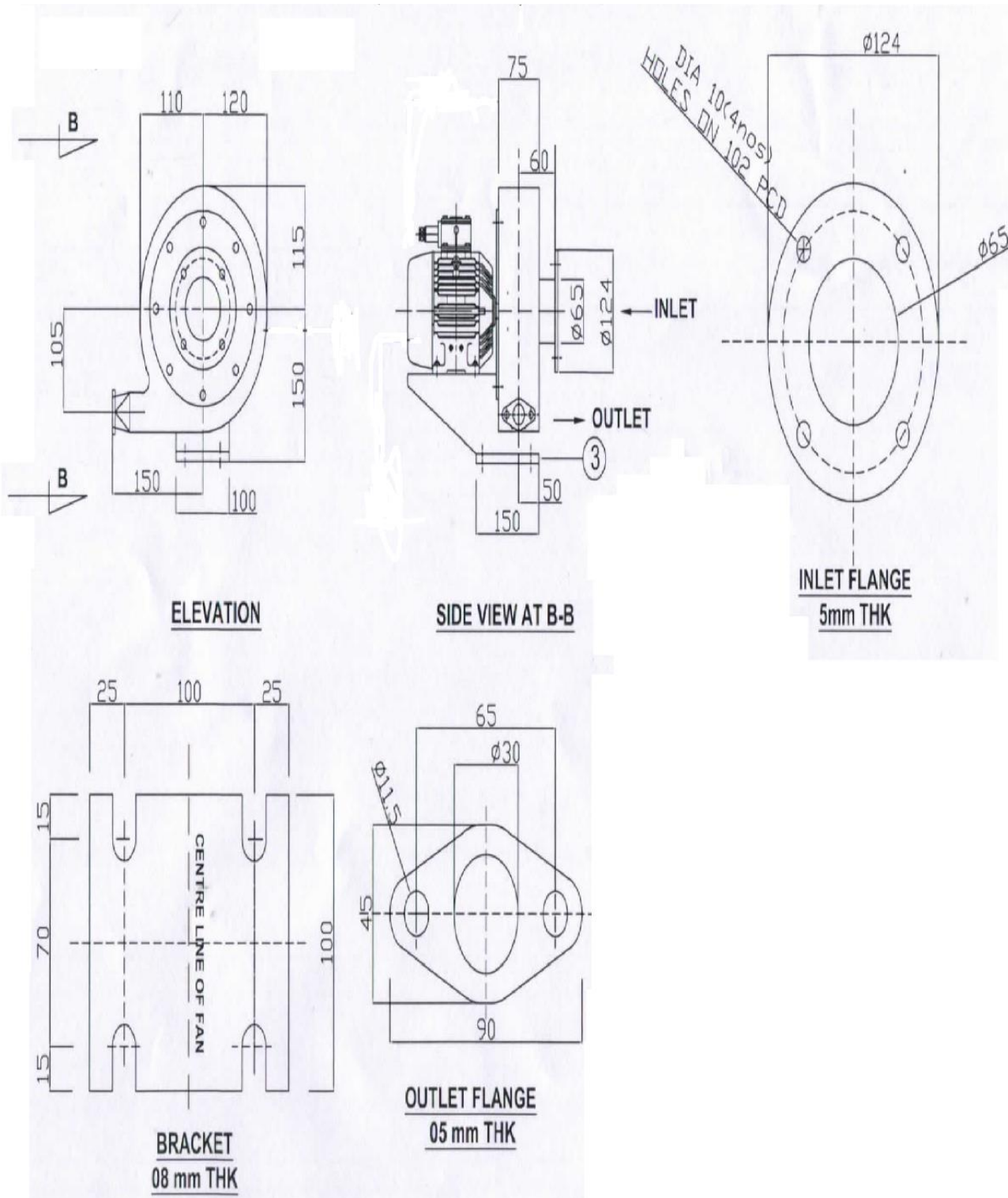


GA DRAWING TO MATCH DIMENSION FOR CONTROL FLUID VAPOR EXHAUSTER



PRE-QUALIFICATION REQUIREMENT
Lube Oil /Control Fluid Vapour Exhauster

DOCUMENT NO.
TL/OVE/PQR/20242721
Rev:00 Dt:13.12.24

Description:- Oil Vapor exhauster handles oil fumes generated during the running of the turbine. It shall also maintain a partial vacuum in the main oil tank and turbine bearing pedestal etc. The fumes to be handled by the exhauster contain free droplets of oil. Viscosity grade of the oil is ISO VG046.

Control fluid vapour exhauster is to handle the control fluid fumes generated during running of the turbine. It shall also maintain a partial vacuum in the tank. The fumes to be handled by the exhauster shall contain free droplets of control fluid.

The vapour exhauster/CF Vapor Exhauster used in system is complete assembly of Fan, motor, coupling, base plate and other accessories. The vapour exhauster/CF Vapor Exhauster should be of very reliable and proven design to maintain the required parameters to meet system requirements under all conditions.

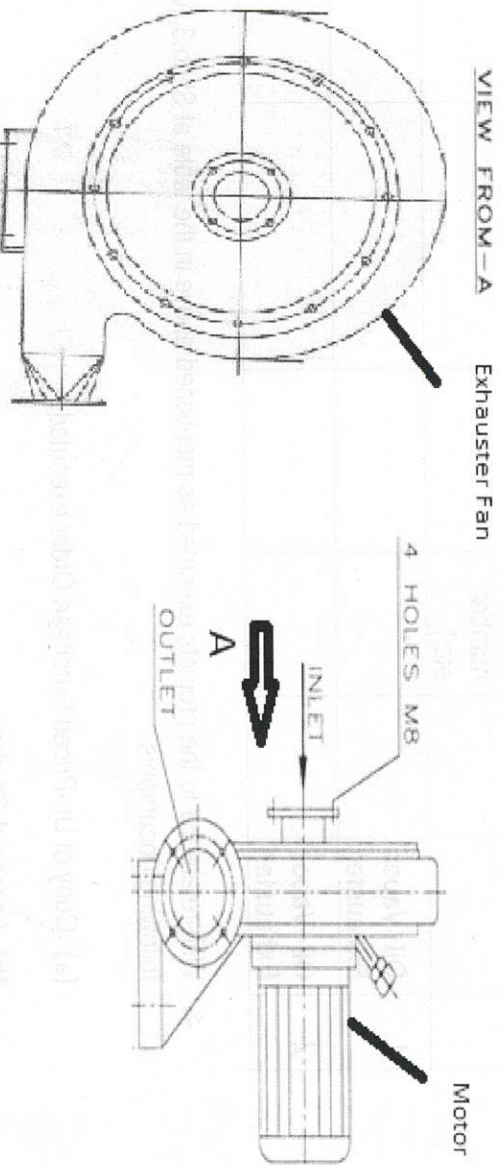


Figure 1

Acceptance Criteria:-

1. Vendor or its principal should have manufactured, tested and supplied at least 2 nos. Oil vapor exhausters Fan along with electric motor in last 10 years from the date of issuance of enquiry (i.e. P.O. on or after 01.12.2014) with minimum following details – Yes/No.

Sl No.	Medium	Parameter	Value Range
1.	Lube oil/Control Fluid	Continuous discharge capacity at operating point	0.05 to 0.20 m3/sec
2.		Nominal discharge pressure at operating point	Minimum 220 mmWC

Deptt	Worked By	Checked By	Approved By
STE	H Gupta	HSDOGRA	ANUJ JAIN
CIE	L K MISHRA	SATISH KUMAR	VINOD KUMAR



BHARAT HEAVY ELECTRICALS LIMITED, HARIDWAR

Steam Turbine Engineering- Turbine Layout

PRE-QUALIFICATION REQUIREMENT Lube Oil /Control Fluid Vapour Exhauster

DOCUMENT NO.
TL/OVE/PQR/20242721
Rev:00 Dt:13.12.24

2. Vendor (Main pump supplier) or Sub vendor (Motor supplier) should have commissioned the Exhauster Fan with AC motor (squirrel cage induction motor suitable for direct-on-line starting with continuous duty type (S1)) of 415V-AC, (+/-10%), 50Hz (+/-5%) & absolute sum variation 10% with starting current limited to 600% + (tolerances) as per IS: 12615-2011/ IEC 60034... **Yes/No.**

3. In support of Clause No.1, vendor shall furnish their credential list, as per the following format.

S. No.	Detail of Item supplied	Name & address of customer	Contact Details of the customer (email & phone number etc.)	Purchase order reference no. and issue date	Continuous discharge capacity (m3/sec)	Discharge pressure (mmWC)	Type & rating of motor used
1	Oil Vapor Exhauster						
2	Oil Vapor Exhauster						

4. With reference to the projects executed as mentioned above in the table at Sl.no.3, Vendor to furnish following documents:

- (a) Copy of Un-Priced Purchase Order executed.
- (b) Approved GA drg.
- (c) Unpriced dispatch documents e.g .LR, SRV, Invoice etc.
- (d) Motor data sheet, wiring diagram, motor characteristics curve and GA drawing.

Note - BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false / incorrect, the offer shall be rejected.

----End of PQR----

Deptt	Worked By	Checked By	Approved By
STE	H Gupta	HSDOGRA	ANUJ JAIN
CIE	L K MISHRA	SATISH KUMAR	VINOD KUMAR

MANUFACTURER'S NAME AND ADDRESS			STANDARD QUALITY PLAN				TO BE FILLED BY BHEL		TO BE FILLED BY BHEL			
BHEL	VENDOR'S NAME	ITEM	CONTROL FLUID VAPOUR EXHAUSTER		QP NO.	QA/BE/QP/350						
				DATED & REV	23.12.2024 01							
		DRG. NO.	AS PER PO									
		SPEC.	ST 39006									
		REV	AS PER PO			Page 1 of 3						
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									M	B	N	
1	2	3	4	5	6	7	8	9	D	10		11

1.0	RAW MATERIAL												
1.1	CASING, SHAFT, IMPELLER, BLADES & BASE PLATE, SLEEVE, O-RING, SEALS	CHEMICAL, MECHANICAL PROPERTIES & SIZE	MAJOR	TEST & MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	MTC	✓	P	V	-	NABL Lab TC
1.2	NUTS & BOLTS, LIFTING LUG & COUPLING	CHEMICAL, MECHANICAL PROPERTIES & SIZE	MAJOR	VISUAL	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	TC	✓	P	V	-	
1.3	AC INDUCTION MOTOR (Please specify make, degree of protection and rating)	ROUTINE & TYPE TESTS CERTIFICATE INCLUDING DEGREE OF PROTECTION AND EXPLOSION PROOFNESS	MAJOR	REVIEW	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	TC	✓	P	V	-	From BHEL Approved sources
2.0	INPROCESS INSPECTION												
2.1	ALL WELDS	QUALITY OF WELDS	MAJOR	DPT/MPT	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	TC	✓	P	V	-	NOTE:1
2.2	IMPELLER	DIMENSIONS AFTER MACHINING	MAJOR	MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	IR	-	P	-	-	
		DYNAMIC BALANCING OF ROTOR	MAJOR	MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	TC	✓	P	W	-	Ensure calibration of balancing machine
2.3	ASSEMBLY OF FAN	INTERNAL CLEARANCE BETWEEN IMPELLER & CASING	MAJOR	MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	IR	✓	P	V	-	
3.0 FINAL INSPECTION ON THE COMPLETE ASSEMBLY													
3.1		OVERALL DIMENSIONS	MAJOR	MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	TC	✓	P	W	-	

MANUFACTURER/ SUBCONTRACTOR		LEGEND:	FOR CUSTOMER USE	APPROVED BY
		RECORDS IDENTIFIED WITH '✓' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. IR: INSPECTION REPORT TC: TEST CERTIFICATE COC: CERTIFICATE OF CONFIRMANCE		
		M: MANUFACTURER / SUBCONTRACTOR B: BHEL / NOM. INSPECTION AGENCY N: CUSTOMER INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION		
		ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER		

MANUFACTURER'S NAME AND ADDRESS			STANDARD QUALITY PLAN				TO BE FILLED BY BHEL		TO BE FILLED BY BHEL				
BHEL	VENDOR'S NAME	ITEM	CONTROL FLUID VAPOUR EXHAUSTER		QP NO.	QA/BE/QP/350							
					DATED & REV	23.12.2024 01							
		DRG. NO.		AS PER PO									
		SPEC.		ST 39006									
		REV		AS PER PO		Page 2 of 3							
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS		CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY		REMARKS
										M	B	N	
1	2	3		4	5	6	7	8	9	D	10		11

3.2		ONLINE GREASING FACILITY FOR MOTOR	MAJOR	VISUAL	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	TC	✓	P	W		
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3.3		SEALS AS PER CLAUSE 5.5 OF SPEC ST39006	Major	Visual	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	TC	✓	P	W		
3.4		PERFORMANCE (INCLUDING DISCHARGE V/S PRESSURE & POWER CONSUMPTION, EFFICIENCY) & STRIP TEST	MAJOR	PERFORMANCE	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	TC	✓	P	W	-	
3.5		FAN SPEED AT 80% OF RATED VOLTAGE	MAJOR	ELECTRICAL	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	TC	✓	P	W	-	
3.6		FAN SPEED, SMOOTH RUNNING, DIRECTION OF ROTATION	MAJOR	VISUAL	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	IR	✓	P	W	-	
3.7		NOISE LEVEL	MAJOR	MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	IR	✓	P	W	-	
3.8		VIBRATION	MAJOR	MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	IR	✓	P	W	-	
3.9		CLEANING, PRESERVATION, PACKING & PAINTING INCLUDING PAINT THICKNESS (DFT)	MAJOR	VISUAL & MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	IR/TC		P	-	-	
3.10		COMPLIANCE OF TECHNICAL REQUIREMENTS & COMPLETION OF DOCUMENTS	MAJOR	--	100%	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	COC		P	V	-	

		<p>LEGEND: RECORDS IDENTIFIED WITH '✓' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. IR: INSPECTION REPORT TC: TEST CERTIFICATE COC: CERTIFICATE OF CONFIRMANCE M: MANUFACTURER / SUBCONTRACTOR B: BHEL / NOM. INSPECTION AGENCY N: CUSTOMER INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION</p>	FOR CUSTOMER USE	
MANUFACTURER/ SUBCONTRACTOR		<p>ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER</p>		APPROVED BY

MANUFACTURER'S NAME AND ADDRESS			STANDARD QUALITY PLAN				TO BE FILLED BY BHEL		TO BE FILLED BY BHEL			
BHEL	VENDOR'S NAME	ITEM	CONTROL FLUID VAPOUR EXHAUSTER		QP NO.	QA/BE/QP/350						
				DATED & REV	23.12.2024 01							
		DRG. NO.	AS PER PO									
		SPEC.	ST 39006									
		REV	AS PER PO			Page 3 of 3						
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									M	B	N	
1	2	3	4	5	6	7	8	9	D	10		11

4.0	PACKING												
4.1		SOUNDNESS OF PACKING AGAINST TRANSIT DAMAGE	MAJOR	PHYSICAL	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	INTERNAL RECORDS		P	-	-	

NOTE 1: WELDING TO BE DONE BY QUALIFIED WELDER AS PER ASME IX WPS AND PQR TO BE CHECKED BY INSPECTING AGENCY.

NOTE 2: STRIP TEST SHALL BE CARRIED OUT IF ABNORMAL SOUND OBSERVED DURING PERFORMANCE TEST.

NOTE 3: ALL PAGES OF THE INSPECTION DOCUMENTS SHALL BE NUMBERED IN CHRONOLOGY WITH THE QAP CLAUSES, DULY MENTIONING THE CORRESPONDING QAP CLAUSE NO. AT THE TOP OF EACH PAGE.


NOTE 4: ONE 'INDEX' PAGE CONTAINING THE DOCUMENT DESCRIPTIONS, THEIR PAGE NO'S & QAP CL NO. SHALL BE ATTACHED UPFRONT THE INSPECTION DOCUMENTS.



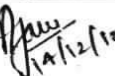
NOTE 5: PAINTING CAN BE DONE ONLY AFTER INSPECTION CLEARANCE, AS PER CUSTOMER'S /BHEL APPROVED PAINT SPECIFICATION / SCHEDULE (IF REQUIRED). OTHERWISE MANUFACTURER'S STANDARD SHALL BE FOLLOWED.


NOTE 6: FOR ANY SPARES ITEM, APART FROM 'VISUAL INSPECTION' THE 'INTERCHANGEABILITY FITMENT CERTIFICATE' OR 'MATERIAL TC' ARE TO BE SUBMITTED, WITH SPECIFIC MENTIONING OF THE ' PART NO/ ITEM NO OF THE APPROVED GA/ X-SEC DRG. ".

MANUFACTURER/ SUBCONTRACTOR		LEGEND:	FOR CUSTOMER USE	APPROVED BY
		RECORDS IDENTIFIED WITH '✓' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. IR: INSPECTION REPORT TC: TEST CERTIFICATE COC: CERTIFICATE OF CONFIRMANCE		
		M: MANUFACTURER / SUBCONTRACTOR B: BHEL / NOM. INSPECTION AGENCY N: CUSTOMER INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION		
		ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER		


दिनांक एवं हस्ताक्षर SIGN & DATE		ST- 39006	
पृष्ठ 13 का 1		Page 1 of 13	
सामग्री सूची संख्या को अधिकृत करता है		उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)	
SUPERSEDES INVENTORY NO.		TECHNICAL SPECIFICATION FOR CONTROL FLUID VAPOUR EXHAUSTER	
सामग्री सूची संख्या को अधिकृत करता है		1. INTENT OF SPECIFICATION: <p>This specification is intended to cover design, manufacture, assembly testing and supply of control fluid vapour exhauster complete with foundation base plate, anchor bolts, Lifting lugs, coupling, and other accessories including motor and their commissioning at power station to which BHEL supplies the equipment.</p> <p>The exhauster are intended for operation in conjunction with steam turbines and should be suitable for continuous operation at an ambient temperature of 50°c & 90% humidity.</p>	
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company		2. FUNCTION: <p>Control fluid vapour exhauster comes in operation in conjunction with the running of any of the control fluid pumps. Exhauster is to handle the control fluid fumes generated during the running of the turbine. It shall also maintain a partial vacuum in the tank. The fumes to be handled by the exhauster shall contain free droplets of control fluid.</p>	
स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है शुरूका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए ।		3. FLUID SPECIFICATION: <p>The specification of control fluid is given below:</p> <p>Medium - Phosphoric Ester type HS-D</p> <p>Kinematic viscosity at 40°c min 33 cST max 48 cST</p> <p>Kinematic viscosity at 20°c min 115 cST max 210 cST</p> <p>Density at 15°c max 1.25 g/cm³</p> <p>Flash point 235°C</p>	
हस्ताक्षर एवं दिनांक SIGN & DATE		नाम NAME	
दिनांक एवं हस्ताक्षर SIGNATURE & DATE		नाम NAME	
TSX		B.CHOUDHARY	
CIE		VINOD KUMAR	
QAX		S.K.CHAUHAN	
सहमत विभाग AGREED DEPTT.		नाम NAME	
दिनांक एवं हस्ताक्षर DATE & SIGNATURE		पर्यवेक्षणकर्ता SUPERVISED BY	
A.B.GUPTA		A.B.GUPTA	
REAFFIRMED		स्वीकृति : APPROVED : (A.B.GUPTA) AGM	
REV.NO. 06		निर्माण : PREPARED : PED	
Dt. 25/02/20		ISSUED : TSX	
C/A No. STE-20-19		DATE : 11.04.1983	


चित्रणक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006											
				पृष्ठ 13 Page 2	का 2 Of 13										
समग्री सूची	4. <u>DATA SHEET OF CONTROL FLUID VAPOUR EXHAUSTER:</u> <table border="0"> <tr> <td style="text-align: center;"><u>Type</u></td> <td style="text-align: center;"><u>Centrifugal</u></td> </tr> <tr> <td>Discharge capacity</td> <td>0.017 m3/sec</td> </tr> <tr> <td>Pressure difference</td> <td>50 mm we</td> </tr> <tr> <td>Design temperature</td> <td>100°C</td> </tr> <tr> <td>Operating temperature</td> <td>65°C</td> </tr> </table> <p>Exhauster shall be suitable for mounting on the oil tank and exhauster base plate shall match with the counter flange provided on the tank as per drawing shown in Annexure-I. Smooth functioning should be ensured when working with control fluid levels as given in the arrangement drawing in Annexure-II.</p>					<u>Type</u>	<u>Centrifugal</u>	Discharge capacity	0.017 m3/sec	Pressure difference	50 mm we	Design temperature	100°C	Operating temperature	65°C
<u>Type</u>	<u>Centrifugal</u>														
Discharge capacity	0.017 m3/sec														
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Operating temperature	65°C														
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.	5. <u>DESIGN AND CONSTRUCTION OF CONTROL FLUID VAPOUR EXHAUSTER:</u> 5.1 All materials used in the construction of the exhauster shall be selected from the range of materials most appropriately suitable for the purpose and service conditions. The bidder shall furnish along with the bid the material specification for all the components to BHEL for their review and acceptance by BHEL /owner. BHEL/owner reserves the right to ask for changes in material.														
	5.2 The materials of construction of the exhauster shall be such as to resist corrosion and erosion and shall give a long trouble free service.														
	5.3 The supplier shall also furnish the method and frequency of lubrication of the bearings and quantity and type of lubricant required for normal operation.														
	5.4 The design shall be such as to keep the friction loss and wear caused by and thrust, wear in mechanical seals and bearings to the minimum. It should ensure long and trouble free service. The rotor of the exhauster should be balanced dynamically so that the vibration of the exhauster is not greater than 22 µm r.m.s. displacement in accordance with ISO 10816-3:2009. The noise level should not be greater than 85 dBA when measured at a distance of 1.5 meters above floor level and one meter horizontally from the base of the equipment.														
हस्ताक्षर एवं दिनांक SIGN & DATE	21/12/12														
समग्री सूची संख्या INVENTORY NO.	REV. NO.		निर्माणकर्ता WORKED BY	A.KUMAR	Ashok 14/12/12										
9-5469	06		जांचकर्ता CHECKED BY	ANUJ JAIN	Anu 14/12/12										


दिनांक एवं हस्ताक्षर SIGN & DATE			उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006 पृष्ठ 13 का 3 Page 3 of 13		
सामग्री सूची संख्या को अतिरिक्तित्व करता है SUPERSEDES INVENTORY NO.		5.5 Seals must comply with the following properties: a) Ready access and amenability for maintenance work. b) No contamination of the medium from material abraded from the seals. c) No seepage of lubricants into the flow medium. d) No leakage of control fluid gases outside in the atmosphere. e) No seepage of control fluid towards motor and outside along with the shaft. 5.6 At suitable points on the components erection eyes or lifting hooks shall be fitted for transport and erection. Their locations must be shown on the dimensional drawing 5.7 Exhauster bearings shall be designed so as to assure 50,000 hours continuous service for friction bearings and 25,000 hours for ball and roller bearings. 5.8 The mechanical design shall allow easy access to the parts for maintenance work to be carried out. 5.9 The exhauster shall be provided with drainage devices. 5.10 The exhauster casing shall be such as to give facility of changing the orientation of the discharge branch by 45°. One of such orientation shall be horizontal as shown in Annexure-I. 5.11 All system parts conveying control fluid shall be of control fluid tight construction. compression-type fittings are not permissible. 5.12 For exhauster running at subcritical speeds it shall be demonstrated that the critical speed lies above the maximum speed attainable during operation. For exhauster running at super critical speeds, it shall be demonstrated that there is a difference of sufficient magnitude (not less than 15 %) between the operating speed and the bordering critical speed. Allowance shall be made for the type of coupling between the exhauster & motor when calculating the critical bending speed. 5.13 <u>COUPLING :</u> Suitable coupling with guards shall be provided for coupling exhauster with motor and shall be designed to facilitate easy alignment. One set of coupling pins/bolts shall be supplied in spare Common shaft for exhauster and motor shall be preferred. 5.14 <u>FOUNDATION:</u> The exhauster shall be mounted on the control fluid tank top. 5.15 <u>SPECIAL TOOLS & TACKLES :</u> One set of tools required for erection, operation and maintenance shall be supplied together with each set comprising of two numbers of exhauster with motor. List of these tools shall be submitted along with the offer.					
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company							
स्वतंत्राधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।							
हस्ताक्षर एवं दिनांक SIGN & DATE	21/12/12						
सामग्री सूची संख्या INVENTORY NO.	1-54469	REV. NO. 06		निर्माणकर्ता WORKED BY	A.KUMAR		
				जांचकर्ता CHECKED BY	ANUJ JAIN		


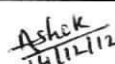
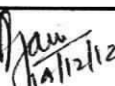
दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006	
				पृष्ठ 13 का 4 Page 4 of 13	
सामग्री सूची संख्या को अधिकारित करता है SUPERSEDES INVENTORY NO.	6.0 Motor: A suitable motor conforming to the shall be supplied exhauster requirement shall be supplied The motor shall also meet the following requirement broadly. The moter shall conform to IS:4722 and IS:325, IS:2253 IS:2254, IS:4029 or equivalent BS specification. The motor shall meet all Indian statutory requirements.				
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company		6.1 Application: To drive control fluid vapour exhauster. 6.2 Location Turbine oil room. 6.3 Type of motor Squirrel cage, induction motor 6.4 KW Rating: It shall have at least 25% reserve capacity over required power to drive the exhauster when it is discharging max. quantity. 6.5 KW actually required by Driven equipment under specified operation/ startup conditions. Capacity of the exhauster.			
		6.6 Rated voltage 415 V 6.7 Frequency 50 Hz 6.8 Permissible voltage plus Frequency variation under Normal rinning condition. $\pm 10\%$ volt. $\pm 5\%$ frequency. 6.9 Combined variation $\pm 10\%$ 6.10 Min. voltage required under Starting conditions to bring driven equipment upto rated speed 80 % rated. 6.11 No.of phases 3 ϕ 6.12 Type of duty Continuous 6.13 Full load speed It shall be commensurate with exhauster speed as per design. 6.14 Full losd current As per design. 6.15 Starting current Not to exceed 600 % of rated 6.16 Starting torque 1.3(Min) of rated torque 6.17 Break down torque Two times (Min) of rated value. 6.18 Efficiency at full load: 90 % (Min) 6.19 Power factor at full load 0.85 (Min)			
स्वत्वधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।	हस्ताक्षर एवं दिनांक SIGN & DATE 21/12/12				
सामग्री सूची संख्या INVENTORY NO. P-5469	REV. NO. 06			निर्माणकर्ता WORKED BY A.KUMAR	जांचकर्ता CHECKED BY ANUJ JAIN
				Ashok 14/12/12	Anu 14/12/12



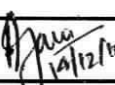
दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006 पृष्ठ 13 का 5 Page 5 of 13	
सामग्री सूची संख्या INVENTORY NO. P-5469		SUPERSEDES INVENTORY सामग्री सूची संख्या को अधिकृत करता है		6.20 Starting data 6.20.1 Starting Direct on line 6.20.2 Acceleration time with full Load connected $3.5 \pm .05$ secs. 6.20.3 Permissible starting duty cycle No. of starts 3 Starts spread over an hour 2-Consecutive starts from hot condition without any Injurious Heating to the winding. Motor shall be capable of running at full load with 80% of rated voltage for 5.0 minutes and 70% of rated voltage for 1.0 sec. 6.20.4 Overload (% of full load) that can be carried by motor without impairing over all performance and period for which this over load is applicable 6.20.5 Locked rotor with stand time under hot condition at rated voltage shall be atleast 2.5 sec. more than starting time 6.21 Winding 6.21.1 Class of insulation Class-B, Fungus resistant tropicalized 6.21.2 Winding temp. detector N.A. 6.22 Mechanical construction 6.22.1 Shaft disposition mounting Horizontal / flange mounted. 6.22.2 Method of connections Flange flexible coupling 6.22.3 Direction of rotation and corresponding terminal designation To suit exhaustor 6.22.4 Enclosure and ventilation Totally enclosed fan cooled-1P55 6.22.5 Bearing Bearing as per supplier's design, life not less than 30,000 hrs 6.22.6 Grounding device Suitable arrangement shall be provided for earthing the motor at two separate and distinct connection points. Design of earthing conductor shall be as per IS:4722-1992. 6.22.7 Terminal connection for stator heads type and Number 3 terminals shall be connected externally in the terminal box. 6.23 Cable for grounding points NA 6.24 Terminal box. To be provided with double compression cable gland for Al cable	
स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।		COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company		हस्ताक्षर एवं दिनांक SIGN & DATE 24/12/12	
REV. NO. 06		निर्माणकर्ता WORKED BY A.KUMAR		जांचकर्ता CHECKED BY ANUJ JAIN	



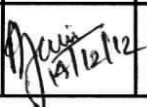
दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006	
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SUPERSEDES INVENTORY NO.	6.24.1 Whether phases segregated No 6.24.2 Fault level 45 KA for 0.25 sec 6.25 Space heaters NA 6.25.1 Rated voltage NA 6.26 SPECIAL REQUIREMENTS: 6.26.1 The motor shall be suitable to operate in an environment of oil fumes 6.26.2 The motor shall be suitable for rewinding 6.26.3 The motor shall have on line greasing facility. 6.26.4 The motor construction shall be suitable for easy disassembly and reassembly. 6.26.5 The terminal box shall be suitable for top and bottom entry of cables and shall be suitable for PVC insulated PVC sheathed armoured aluminium cables and shall be capable of being rotated by 180° in steps of 90° 6.27 Documents to be supplied. These shall be supplied in soft copies each and two hard copies with the equipments in the event of an order 6.27.1 Characteristic curve at 80%, 100% and 110% of rated voltage. The offer should be accompanied with following documents in triplicate. The offer may not be considered if all these documents are not supplied. i) Starting current v/s time. ii) Torque v/s slip. iii) Thermal with stand.				
सामग्री सूची संख्या को अधिकृत करता है	6.27.3 Type and frame size 6.27.4 Starting time with full load(with 80%, 85% and 100% voltage at terminal) 6.27.5 Safe stall time at 100% rated voltage under hot condition. 6.27.6 Motor GD2 value. 6.27.7 Weight of motor. 6.27.8 Expected life of bearing and type of bearing 6.27.9 Type and size of cable for which gland is provided in the terminal box. 6.27.10 (i) Type and routine test certificates as per IS:4722. (ii) In addition to 5.27.10(i),the following tests shall also be carried out. a. Degree of protection test as type test. b. 20% over speed test for 2 minutes as routine test. c. Measurement of vibration as routine test.				
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स्वत्वधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत भारती इलेक्ट्रिकल्स की संपत्ति है इसका प्रयोग एवं अपरव्यवहार रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में प्रतिकारक हो न किया जाए।					
हस्ताक्षर एवं दिनांक SIGN & DATE	6.28 Documents to be furnished within four weeks of placement of order. 6.28.1 Soft copies and two hard copies with one reproducible of the motor data sheet in BHEL format which will be furnished to successful bidder. 6.28.2 Drawing showing terminal detail of all terminals, location and dimensions of box. 6.28.3 Clearance required to remove rotor from stator. 6.28.4 Rotor weight				
सामग्री सूची संख्या INVENTORY NO.	REV. NO. 0.6	निर्माणकर्ता WORKED BY	A.KUMAR	आशोक 14/12/12	
P-5469		जांचकर्ता CHECKED BY	ANUJ JAIN	Anuj 14/12/12	


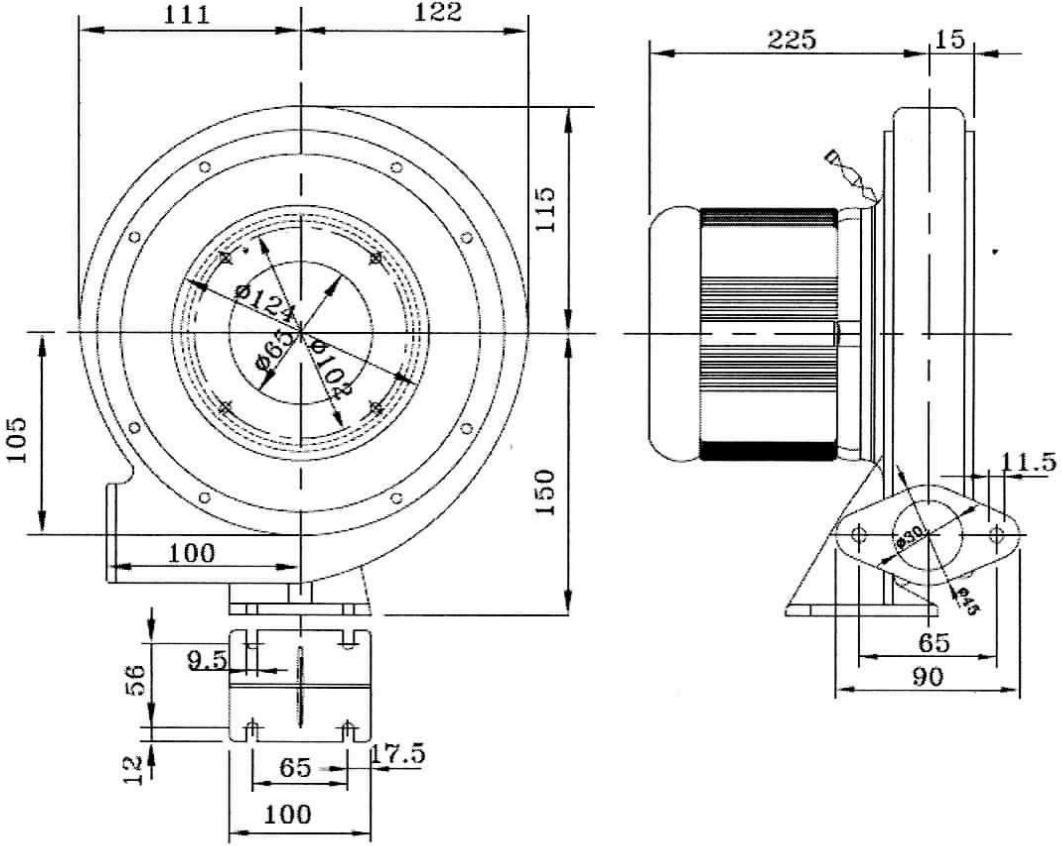
दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006					
पृष्ठ 13 का 7 Page 7 of 13		SUPERSEDES INVENTORY		सामग्री सूची संख्या को अधिकृतित करता है					
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company		स्वत्वधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।		हस्ताक्षर एवं दिनांक SIGN & DATE 21/12/12					
सामग्री सूची संख्या INVENTORY NO. P-5469		REV. NO. 06		निर्माणकर्ता WORKED BY A.KUMAR जांचकर्ता CHECKED BY ANUJ JAIN					
7.0 QUALITY ASSURANCE, INSPECTION AND TESTING									
a) The manufacturer shall conduct all tests required to ensure all the component parts of the CF vapour exhaustor offered conform to the requirements of applicable codes and standards. b) The bidder shall submit along with his offer quality plan in the BHEL format.									
7.1 The particular of the proposed shop tests and procedures for the test shall be submitted to BHEL/Owner for approval along with quality plan.									
7.2 The material shall be dispatched only after inspection and clearance of material by BHEL/Owner and approval of test certificates by BHEL/owner.									
7.3 The minimum tests/checks to be carried out on CF vapour exhaustor as envisaged by BHEL are given below. This is however not intended to form a comprehensive testing programme as it suppliers responsibility to prepare the detailed Quality plan, which should also include tests/checks carried out by supplier as a part of their normal practice. This quality plan is subject to the approval of BHEL /Owner and BHEL/Owner reserves the right to ask for any more checks at the time of quality plan finalization.									
7.3.1 Testing of materials-The material of major component (Shaft, casing & impeller) shall be tested as per relevant specification for its chemical composition and mechanical properties viz YS, uTS, Impact, % age elongation, % RA etc. Suitable NDT to ensure freedom from surface and subsurface defects shall be carried out.									
7.3-2 Following tests shall be carried out during various stages of manufacturer at manufacturers' works.									
a) Check for dimensions of all the component parts including surface finish, axial and radial run out of shaft etc. b) Non-destructive examination-DPT/MPI for casing shaft and seals etc. to ensure freedom from surface/Sub-surface defects. Bidder shall also inform his practice regarding checks being carried out to ensure freedom from internal defects on shaft, casing & impeller etc. c) Dynamic balancing of rotor as per ISO 1940 Gr6.3/ISO 1940 Gr2.5 or equivalent. d) Check for direction of rotation of Exhaustor and its working as per clause 6.12 of spec. e) Performance testing eg. discharge V/S pressure, power consumption, noise and vibration etc. f) Strip down examination to check condition of bearing, mechanical clearance and axial play of shaft. g) Check the condition of the oil seals and any seepage of fluid through the seals.									
Ashok 14/12/12		Anuj 14/12/12							


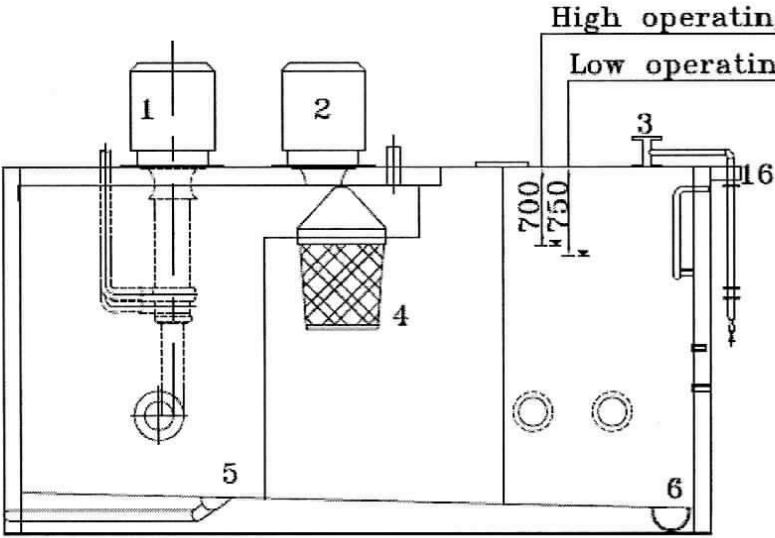
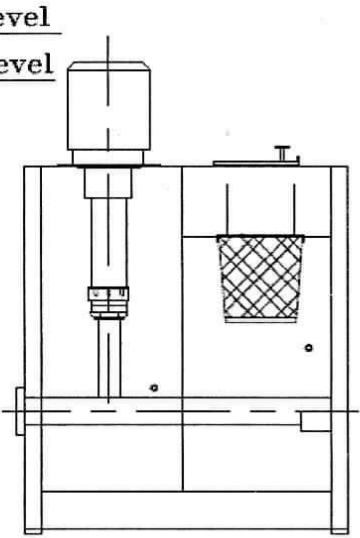
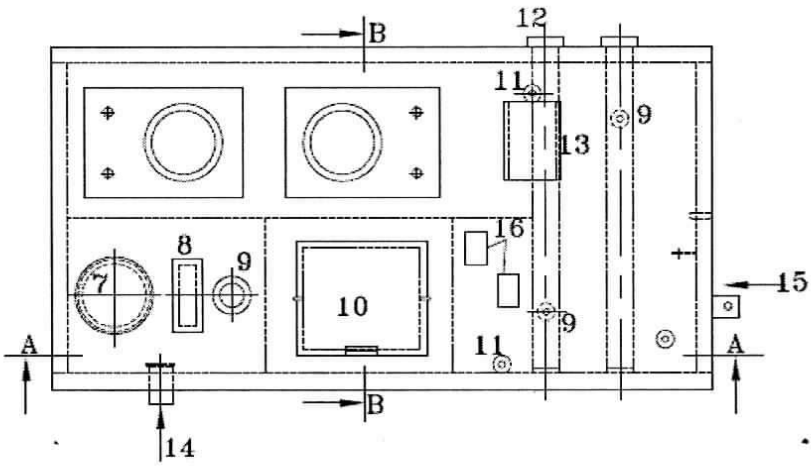

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006	
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सामग्री सूची संख्या को अधिकृतित करता है	SUPERSEDES INVENTORY	<p>7.3.3 After testing the exhaustor, all the surfaces and internals shall be thoroughly cleaned, dried and conserved. All the metallic surface except bright parts exposed to weather shall be given a suitable priming coats of approved paints. Ensure packing in water and dust proof packages. The packages should be sufficiently strong to safeguard against any damage during transit.</p> <p>7.3.4 Test certificates indicating the actual test results of material testing NDT, dynamic balancing, performance test, strip down examination etc. shall be furnished.</p> <p>8.0 <u>DOCUMENTS TO BE SUPPLIED AFTER THE PLACEMENT OF ORDER.</u></p> <p>These shall be supplied in six hard copies each and two soft copies.</p> <ul style="list-style-type: none"> (i) Contractual drawing i.e. preapproval drgs./ documents in final shape after incorporating BHEL's comments if there are any. 8 weeks (ii) Overhaul and spare parts list. 8 weeks (iii) Equipment description. 8 weeks (iv) Operating instructions. 12 weeks (v) Cleaning and maintenance instructions with lubrication diagram. 12 weeks (vi) Assembling and dismantling instructions. 12 weeks (vii) Record of test on noise levels. Before dispatch (viii) List of tools and tackles. 8 weeks (ix) The static and dynamic loading details on support/ foundation. 8 weeks (x) Instruction on conservation and deconservation. 12 weeks <p>9.0 <u>PRE-APPROVAL DOCUMENTS AT THE TIME OF OFFER</u></p> <ul style="list-style-type: none"> (i) Assembly drawing with parts list, nozzles sizes and their coordinates, base plate details and cross sectional arrangement along with static & dynamic loading. (ii) Calculations with necessary drawings (torque/ speed) characteristic etc. power requirement. (iii) Welding procedure plan including particulars of the welders. <p>9.1 Examination of the preapproval documents by BHEL shall not release the manufacturer and his subcontractors of their responsibilities.</p> <p>9.2 The pre approval documents shall form the basis for the order. No changes shall be made without approval from BHEL</p>			
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company		स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए ।			
दिनांक एवं हस्ताक्षर SIGN & DATE	24/12/12				
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दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006 पृष्ठ 13 का 9 Page 9 of 13	
SUPERSEDES INVENTORY सामग्री सूची संख्या को अधिकृत करता है	10. <u>NAME PLATE IDENTIFICATION MARKINGS SHOULD BE AS FOLLOWS</u> (i) Type / designation. (ii) Manufacturer. (iii) Manufacturer's works No. (iv) Year of manufacturing. (v) Purchase's order no. (vi) Volumetric flow (m ³ / s) (vii) Operating temperature (°C) (viii) Discharge pressure (MMWC) (ix) Flow medium (x) Speed				
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company	11. <u>CLEANING, PAINTING, CONSERVATION & PACKING.</u> <p>The surface shall be cleaned & prepared for the application of the coatings by blasting with non- silicatic abrasive agents. The protective coating should be resistant to prevent control fluid contamination of control fluid specified & to prevent the deterioration of the coating itself. The supplier shall give exact and precise details about the measures envisaged by him for surface protection, which shall be checked & approved by BHEL.</p> <p>After testing the exhaustor, its internals shall be thoroughly cleaned, dried and conserved before packing it. The exhaustor shall be suitably packed for transportation. It should be packed such that it is safe at least for 2 year in a very damp atmosphere.</p> <p>Instructions should be issued regarding reconsevation, deconsevation and storage of package.</p>				
स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।	12. <u>GENERAL:</u> <p>The tenderer can make suitable offers even if there are minor deviations which do not effect the efficient functioning of the equipment. However, the deviations must be clearly spelt out. Supplier shall also fill in the blank data sheet and submit the same along with the offer. The offer may not be considered if all the technical particulars and information called for in the specifications are not submitted along with the offer.</p>				
हस्ताक्षर एवं दिनांक SIGN & DATE 21/12/12	13. <u>GUARANTEE:</u> 13.1 The supplier shall guarantee trouble free and satisfactory operation of the equipment for a period of 18 months after the installation and commissioning or for a period of 36 months from the day the equipment leaves the supplier's works whichever is earlier. 13.2 The supplier shall guarantee the capacity, head and efficiency of the exhaustor as per the tested characteristics with control fluid fumes.				
सामग्री सूची संख्या INVENTORY NO. P-5469	REV. NO. 06		निर्माणकर्ता WORKED BY	A.KUMAR	
			जांचकर्ता CHECKED BY	ANUJ JAIN	

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सामग्री सूची संख्या को अधिकृतित करता है	SUPERSEDES INVENTORY		13.3 If during erection at site any deficiency in a part is detected BHEL site representative shall prepare the assessment report and a copy of the same shall be forwarded to the supplier. The supplier shall replace / rectify the concerned items free of charge. The supplier if he so desire may depute his representatives to site at his own cost otherwise the finding of BHEL Representative shall be final and binding on the supplier. 13.4 The supplier shall repair / replace the defective parts at his own cost during the guarantee period.																												
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company			14. <u>ERECTION:</u> The contractor shall ensure proper erection of the exhauster and all individual parts bearing in mind ISO fitting tolerances and recommendations. 15. <u>SPARES:</u> The supplier shall quote item wise price of recommended spares for 3 years and 5 years operation respectively. 16. Based on standard own experience. 17. Cross referred standard No. IS IS:4722, IS:325, IS:2253, IS:2254, IS: 4029, IS: 2148, IS: 12075, ISO:1940.																												
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हस्ताक्षर एवं दिनांक SIGN & DATE	21/12/12		2.0 <u>Design and performance.</u> <table border="0"> <tr><td>2.1</td><td>Designed capacity of each exhauster</td><td>m³ /s</td></tr> <tr><td>2.2</td><td>Normal discharge pressure</td><td></td></tr> <tr><td>2.3</td><td>Efficiency.</td><td></td></tr> <tr><td>2.4</td><td>Rated speed.</td><td></td></tr> <tr><td>2.5</td><td>Performance guaranteed when Installed as per given arrangement.</td><td></td></tr> <tr><td>2.6</td><td>Exhauster b. h.p./kw at rated capacity.</td><td></td></tr> </table>	2.1	Designed capacity of each exhauster	m ³ /s	2.2	Normal discharge pressure		2.3	Efficiency.		2.4	Rated speed.		2.5	Performance guaranteed when Installed as per given arrangement.		2.6	Exhauster b. h.p./kw at rated capacity.											
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सामग्री सूची संख्या INVENTORY NO.	REV. NO. 06		निर्माणकर्ता WORKED BY	A.KUMAR																											
			जांचकर्ता CHECKED BY	ANUJ JAIN																											

दिनांक एवं हस्ताक्षर SIGN & DATE			उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006 पृष्ठ 13 का 11 Page 11 of 13		
सामग्री सूची संख्या को अधिकृतित करता है SUPERSEDES INVENTORY		3.0 <u>Material of construction.</u> 3.1 Casing 3.2 Rotor and blades 3.3 Base plate 3.4 Wearing rings 3.5 Type of bearing used 3.6 Type of coupling 3.7 Packing 4.0 <u>Connections.</u> 4.1 Suction size 4.2 Discharge size 5.0 <u>Drawings.</u> 5.1 General arrangement and sectional drawings enclosed with offer Yes/No 6.0 <u>Weight schedule.</u> 6.1 Weight of exhauster 6.2 Weight of motor 6.3 Weight of exhauster with motor and base frame 7.0 <u>Characteristic curves.</u> 7.1 Power consumption/discharge pressure 7.2 Discharge quantity/pressure 7.3 Discharge/efficiency 8.0 Any deviation taken Yes/No 9.0 Deviations taken as mentioned here.					
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स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए ।							
दिनांक एवं हस्ताक्षर SIGN & DATE	24/12/12						
सामग्री सूची संख्या INVENTORY NO.	P-5409	REV. NO. 06		निर्माणकर्ता WORKED BY	A.KUMAR		
				जांचकर्ता CHECKED BY	ANUJ JAIN		

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006 पृष्ठ 13 का 12 Page 12 of 13	
सामग्री सूची संख्या को अधिकृतित करता है	SUPERSEDES INVENTORY	Annexure-I			
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स्वत्वधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए ।		<p style="text-align: center;">CONTROL FLUID VAPOUR EXHAUSTER</p>			
हस्ताक्षर एवं दिनांक SIGN & DATE	21/12/12				
सामग्री सूची संख्या INVENTORY NO. P-5469	REV. NO. 06		निर्माणकर्ता WORKED BY	A.KUMAR	Aslock 14/12/12
			जांचकर्ता CHECKED BY	ANUJ JAIN	Anuj 14/12/12

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD (STEAM TURBINE ENGINEERING)		ST- 39006 पृष्ठ 13 का 13 Page 13 of 13	
SUPERSEDES INVENTORY सामग्री सूची संख्या को अपडेट कर देना है	Annexure-II 6 DATA SHEET OF CONTROL FLUID VAPOUR EXHAUSTER:				
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	SECTION-AA		SECTION-BB		
स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।			<ol style="list-style-type: none"> 1. Control fluid pump. 2. Control fluid pump.(Standby). 3. Air vent 4. Strainer 5. IN-coming chamber drain. 6. Main chamber drain. 7. Main hole cover. 8. Water detector 9. Blind flange. 10. Strainer cover 11. Water detector 12. Pipe for warming. 13. Opening for level switch. 14. Inlet from cooler. 15. Inlet from regenerative system. 16. CF vapour exhauster 		
दिनांक एवं हस्ताक्षर SIGN & DATE 24/12/12	CF TANK ARRANGEMENT				
सामग्री सूची संख्या INVENTORY NO. P-5469	REV. NO. 06	निर्माणकर्ता WORKED BY	A.KUMAR		
जांचकर्ता CHECKED BY	ANUJ JAIN	