall arrange all calibrated gauges, Instruments during inspection.
14.	Mechanical running and the performance test shall be carried out. Bidder shall arrange Motor for the shop test and inspection.
15.	The performance test may be carried out using air at shop and shall be converted to the design condition.
16.	Inspection and testing will be done as per NTPC approved Quality Plan. In case of order placed on foreign Vendor, Vendor shall engage and appoint at their cost of any reputed Third Party Inspection Agencies having international presence for carrying out inspection of equipment's and material at vendor's & sub vendors works. Sample QP(indicative) is attached herewith for reference, however any change during final approval shall be acceptable to vendor.
12.0	PAINTING
1.	Surface Preparation : Blast Cleaning SA 2.5
2.	PRIMER COAT: Red Oxide Zinc Phosphate Primer to IS: 12744 (Two coats) DFT 60 μm min FINISH COAT: Synthetic Enamel to IS 2932 Shade: Grey white RAL 9002 (Two coats) DFT 60 μm min Total DFT : 120 μm min



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S.No	Description
	The above painting is just a tentative schedule. Painting details will be informed during contract stage. a. Base: To be informed during contract stage b. Lettering: To be informed during contract stage
3.	Rust preventive paint after inspection at shop floor before dispatch shall be in bidder's scope
4.	Corrosion protection, coating and galvanizing, painting shall be taken care by the bidder. Bidder shall submit the painting scheme during detail Engg in line with the specification and shall be subject to approval of BHEL / NTPC.
13.0	SPARES, TOOLS & TACKLES
13.1	START UP & COMMISSIONING SPARES
	Start-up & Commissioning Spares shall be part of the main supply of Oxidation blowers. Start-up & commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares required for successful operation till commissioning of Oxidation blowers shall come under this category. Bidder shall provide an adequate stock of such start up and commissioning spares to be brought by him to the site for the equipment erection and commissioning. The spares must be available at site before the equipment's are energized. These start-up & commissioning spare part list shall not be included in "Initial Spare Parts List".
13.2	INITIAL SPARE PARTS (MANDATORY SPARES):
	Bidder to quote for below mentioned mandatory spares with break up price: a. Bearings - 3 nos. of each type b. Impeller assembly – 2 nos. Bidder shall quote for the "Initial Spares Part List", and it will be considered for L1 evaluation. Initial spare parts items shall be handed over separately and shall not be mixed with the supply of the main equipment parts. Spares shall be sent in pre-decided lots in containers/secure boxes. All boxes/containers are to be distinctly marked in red color with boldly written "S" mark on each face of the containers. Spares shall not be dispatched before dispatch of corresponding main equipment's. Each item shall be labelled in English and be packed against damage and sealed to prevent deterioration from corrosion. The protection shall be sufficient for a minimum of 10 years' storage in a dry weatherproof building. All spares supplied under this contract shall be strictly inter-changeable with the parts for which they are intended for replacements. All the Initial spares shall be manufactures along with the main equipment components as a continuous operation as per same specification and quality plan. Any special tools & tackles required for the entire equipment to disassemble, assemble or maintain the units, they shall be included in the quotation and furnished as part of the initial supply of the machine. List of special tools & tackles shall be decided by bidder as per his proven practice. When special tools are provided, they shall be packaged in separate, boxes with lugs and marked as "Special Tools for (tag / item number)." Each tool shall be stamped or tagged to indicate its intended usage. Levers and eye bolts for the removal of parts to be serviced shall be submitted with special tools.



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13.3	RECOMMENDED SPARES
	Bidders shall also furnish the Final Spares Part List (i.e. recommended spares list) along with the offer required for 3 years of normal operation of the plant and should be independent of the list of the mandatory spares. Prices of recommended spares will not be used for evaluation of the bids. The price of these spares will remain valid up to 6 months after placement of Notification of Award for the main equipment.
13.4	SPECIAL TOOLS & TACKLES:
	Any special tools & tackles required for the entire equipment to disassemble, assemble or maintain the units, they shall be included in the quotation and furnished as part of the initial supply of the machine. List of special tools & tackles shall be decided by bidder as per his proven practice. When special tools are provided, they shall be packaged in separate, boxes with lugs and marked as "Special Tools for (tag / item number)." Each tool shall be stamped or tagged to indicate its intended usage. Levers and eye bolts for the removal of parts to be serviced shall be submitted with special tools.
14.0	PERFORMANCE GUARANTEE
	All performance tests for blowers shall be carried out in accordance with any latest international codes/standards. 1) Bidder shall furnish Performance guarantee for the design, manufacture, material, safe and trouble-free operation of the Oxidation Blower and its accessories 2) Capacity and head of the blower to be guaranteed. 3) The bidder shall guarantee 98% availability of equipment for a continues period of 120 days 4) The Bidder shall ensure a design of the equipment to achieve an average target availability of 90%. 5) Noise level-≤ 85 dB (A) at 1m horizontal distance from equipment/enclosures and 1.5m above operating floor is to be guaranteed. 6) Vibration levels measured on the non-rotating parts shall not exceed the zone limit "B" as defined in ISO 10816 at steady conditions and shall not exceed the zone limit "C" as defined in ISO 10816 at transient conditions. 7) Acceptance tests to be carried out as per the procedure defined by the bidder which shall be submitted for NTPC's approval. 8) In the event that the performance test is unsuccessful in meeting performance guarantees, bidder shall take necessary remedial action at his cost and the performance test shall be repeated.
15.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION:
1.	POWER GUARANTEE Bidder to specify the guaranteed Shaft power per blower operating at the duty point in their offer. Bidder has to meet the minimum efficiency as stipulated in clause no: 5.0 sl no:2.



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2.	BID EVALUATION CRITERIA FOR POWER CONSUMPTION: Power consumption quoted by bidder shall be limited to the ceiling value specified below. The Lowest of the power consumption quoted by any qualified bidder shall be taken as the base or ceiling value. Bid prices of other bidders will be loaded for every KW excess over the ceiling value as per the formula given below. In case, Guaranteed Shaft power offered by the bidder exceeds the ceiling value specified above, his bid price will be loaded for excess power consumption as per the formula given below. Adjustment factor for excess power consumption in USD = (GPC-CV) X PL X 3 No's of Working Blowers GPC- Guaranteed Power Consumption quoted by bidder in KW CV- Lowest of the power consumption quoted by any bidder PL- Power Loading @ 2230 USD/KW Exchange rate as applicable on bid opening date will be considered. No Price advantage apart from NIL Power Loading will be given if Guaranteed Power consumption offered is less than the ceiling value.
16.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
1.	If actual Power Consumption during prove out (or) PG Test measured at motor input terminals operating at the duty point exceeds the value guaranteed by the bidder., liquidated damages for shortfall in performance shall be deducted from contract price as per the formula given below Liquidated damage deductible in USD = (GPC-APC) X P X 3 No's of Working Blowers - GPC- Guaranteed Power Consumption quoted by bidder in KW - APC- Actual Power Consumption in KW - P- Penalty @ 3275 USD/ KW
2.	Minimum Acceptance Level: 120% of Functional Guarantee Value. NTPC/BHEL reserves the right to reject the equipment if actual power consumption exceeds the minimum acceptance level.
17.0	WARRANTY
1.	The warranty period shall be 24 months from the date of supply or 18 months from the date of commissioning whichever is earlier. Provided that the successful bidder shall extend the provisions of this warranty to cover all repaired and replacement parts furnished under the warranty obligations hereunder, subject to the warranty period for the same being for a period of 24 months from the date on which replacement or renewal work is completed.
2.	In case of failure of the equipment to meet the guarantee, NTPC/BHEL reserves the right to reject the equipment. However, NTPC/BHEL reserves the right to use the equipment



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S.No	Description
	until new equipment supplied by bidder meets the guaranteed requirement .
18.0	FIRST FILL OF CONSUMABLES:
1.	Bidder's scope shall also include supply and filling of all chemicals, reagents, resins, lubricants, grease, filters and consumable items for operation up to COD including top up requirements at the time of issuance of PAC/declaration of COD. All lubricants proposed for the plant operation shall be suitable for all operating and environmental conditions that will be met on site consistent with good maintenance procedures as instructed in the maintenance manuals.
2.	Detailed specifications for the lubricating oil, grease, gases, servo fluids, control fluids, chemicals including items qualities and quantities required per month of the plant operation for the NTPC/BHEL's approval herein shall be furnished eighteen (18) months prior scheduled COD of the 1 st unit. On completion of erection complete list of bearings/equipment giving their location and identification marks shall be furnished to NTPC along with lubrication requirements. All types of chemicals, consumables, lubricants and grease shall be readily obtainable locally and the number of different types shall be kept to a minimum. For each type and grade of lubricant recommended, bidder shall list at least three equivalent lubricants manufactured by alternative companies.
19.0	TRAINING
	Successful bidder shall provide comprehensive training for NTPC Engineering, O&M, Erection & Commissioning staffs at site covering all aspects of the Oxidation blower- Operation & Maintenance, Troubleshooting etc.
20.0	CONFLICT
	Bidder's equipment shall be designed for and shall meet the service, performance and minimum level of quality requirements specified. Bidder shall be solely responsible for advising BHEL in writing of any conflicts between the specifications and Bidder's design, including performance and levels of quality. Bidder agrees that its obligations, liabilities and warranties shall not be diminished or extinguished due to its meeting the requirements of the Specification.
21.0	DOCUMENTATION
A	DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER
	The Bidder shall submit all documents, drawings, diagrams and all such information, which are necessary to fully understand the offer for techno – commercial evaluation. As a minimum requirement, document as per Annexure-VI: A shall be furnished to fully describe the scope of work and services offered. The Bidder shall also submit duly filled in Technical data sheets and guarantee schedule as per Annexure II and Annexure III respectively.



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S.No	Description
B	DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT
	The Successful bidder shall submit necessary data, documents and drawings for review, approval with requirements specified as per Annexure-VI: B. Drawings that are reviewed by the NTPC/BHEL will be returned to bidder with a transmittal letter with any comments and / or questions marked on the drawings or noted in the letter. All comments and questions must be resolved before a resubmission of drawings / documents. If the design has not developed enough to resolve some of the comments or questions, bidder shall place a “hold” on those items or areas of design. NTPC / BHEL reserves the right to return drawings unprocessed to bidder if there exists any evidence that bidder has not acknowledged all comments and questions. All necessary GA drawings, sections, sub-assembly drawings, specifications of main and sub components and necessary set of operation & maintenance manual as asked by NTPC must be furnished by bidder in soft and hard copy forms. For all documents softcopy format shall be searchable pdf, however in addition all drawings, diagrams like P&IDS shall be supplied in ACAD or other editable format and all lists in Excel format. Further break up of technical documents will be discussed during finalization of the purchase contract. Unless agreed otherwise, ten (10) hard copies and five (05) sets of electronic copies of all documents are to be submitted in the English language. Electronic Copies shall be submitted in primary original data format (e.g. DOC, XLS, DWG) as well as in a printable non-proprietary document format (e.g. PDF). Especially P&IDs shall be submitted as DWG files and PDF files. Bidder to ensure submission of hard copies as per NTPC’s requirement for all engineering drg/doc and for all subsequent revisions along with a soft copy through email to concerned project team. However all the engineering related information shall be furnished in soft form to BHEL.



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22.0 ANNEXURES

ANNEXURE –I QUALIFICATION REQUIREMENT.

The Bidders are required to meet the Qualification Requirement (QR) for Oxidation Blowers as per criteria stipulated below.



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ANNEXURE –II- TECHNICAL DATA SHEET

Sl. No	Description	Data
1.0	GENERAL	
	a. Client	: BHEL-Ranipet
	b. Project	: North karanpura (3X660 MW)
	c. Ultimate Customer	: NTPC
	d. Location	: Hazaribagh & chata district Jharkand, India
	e. Service	: Continuous
	f. Installation	: In-door
	g. No of Blowers for each unit	: 1 Working + 1 Standby
	h. Total number of Blowers	: Unit-1 - 2 No's Unit-2 - 2 No's Unit-3- 2 No's
2.0	MANUFACTURER DETAILS	
	a. Model	:
	b. Type	: Single stage centrifugal with integral gearbox
	c. Type of Driver	: As per specification
	d. Area classification	: Safe
	e. No of Stage	: Single(1)
3.0	OPERATING CONDITION	
	a. Gas composition % by weight / Mole percent	: Atmospheric air
	b. Solids at suction g/m ³	: As per ambient condition
	c. Relative humidity at suction %	: As per ambient condition
	d. Molecular weight	: As per ambient condition
	e. Specific weight at suction Kg/m ³	: As per ambient condition
	f. Capacity at suction Nm ³ / Hr	: 15000 Nm ³ /hr-Wet
	g. Suction pressure KPa	: Bidder to Provide
	h. Discharge pressure mmWc	: 8500 mmwc
	i. Differential Pressure	: Bidder to confirm
	j. Suction temperature Deg C	: Ambient
	k. Discharge temperature Deg C	: <100
4.0	PERFORMANCE DATA	
	a. Capacity Nm ³ /Hr	: Bidder to Provide
	b. Static efficiency %	: Bidder to Provide
	c. BKW Normal / Maximum KW	: Bidder to Provide
	d. BKW at minimum suction temperature KW	: Bidder to Provide
	e. Motor rating KW	: Bidder to Provide
	f. Motor Speed rpm	: Bidder to Provide
	g. Discharge pressure static (inclusive of losses) mmWc	: Bidder to Provide
	h. Differential pressure (inclusive of losses) mmWc	: Bidder to Provide



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	i. Speed Maximum/ Normal/Minimum	:	Bidder to Provide
	j. Noise level	:	Bidder to Provide
	k. Performance curve	:	Bidder to Provide
5.0	CONSTRUCTION DATA		
	a. Manufacturer	:	
	b. Model No.	:	Bidder to Provide
	c. Suction	:	Single
	d. Suction Rating / Size	:	Bidder to Provide
	e. Discharge Rating / Size	:	Bidder to Provide
	f. Type of rotor	:	Bidder to Provide
	g. Size of rotor Dia mm	:	Bidder to Provide
	h. Journal bearing: Type / Size:	:	Bidder to Provide
	i. Thrust bearing: Type / Size:	:	Bidder to Provide
	j. Bearing cooling required	:	Yes / No - Bidder to confirm
	k. Cooling water required	:	Bidder to confirm the quantity
	l. Type of drive	:	As per specification
	m. Shaft seal	:	Packing / Rubber seal
	n. Size / Code	:	Bidder to Provide
	o. Type of coupling	:	Bidder to Provide
	p. Service factor	:	Bidder to Provide
	q. GD ² at drive shaft end	:	Bidder to Provide
	r. Rotation viewed from coupling end	:	Clock wise / Counter clock wise
	s. Fluid Coupling	:	Yes / No - Bidder to confirm
	t. Fluid Coupling make	:	Bidder to Provide
	u. Fluid Coupling control	:	Bidder to Provide
	v. Suction filter	:	Required
	w. Degree of filtration	:	Bidder to Provide
	x. Base plate common to Blower. Inboard bearing housing and fluid coupling & Motor	:	Yes / No - Bidder to confirm
	y. Total weight kg	:	Bidder to Provide
	z. Maximum Erection weight kg	:	Bidder to Provide



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6.0	MATERIALS		
	a. Casing	:	Bidder to Provide
	b. Rotor	:	Bidder to Provide
	c. Shaft	:	Bidder to Provide
	d. Packing Seal	:	Bidder to Provide
	e. Suction filter elements/ housing	:	Bidder to Provide
	f. Base frame	:	Bidder to Provide

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----

BIDDER SIGN WITH SEAL AND DATE:



**TECHNICAL SPECIFICATION OF OXIDATION BLOWER -: NORTH KARANPURA
3x660MW**

NKP:FGD:AOB:R01

ANNEXURE III- SCHEDULE OF GUARANTEES

Sl. No	Description	Data
1.	Rated capacity of Blower Nm ³ /hr	:
2.	Total head at design capacity mmWc	:
3.	Guaranteed power consumption at rated capacity & head kW	:
4.	Noise level at a distance of 1.0 meter from the equipment at site and 1.5 m above operating floor dB(A)	:
5.	Maximum vibration (peak to peak amplitude at site) microns	:
6.	Equipment Availability (%)	:

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NAME -----

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ANNEXURE –IV- LIST OF DEVIATIONS/EXCEPTIONS TO THE ENQUIRY DOCUMENT

SI No	Clause No	Page No	Description of Deviation

Note: Enlarge the table to incorporate items

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NAME -----

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ANNEXURE – V

a) REFERENCE LIST as per format shown below.

S.No	Project Name , Customer & Plant capacity	Coal fired Yes/No	Wet Limestone Based FGD Yes/No	Model	Capacity Nm ³ /hr.	Head mmWc	Speed rpm	Year of Commg	Qty

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NAME -----

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ANNEXURE -VI

A) DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER:

Sl. No.	Description	No of copies With proposal
1.	Signed compliance to specification	1
2.	Quality function requirement (Annexure-I & attachment 3K)	1
3.	Data Sheet-(Annexure-II)	1
4.	Schedule of Guarantee (Annexure-III)	1
5.	Deviation List (Annexure-IV)	1
6.	Anchor Plan & Civil foundation Loading details	1
7.	Performance curve i. Flow v/s Total pressure ii. Flow v/s efficiency iii. Flow v/s power consumption iv. Torque vs. speed curve for Motor selection	1
8.	Proforma Packing List	1
9.	Shortest Manufacturing Time	1
10.	Approximate weight of each skid	1
11.	Reference plant details	1
12.	Required Electric power & other Utility List	1
13.		1
14.	General Assembly Drawing	1
15.	Blower and Motor Sizing Calculation	1
16.	Cross-sectional Drawing	1
17.	Sub-Vendor List	1
18.	Scope of Supply	1
19.	Quality Plan	1
20.	Spare List (Mandatory, Recommended)	1
21.	Start-up & Commissioning Spares	1
22.	List of Special Tools	1
23.	Delivery Schedule	1
24.	Test Arrangement & Test procedure	1



TECHNICAL SPECIFICATION OF OXIDATION BLOWER -: NORTH KARANPURA 3x660MW

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25.	T-S curve	1
26.	Hoist/Crane requirement	1
27.	P & I Diagram	1
28.	Catalogue	1

B) DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT:

Sl. No.	Description	No of copies After award of contract	Delivery Time
1.	Sizing calculation for HT Motor	1	2 weeks after contract
2.	Utility Consumption	1	2 weeks after contract
3.	Foundation Data including Anchor plan	1	2 weeks after contract
4.	Performance curve i. Flow v/s Total pressure ii. Flow v/s efficiency iii. Flow v/s power consumption iv. Torque vs. speed curve for Motor selection	2	2 weeks after contract
5.	Assembly drawings of each equipment	1	1 month after contract
6.	Cross section detail drawing	1	1 month after contract
7.	Data Sheet	1	2 weeks after contract
8.	Lubricating oil list	1	2 months after contract
9.	Special tools list	1	2 months after contract
10.	Installation and assembly procedure	1	4 months after contract
11.	Inspection and Test Procedure	1	1 month after contract
12.	Inspection & Test record	1	In 2 weeks after test
13.	Inspection Certificate	1	In 2 weeks after test
14.	Sub vendors List	1	2 weeks after contract
15.	Manufacturing Schedule	1	2 weeks after contract
16.	Progress report	1	Every month
17.	Proforma Packing List	1	2 months prior to shipping
18.	Approximate weight of each skid	1	2 months after contract
19.	Required Electric power	2	2 weeks after contract



**TECHNICAL SPECIFICATION OF OXIDATION BLOWER -: NORTH KARANPURA
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Sl. No.	Description	No of copies After award of contract	Delivery Time
20.	Blower and Motor Sizing Calculation	1	2 weeks after contract
21.	Material Test Certificates	2	In 2 weeks after test
22.	Pre Commissioning Check List	2	4 months after contract
23.	Scope of Supply	2	2 weeks after contract
24.	Quality Plan	4	1 month after contract
25.	Operation and Maintenance Manual	• 10 hardcopies and 5 electronic copies in English • 1 hardcopy and 1 electronic copy	4 months after contract
26.	Spare List (Mandatory, Recommended)	1	1 month after contract
27.	Start-up & Commissioning Spares	2	1 month after contract
28.	List of Special Tools	1	1 month after contract
29.	Delivery Schedule	1	2 weeks after contract
30.	Test Arrangement & Test procedure	2	1 month after contract
31.	T-S curve	2	2 weeks after contract
32.	P & I Diagram	2	2 weeks after contract
33.	Catalogue	2	2 weeks after contract

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----



**TECHNICAL SPECIFICATION OF OXIDATION BLOWER -: NORTH KARANPURA
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ANNEXURE-VII

TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING (applicable for supplies from outside India)

Refer to Specification No: PE-TS-888-100-A001 for detailed specification on Seaworthy packing.

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NAME -----

DESIGNATION -----

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ANNEXURE-VIII

Refer to various clauses of inspection and Testing. Sample QP enclosed.

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ANNEXURE-IX

Refer to the NTPC instrument Specification enclosed

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NAME -----

DESIGNATION -----

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ANNEXURE-X

Reference P&ID drawing indicating the scope between BHEL and the vendor

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ANNEXURE XI- VENDOR TO PROVIDE THE LIST OF COMMISSIONING SPARES

Sl. No.	Description	Quantity
1.		
2.		
3.		
4.		
5.		

Qty will be Number or Set as applicable

- Vendor to identify each and every item which they consider as commissioning spares. Each and every part that is considered to fall under guarantee clause shall be indicated in this list.
- Rubber items which are having a **Shelf-Life** will also be considered as wear item.

SIGNATURE OF BIDDER -----

NAME -----

DESIGNATION -----

BIDDER SIGN WITH SEAL AND DATE: