


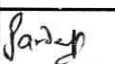

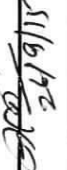

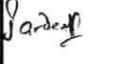





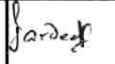
दिनांक एवं हस्ताक्षर SIGN & DATE		<b>उत्पाद मानक</b>  <b>PRODUCT STANDARD</b> ( STEAM TURBINE ENGINEERING )	<b>ST- 39004</b>	
			पृष्ठ 15 का 01 Page 01 of 15	
सुपरीसेड्स INVENTORY NO.	<b>TECHNICAL SPECIFICATION FOR OIL VAPOUR EXHAUSTER</b>			
सामग्री सूची संख्या को अधिकारित करता है	<p>1.0 <b>INTENT OF SPECIFICATION:</b> - This specification is intended to cover design, manufacture, assembly testing and supply of oil vapour exhauster complete with foundation base plate, anchor bolts, lifting lugs, coupling and other accessories including motor. The exhausters should be suitable for continuous operation at an ambient temperature of 50°C &amp; 90% humidity.</p> <p>2.0 <b>FUNCTION:</b> - Oil vapour 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 pedestals etc. The fumes to be handled by the exhauster contain free droplets of oil.</p> <p>3.0 <b>OIL SPECIFICATION:</b> - Viscosity grade of the oil is ISO VG 46. The equivalent grades of various oil suppliers are Servo prime -46 of M/s IOC and Turbinol-47 of M/s Hindustan Petroleum Corporation Ltd.</p> <div style="margin-left: 40px;">           Kinematic viscosity at 65°C/20°C : 16 Cs/100 Cs            Specific gravity at 65°C : 0.8488            Flash point : 200° C (min.)            Operational temperature : 65°C            Pour point : -6.6° C (max.)         </div> <p>4.0 <b>DATA SHEET OF OIL VAPOUR EXHAUSTER:</b></p> <div style="margin-left: 40px;">           Type : Centrifugal            Cont. discharge capacity : 0.11 m³/sec.            Normal discharge pressure : 220mm WC            Design temperature : 100°C            Operating temperature : 65°C            Efficiency of exhauster : Min. 40%         </div> <p>5.0 <b>MOTOR:</b> - A suitable motor conforming to the exhauster requirement shall be supplied. The Motor shall also meet the following requirements broadly. The motor shall conform to IS : 4722, IS : 325, IS-: 2223, IS : 4029 , IS : 4691, IS : 2148 and IS : 12615-2011 or equivalent, BS : Specification. The motor shall meet all Indian statutory requirements.</p> <p>5.1 <b>Application:</b> To drive Oil Vapour Exhauster.</p> <p>5.2 <b>Location:</b> Turbine oil room (indoor).</p> <p>5.3 <b>Type of motor:</b> Squirrel cage, induction motor.</p> <p>5.4 <b>KW Rating:</b> It shall have at least 25% and max. 40% reserve capacity over required power to drive the exhauster when it is discharging max. quantity.</p>			
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सामग्री सूची संख्या INVENTORY NO.				

TSX	DEEPAK	Deepak Singh	22/9/15	नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
MEMBER PSC	R.PANJA	R.Panja	24-9-15	अनुवादक TRANSLATED BY	-
QAX	VIBHUTI SHAH	Vibhuti Shah	22/9/15	निर्माणकर्ता WORKED BY	VIVEK RAWAT
CIE	NIRBHAY KUMAR	Nirbhay Kumar	22/9/15	जांचकर्ता CHECKED BY	P.KUMAR
सहमत विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	ANUJ JAIN	
REAFFIRMED			स्वीकृति		
WORKED BY			APPROVED : (R PANJA) AGM		
CHECKED BY			निर्माण		
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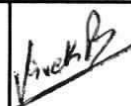
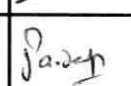
REV.NO. 06  
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 STE-20-20





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सामग्री सूची संख्या INVENTORY NO.	5.5 KW actually required by driven equipment under specified operation/startup conditions at 50°C ambient. : capacity of the exhaustor 5.6 Rated voltage: 415 V 5.7 Frequency: 50 Hz 5.8 Permissible voltage and frequency variation under normal running condition : ± 10% Volt. : ± 5% Frequency 5.9 Combined variation : 10% (sum of absol. value) 5.10 Min. voltage required under starting conditions to bring driven equipment up to rated speed. : 80% rated 5.11 No. of phases : 3ø 5.12 Type of duty : Continuous 5.13 Starting current : Not to exceed 600% of I-rated. 5.14 Starting torque : 1.3 (min.) of rated torque 5.15 Break down torque : Two times (min.) of rated value. 5.16 Class of insulation of winding : Class-B, fungus resistant tropicalized as per IS: 3202. 5.17 <b>Starting data :-</b> 5.17.1 Starting : Direct on line 5.17.2 Acceleration time with full load connected : 3.5 ± 0.5 secs. 5.17.3 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 5.17.4 Overload (% of full load) that can be carried by motor without impairing over all performance and period for which this over load is applicable. : 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 sec. 5.17.5 Locked rotor with stand time under hot condition at rated voltage shall be at least 2.5 sec. more than starting time.				
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दिनांक SIGN & DATE	 24/9/15				
सामग्री सूची संख्या INVENTORY NO.	REV. NO. 06		निर्माणकर्ता WORKED BY	V. RAWAT	 22/9/15
			जांचकर्ता CHECKED BY	P.KUMAR	 22/9/15




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सामग्री सूची संख्या INVENTORY NO.	SUPERSEDES INVENTORY NO.	5.18 <b><u>Mechanical construction :-</u></b> 5.18.1 Shaft disposition mounting : Horizontal / flange mounted. 5.18.2 Method of connections to driven equipment : Flange flexible coupling Directly mounted on the motor shaft. 5.18.3 Direction of rotation and corresponding Terminal designation : To suit exhauster 5.18.4 Efficiency of the motor shall be as per IS: 12615-2011. 5.18.5 Enclosure and ventilation: Totally enclosed fan cooled explosion proof as per IS: 2148. 5.18.6 Bearing: As per supplier's design, life not less than 30,000 hrs. 5.18.7 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. 5.18.8 Terminal connectors for stator: 3 terminals shall be connected externally in the terminal box. heads type and number. 5.19 Terminal box: -To be provided with double compression cable gland for Al cable. - Fault level for terminal box shall be 50KA for 0.25 sec. - It shall be explosion proof 5.20 <b><u>Special requirements:</u></b> 5.20.1 The motor shall be suitable to operate in environment of oil fumes. 5.20.2 The motor shall be suitable for rewinding. 5.20.3 The motor shall have on line greasing facility. 5.20.4 The motor construction shall be suitable for easy disassembly and reassembly. 5.21 Documents to be supplied: - Motor data sheets with G. A. drgs. and Terminal details shall be furnished in 05 sets after award of contract/placement of order for BHEL approval. 5.21.1 Type and frame size 5.21.2 Starting time at i) With 100% voltage at terminal ii) With 85% voltage at terminal 5.21.3 Safe stall time at 100% rated voltage under hot condition.			
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सामग्री सूची संख्या INVENTORY NO. P-5135	REV. NO. 06		निर्माणकर्ता WORKED BY V. RAWAT		22/09/15
			जांचकर्ता CHECKED BY P KUMAR		22/9/15




दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक <b>PRODUCT STANDARD</b> ( STEAM TURBINE ENGINEERING )		<b>ST- 39004</b> पृष्ठ 15 का 04 Page 04 of 15	
SUPERSEDES INVENTORY NO.  सामग्री सूची संख्या को अधिकृतित करता है	5.21.4 Motor GD <sup>2</sup> value. 5.21.5 Weight of motor 5.21.6 I) Type and routine test certificates as per IS: 4722. II) In addition to type and routine test as per IS: 4722, following test shall also be carried out:- - Degree of protection test as type test. (In case test is already carried out and is not more than five years old then only Test Certificates to be furnished).				
<b>COPYRIGHT AND CONFIDENTIAL</b> 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	6.0 <u>DESIGN &amp; CONSTRUCTION OF OIL VAPOUR EXHAUSTER:</u> 6.1 All materials used in the construction of the exhaustor 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. 6.2 The supplier shall also furnish the method and frequency of lubrication of the bearings and quantity and type of lubricant required for normal operation. 6.3 The design shall be such as to keep the friction loss and wear caused by end thrust, wear in mechanical seals and bearings to the minimum. It should ensure long and trouble free service. The rotor of the exhaustor should be balanced dynamically so that the vibration of the exhaustor is not greater than 25µm peak to peak in accordance with IS: 12075. 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.				
<b>स्वत्वाधिकार एवं गोपनीय</b> इस प्रदेख 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।	6.4 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 gases (oil fumes) outside in the atmosphere. e) No seepage of oil towards motor and outside along with the shaft. 6.5 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. 6.6 Exhaustor 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. 6.7 The mechanical design shall allow easy access to the parts for maintenance work to be carried out.				
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सामग्री सूची संख्या INVENTORY NO. P-5735	REV. NO. 06		निर्माणकर्ता WORKED BY V. RAWAT		22/09/15
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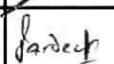


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				पृष्ठ 15 का 05 Page 05 of 15	
सामग्री सूची संख्या INVENTORY NO.	SUPERSEDES INVENTORY NO.	6.9 All system parts shall be of oil tight construction. Compression-type fittings are not permissible.			
सामग्री सूची संख्या को अधिकृत करता है		6.10 For exhauster running at sub critical 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 speeds. Allowance shall be made for the type of coupling between the exhauster and motor when calculating the critical bending speed.			
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		6.12 <b>FOUNDATION:-</b> The exhauster shall be mounted on the oil tank top. Frame of exhauster shall be sturdy to limit the vibration level as mentioned in the clause 6.3. For mounting Dimensions. Refer sketch at Annexure -3 or Annexure -4.			
		6.13 <b>ORIENTATION:-</b> Orientation of motor w.r.t. inlet/outlet connections shall be as per Annexure-3 for var.01 and Annexure -4 for variant 02.			
		6.14 <b>SPECIAL TOOLS &amp; TACKLES:-</b> One set of tools required for erection, operation and maintenance of the sets 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.			
		7.0 <b>QUALITY ASSURANCE, INSPECTION AND TESTING :-</b>			
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		b) The bidder shall submit along with his offer quality plan in the BHEL format /customer format as required.			
		7.1 The material shall be dispatched only after inspection and clearance of material by BHEL / Owner and approval of test certificates by BHEL/Owner.			
		7.2 The minimum tests/checks to be carried out on oil vapour exhauster as envisaged by BHEL are given below. This is however not intended to form a comprehensive testing programme as it is 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/ its customer and BHEL/ its customer reserves the right to ask for any more checks at the time of quality plan finalization.			
		7.2.1 Testing of materials :- The material of each component shall be tested as per relevant specification for its chemical composition and mechanical properties Viz YS, TS, % age elongation shall be carried out.			
दिनांक एवं हस्ताक्षर SIGN & DATE 	REV. NO. 06			निर्माणकर्ता WORKED BY V. RAWAT	
सामग्री सूची संख्या INVENTORY NO. P-5135				जांचकर्ता CHECKED BY P. KUMAR	
				22/09/15	22/09/15


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SUPERSEDES INVENTORY NO.	सामग्री सूची संख्या को अधिलिखित कराया है	7.2.2 Following tests shall be carried out during various stages of manufacture at manufacturer s' works. a) Check for dimensions of all the component parts including finish. b) Non-destructive Examination –DPT/MPT for welds to ensure freedom from subsurface defects. c) Dynamic balancing of rotor as per ISO: 1940 or equivalent, Gr. =6.3. d) Check for direction of rotation of exhaustor and its working as per clause 6.10 of spec. e) Performance testing e.g. discharge V/S pressure, power consumption. f) Noise as per clause 6.3 g) Vibration as per clause 6.3			
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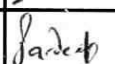

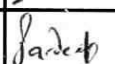

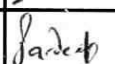
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SUPERSEDES INVENTORY NO.  सामग्री सूची संख्या को अधिकृत करता है	<b>10.0 NAME PLATE IDENTIFICATION MARKS SHOULD BE AS FOLLOWS:-</b> <ol style="list-style-type: none"> <li>1) Type/ Designation</li> <li>2) Manufacturer</li> <li>3) Year of Manufacturing</li> <li>4) Purchaser's order no.</li> <li>5) Volumetric flow (M<sup>3</sup>/S)</li> <li>6) Discharge pressure ( MM WC)</li> <li>7) Operating temperature ( °c)</li> <li>8) Speed</li> <li>9) Flow medium</li> </ol>				
<b>COPYRIGHT AND CONFIDENTIAL</b> 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	<b>11.0 CLEANING, PAINTING, CONSERVATION &amp; PACKING:-</b> The surface shall be cleaned & prepared for the application of the coatings by blasting with non-silicatic abrasive agents. The protective coating should be oil resistant to prevent contamination of oil 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 may be commented by BHEL.  After testing the exhauster, its internals shall be thoroughly cleaned, dried and conserved before packing it. The exhauster packing shall be sufficiently strong to safeguard against any damage during transit. It should be packed such that it is safe at least for 2 years in a very damp atmosphere. Instructions should be issued Regarding reconsevation, deconsevation and storage of package.  <b>12.0 GENERAL:-</b> The tenderer can make suitable offers even if there are minor deviations which do not affect the efficient functioning of the equipment. However, the deviations must be clearly spelt out. Supplier shall also fill in the blank data sheet (Annexure-1) 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.  <b>13.0 GUARANTEE:-</b> <ol style="list-style-type: none"> <li>13.1 The supplier shall guarantee trouble free and satisfactory operation of the equipment for a period of 18 months after delivery or 12 months after commissioning whichever is earlier.</li> <li>13.2 The supplier shall guarantee the capacity, head and efficiency of the exhauster as per the tested characteristics with oil fumes.</li> <li>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 desires may depute his representatives to site at his own cost otherwise the finding of BHEL representative shall be final and binding on the supplier.</li> <li>13.4 The supplier shall repair/replace the defective parts at his own cost during the guarantee period.</li> </ol>				
<b>स्वाधिकार एवं गोपनीय</b> इस प्रलेख में दी गई सूचना भारत भारती 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 26/9/15					
सामग्री सूची संख्या INVENTORY NO. P-5/39	<b>REV. NO.</b> 06		निर्माणकर्ता WORKED BY	V. RAWAT	 22/09/15
			जांचकर्ता CHECKED BY	P.KUMAR	 22/9/15


दिनांक एवं हस्ताक्षर SIGN & DATE				उत्पाद मानक PRODUCT STANDARD ( STEAM TURBINE ENGINEERING )		ST- 39004	
SUPERSEDES INVENTORY NO.						पृष्ठ 15 का 08 Page 08 of 15	
सामग्री सूची संख्या को अधिकृत करता है		ANNEXURE-1					
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		<b>DATA TO BE FURNISHED BY BIDDER ALONG WITH OFFER</b>					
		<b>1.0 Equipment and Services offered :-</b>					
		Please state whether the following equipment service as specified in the data sheets are offered or not.					
		1.1 Exhauster as per specification Yes/No					
		1.2 Motor/Make M/s.....					
		1.3 Necessary instruments, Test connections Yes/No					
		1.4 Base plate as per Annexure-3/4 Yes/No					
		1.5 Companion flanges Yes/No					
		1.6 Maintenance and special erection tools Yes/No					
		1.7 No. of exhausters offered Nos.					
		<b>2.0 Design and performance :-</b>					
		2.1 Designed capacity of each exhauster m <sup>3</sup> /sec					
		2.2 Normal discharge pressure					
		2.3 Efficiency					
		2.4 Rated speed					
		2.5 Performance guaranteed when installed as per given arrangement Yes/No					
		2.6 Exhauster b. h. p. / KW at rated capacity					
		<b>3.0 Material of construction</b>					
		3.1 Casing					
		3.2 Rotor and blades					
		3.3 Base plate					
		3.4 Wearing rings					
		3.5 Type of bearings used					
		3.6 Type of coupling					
		3.7 Type Of Packing					
स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत भारती 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 ।		दिनांक एवं हस्ताक्षर SIGN & DATE 26/9/15					
सामग्री सूची संख्या INVENTORY NO. P-5/35		REV. NO. 06		निर्माणकर्ता WORKED BY V. RAWAT		 22/9/15	
				जांचकर्ता CHECKED BY P.KUMAR		 22/9/15	


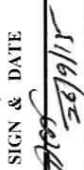

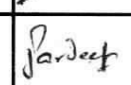
दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक <b>PRODUCT STANDARD</b> ( STEAM TURBINE ENGINEERING )		<b>ST- 39004</b> पृष्ठ 15 का 09 Page 09 of 15	
सामग्री सूची संख्या INVENTORY NO.	4.0 <b><u>Connections:-</u></b> 4.1 Suction size 4.2 Discharge size 5.0 <b><u>Drawings:-</u></b> - General arrangement and sectional drgs. Enclosed with offer Yes/No 6.0 <b><u>Weight schedule:-</u></b> 6.1 Weight of exhauster 6.2 Weight of motor 6.3 Weight of exhauster with motor and base frame 7.0 <b><u>Characteristic curves :-</u></b> 7.1 Power consumption / Discharge pressure 7.2 Discharge quantity / pressure 7.3 Discharge / efficiency 8.0 Any deviation taken against specification Yes/No 9.0 Deviations taken as mentioned here				
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<b>स्वत्वाधिकार एवं गोपनीय</b> 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	 22/09/15				
सामग्री सूची संख्या INVENTORY NO.	REV. NO. 06		निर्माणकर्ता WORKED BY	V. RAWAT	 22/09/15
			जांचकर्ता CHECKED BY	P.KUMAR	 22/09/15


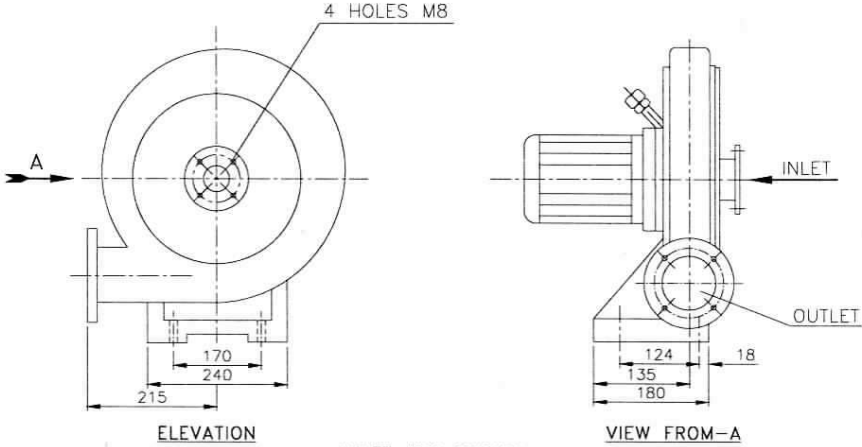


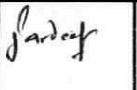


दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD ( STEAM TURBINE ENGINEERING )		ST- 39004	
				पृष्ठ 15 का 10 Page 10 of 15	
SUPERSEDES INVENTORY NO.	ANNEXURE-2				
सामग्री सूची संख्या को अधिकतम कला ह	<b>MOTOR DATA SHEET TO BE FURNISHED AFTER PLACEMENT OF PO FOR APPROVAL</b>				
COPYRIGHT 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	<b>1. GENERAL</b>				
	i) Vendor document no. and revision no./date : _____				
	ii) Project : _____				
	iii) Customer : _____				
	iv) BHEL- P.O. no. and date : _____				
	v) Manufacturer : _____				
	vi) Equipment driven by motor : _____				
	vii) Motor type : _____				
	<b>2. DESIGN AND PERFORMANCE DATA</b>				
	i) Frame size : _____				
	ii) Type of duty : _____				
	iii) Type of enclosure : _____				
	iv) Type of cooling ( IC ) : _____				
v) Applicable standard to which motor conforms : _____					
vi) Enclosure degree of protection ( IP ) : _____					
vii) Type of mounting : _____					
viii) Direction of rotation as viewed from non-driving end : _____					
ix) KW rating at 50 <sup>0</sup> c of ambient temp. : _____					
x) Rated voltage ( volts ) : _____					
xi) Rated frequency ( Hz ) : _____					
xii) Permissible variation of :					
a) Voltage ( Volts ) : _____					
b) Frequency ( Hz ) : _____					
c) Combind voltage and frequency ( absolute value ) : _____					
xiii) Minimum permissible starting voltage ( volts ) : _____					
दिनांक एवं हस्ताक्षर SIGN & DATE 26/9/15	REV. NO. 06	निर्माणकर्ता WORKED BY V. RAWAT			
सामग्री सूची संख्या INVENTORY NO. P-5135		जांचकर्ता CHECKED BY P.KUMAR			
		22/09/15			


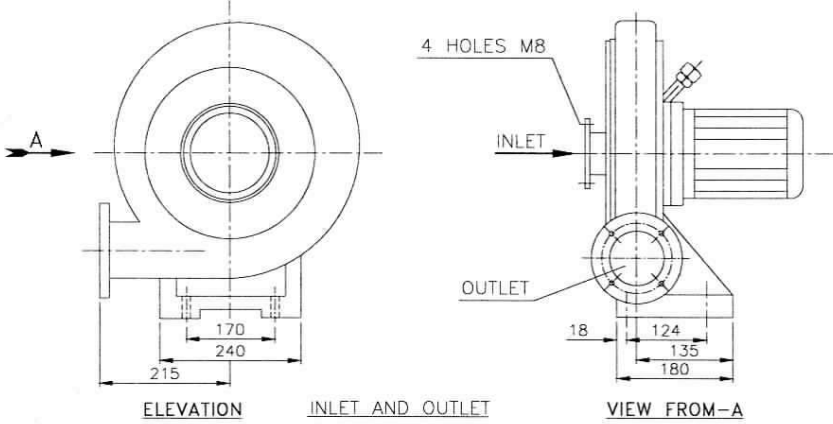
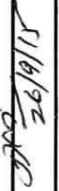

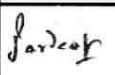
दिनांक एवं हस्ताक्षर SIGN & DATE		<b>उत्पाद मानक</b> <b>PRODUCT STANDARD</b> ( STEAM TURBINE ENGINEERING )	<b>ST- 39004</b> पृष्ठ 15 का 11 Page 11 of 15								
SUPERSEDES INVENTORY NO.  सामग्री सूची संख्या को अधिकारित करता है	xiv) Rated speed at rated voltage and frequency ( RPM ) : _____ xv) At rated voltage and frequency: a. Full load current : _____ b. No load current : _____ xvi) Power factor at : a. 100% load b. 75% load xvii) Efficiency at rated voltage and frequency at a. 100% load : _____ b. 75% load : _____ xviii) Starting current ( amps ) at a. 100% voltage : _____ b. 80% voltage : _____ xix) Starting time at 100% and 80% of rated voltage : _____ xx) Safe stall time with 110% of rated voltage : a. from hot condition : _____ b. from cold condition : _____ xxi) Torques : a. starting ( Kg-meter ) at 80% voltage : _____ b. pull up ( Kg-meter ) : _____ c. pull out ( Kg-meter ) : _____ d. rated torque ( Kg-meter ) : _____ xxii) Stator winding resistance per phase ( ohms ) : _____ xxiii) Flywheel moment ( GD <sup>2</sup> ) of motor ( Kg-m <sup>2</sup> ) : _____										
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<b>स्वत्वाधिकार एवं गोपनीय</b> 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 होनिकाएक हो न किया जाए ।											
दिनांक SIGN & DATE 											
सामग्री सूची संख्या INVENTORY NO. <b>P- 5135</b>	<b>REV. NO.</b>  <b>06</b>		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">निर्माणकर्ता WORKED BY</td> <td style="width: 20%;">V. RAWAT</td> <td style="width: 20%; text-align: center;">  </td> <td style="width: 40%; text-align: center;">22/09/15</td> </tr> <tr> <td>जांचकर्ता CHECKED BY</td> <td>P.KUMAR</td> <td style="text-align: center;">  </td> <td style="text-align: center;">24/9/15</td> </tr> </table>	निर्माणकर्ता WORKED BY	V. RAWAT		22/09/15	जांचकर्ता CHECKED BY	P.KUMAR		24/9/15
निर्माणकर्ता WORKED BY	V. RAWAT		22/09/15								
जांचकर्ता CHECKED BY	P.KUMAR		24/9/15								

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD ( STEAM TURBINE ENGINEERING )		ST- 39004	
				पृष्ठ 15 का 12 Page 12 of 15	
SUPERSEDES INVENTORY NO.	3. <u>CONSTRUCTIONAL FEATURE :</u> i) <u>STATOR WINDING INSULATION:</u> a. Class : _____ b. Tropicalised ( yes / no ) : _____ c. Temperature rise over specified ambient of 50 <sup>0</sup> c, max 70 <sup>0</sup> c ( yes / no ) : _____ d. Method of temp. measurement : _____ e. Stator winding connection : _____ f. Number of terminals brought out : _____ ii) <u>FOR SPACE HEATER:</u> a. Type of terminal box and degree of protection : _____ b. No. of space heaters : _____ c. Location : _____ d. Rated voltage & power : _____ e. Double compression cable glands with lugs provided ( yes / no ) : _____ f. Suitable for cable size : _____ iii) <u>FOR MAIN TERMINAL BOX :</u> a. Type of terminal box & degree of protection : _____ b. Double compression cable glands & lugs provided ( yes / no ) : _____ c. Suitable for cable size : _____ d. Terminal box capable of being rotated through 180 <sup>0</sup> in steps of 90 <sup>0</sup> ( yes / no ) : _____ e. Fault level (KA, sec.) : _____				
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स्वतन्त्रता एवं गोपनीय इस प्रलेख में दी गई सूचना भारत भारती 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 ।					
दिनांक SIGN & DATE 22/09/15					
INVENTORY NO. P-5135	REV. NO. 06			निर्माणकर्ता WORKED BY V. RAWAT	22/09/15
				जांचकर्ता CHECKED BY P. KUMAR	22/09/15

दिनांक एवं हस्ताक्षर SIGN & DATE		<b>उत्पाद मानक</b> <b>PRODUCT STANDARD</b> ( STEAM TURBINE ENGINEERING )	<b>ST- 39004</b> पृष्ठ 15 का 13 Page 13 of 15
सामग्री सूची संख्या INVENTORY NO.	iv) <u>BEARINGS :</u> a. Type ( at DE / NDE ) : _____ b. Make : _____ c. Recommended lubricant : _____ d. Life : _____ v) <u>STARTING SUITABLE FOR :</u> a. DOL only ( yes / no ) : _____ b. DOL as well as star-delta ( yes / no ) : _____ vi) <u>TOTAL WEIGHT OF MOTOR ( KG ):</u> : _____ 4. i) Noise level : _____ ii) Vibration level : _____ iii) Paint materials, thickness, color : _____ <p style="text-align: center;">Note : Supplier / vendor shall get the confirmation about paint from BHEL before manufacturing of motor.</p> 5. <u>DOCUMENTS :</u> i) Motor GA / dimensional drawings including terminal boxes : drg.no. :- _____ ii) <u>CURVES AT RATED VOLTAGE :</u> a. Starting current -vs- time curve : drg. no. :- _____ b. Speed -vs- starting time curve : drg.no. :- _____ c. Torque -vs- speed curve : drg.no. :- _____ d. Speed -vs- current curve : drg.no. :- _____ e. Thermal withstand curve for hot and cold conditions. : drg. no. :- _____		
<b>CROSS REFERRED STANDARDS:-</b> ISO VG 46 IS : 4722, IS : 325, IS : 2223, IS : 4029, IS : 4691 IS : 2148, IS : 3202, IS : 12075, ISO : 1940, IS : 12615-2011			
हस्ताक्षर एवं दिनांक SIGN & DATE	 26/9/15		
सामग्री सूची संख्या INVENTORY NO.	REV. NO. 06	निर्माणकर्ता WORKED BY V. RAWAT	 22/09/15
सामग्री सूची संख्या INVENTORY NO.	जांचकर्ता CHECKED BY P.KUMAR	 24/9/15	24/9/15

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक <b>PRODUCT STANDARD</b> ( STEAM TURBINE ENGINEERING )		<b>ST- 39004</b> पृष्ठ 15 का 14 Page 14 of 15	
सामग्री सूची संख्या INVENTORY NO.	<div style="text-align: right;">ANNEXURE-3</div> <div style="text-align: center;">  <p>4 HOLES M8</p> <p>ELEVATION</p> <p>VIEW FROM-A</p> <p>INLET AND OUTLET            CONNECTION NB100            OUT SIDE DIA 165            BOLT CIRCLE DIA 139</p> <p>VAR. 01</p> </div>				
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हस्ताक्षर एवं दिनांक SIGN & DATE					
सामग्री सूची संख्या INVENTORY NO.	REV. NO. 06		निर्माणकर्ता WORKED BY	V. RAWAT	 22/09/15
			जांचकर्ता CHECKED BY	P.KUMAR	 24/9/15



दिनक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक <b>PRODUCT STANDARD</b> ( STEAM TURBINE ENGINEERING )		<b>ST- 39004</b> पृष्ठ 15 का 15 Page 15 of 15	
सामग्री सूची संख्या INVENTORY NO.	ANNEXURE-4				
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	<div style="text-align: center;">  <p>             ELEVATION      INLET AND OUTLET      VIEW FROM-A              CONNECTION NB100              OUT SIDE DIA 165              BOLT CIRCLE DIA 139              VAR.02           </p> </div>				
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 ।					
हस्ताक्षर एवं दिनक SIGN & DATE					
सामग्री सूची संख्या INVENTORY NO.	REV. NO. 06		निर्माणकर्ता WORKED BY	V. RAWAT	 22/09/15
P-5135			जांचकर्ता CHECKED BY	P.KUMAR	 24/9/15

<b>Drawing No. - 4 18101-I4-005</b>		<b>REV. NO.-00</b> DATE- 21.05.25
APPLICATION : OIL VAPOUR EXHAUSTER FAN FOR STEAM TURBINE ITEM : MOTORS (AC)		
<b><u>ADDENDUM TO ST39004:</u></b>  <b><i>Following additional specifications shall be complied to: -</i></b> <ol style="list-style-type: none"> <li>(a) Motor Terminal box- fault level shall be 50 KA (rms) for 415V-AC system.            (b) Cable glands shall be Nickel-Chromium plated brass, heavy duty, double compression type, confirming to BS:6121 with lugs.            (c) The sizes of cables for glands will be intimated later on.</li> <li>Motor bearing shall be selected to take of the Vertical/Axial thrust of the motor and the bearing loading &amp; selection criteria shall be furnished.</li> <li>Motor shall be energy efficient conforming premium efficiency class IE-3 as per IS:12615.</li> <li>Starting current shall be less than or equal to six times the rated current with IS tolerance.</li> <li>Paint shade shall be as per "RAL 9002 (GREY) two coats of Red oxide Primer and Enamel paint.</li> <li>Reports of type tests shall be those conducted within last five years.</li> <li>Motor data sheets &amp; other documents shall bear the "Document no.", "Revision no.". &amp; "Date" and shall be subject to BHEL/customer approval.</li> </ol>		
<b>Prepared by(LKM)</b>	<b>Checked by (SK)</b>	<b>Approved by(VK)</b>



Vendors are supposed to fill relevant columns with Yes/ No.		
<b>PQR Clause Nos./infomration asked in PQR</b>	<b>Vendor Response in Yes/No</b>	<b>Additonal Information by vendor</b>
meeting Clause 1		
Filled table Submitted		
Copy of P.O submitted.		
Copy of earlier supplied GA, Technical Datasheet etc submitted to meet the PQR .		

## CHECK LIST (TECHNICAL)

Doc. No.: 4-119OVE-00001

Vendors are supposed to fill relevant columns with Yes/ No. It may be noted that this is not the specification. Incase of any discrepancy between the info in this document and the specification, the same is to be informed to BHEL in writing and clarified. Incase of any dispute, the specification shall prevail.

Technical Data	BHEL requirement	Vendor Response in Yes/No	Remarks (mention here the if equivalent or better or any deviation)
TYPE OF FAN OFFERED:	Centrifugal, mounted on Steel frame		
DISCHARGE PRESSURE OF OFFERED FAN	220mmWC		
RATED FLOW OF OFFERED EXHAUSTER FAN MOTR SET	0.11M3/SEC		
MOUNTING AND ORIENTATION	VAR 01 OF SPEC ST39004 , Page-14		
DEVIATION TAKEN WRT TO BHEL SPEC	No deviation		
GA drg of offered pump submitted alongwith offer	Submission required		
Datasheet of offered pump motor set submitted alongwith offer	Submission required		



**BHARAT HEAVY ELECTRICALS LIMITED, HARIDWAR**

Steam Turbine Engineering- Turbine Layout

**PRE-QUALIFICATION REQUIREMENT****Lube Oil vapour Exhauster**

DOCUMENT NO.

TL/OVE/PQR/20240423

Rev:00 Dt:23.04.24

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



# BHARAT HEAVY ELECTRICALS LIMITED, HARIDWAR

Steam Turbine Engineering- Turbine Layout

## PRE-QUALIFICATION REQUIREMENT

### Lube Oil vapour Exhauster

DOCUMENT NO.

TL/OVE/PQR/20240423

Rev:00 Dt:23.04.24

**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. The vapour exhauster used in system is along with motor, coupling, base plate and other accessories. The Oil Vapour exhauster should be of very reliable and proven design to maintain the required parameters in line with system requirements under all conditions.

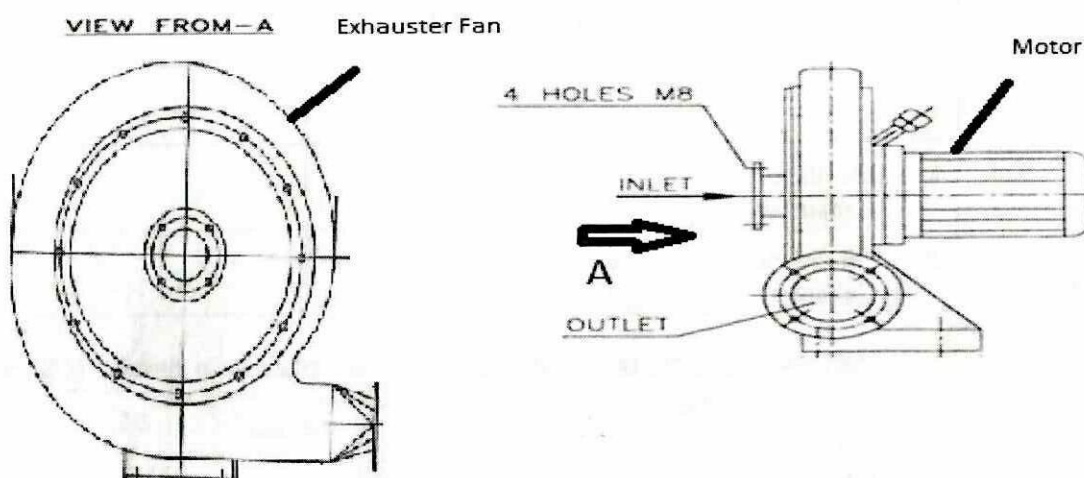


Figure 1

### 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 01.01.2014) with minimum following details – **Yes/No**.

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

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**.

Page 1 of 2

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	VAPOUR EXHAUSTER	QP NO.	QA/BE/QP/306									
				DATED & REV	19.03.2025 04									
		DRG. NO.	AS PER PO											
		SPEC.	ST39004											
		REV	AS PER PO		Page 1 of 2									
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, IMPELLER, BLADES & BASE FRAME/ PLATE, SLEEVE, Bearing etc.	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	V	
1.2	NUTS & BOLTS	TRADE MARK & PRPERTY CLASS	MAJOR	VISUAL	100%	AS PER VENDOR'S PROCEDURE	AS PER VENDOR'S PROCEDURE	IR	✓	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	V	Also Include Enclosure Certificate as per Spec
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	IR	✓	P	V	-	NOTE:1
2.2	IMPELLER	DIMENSIONS	MAJOR	MEASUREMENT	100%	ORDERING DWG	ORDERING DWG	IR	-	P	-	-	
		DIMENSIONS AFTER MACHINING	MAJOR	MEASUREMENT	100%	ORDERING DWG	ORDERING DWG	IR	-	P	-	-	
		DYNAMIC BALANCING	MAJOR	MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. / DATA SHEET	TC	✓	P	V	V	
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	V	

		LEGEND: RECORDS IDENTIFIED WITH '✓' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. <b>M:</b> MANUFACTURER / SUBCONTRACTOR <b>B:</b> BHEL / NOM. INSPECTION AGENCY <b>N:</b> CUSTOMER INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER	FOR CUSTOMER USE	
MANUFACTURER/ SUBCONTRACTOR				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	VAPOUR EXHAUSTER	QP NO.	QA/BE/QP/306								
				DATED & REV	19.03.2025 04								
		DRG. NO.	AS PER PO										
		SPEC.	ST39004										
		REV	AS PER PO		Page 2 of 2								
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		PERFORMANCE (INCLUDING EFFICIENCY, DISCHARGE, PRESSURE, POWER CONSUMPTION, DISCHARGE PRESSURE, DISCHARGE QUANTITY)	MAJOR	PERFORMANCE	100%	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	TC	✓	P	W	V	
3.4		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	V	
3.5		NOISE LEVEL	MAJOR	MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	IR	✓	P	W	V	
3.6		VIBRATION	MAJOR	MEASUREMENT	100%	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	IR	✓	P	W	V	
3.7		APPEARANCE 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	V	V	As per Customer/ BHEL Req. (if any)
3.8		COMPLIANCE OF TECHNICAL REQUIREMENTS	MAJOR	--	100%	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	COC		P	V	-	
3.9		COMPLETION OF DOCUMENTS	MAJOR	PHYSICAL	100%	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	ORDERING SPEC. / BHEL APPD. DRG. & DATA SHEET	DOCUMENTS	✓	P	V	-	
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: 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 3: One 'index' page containing the document descriptions, their page no's & QAP cl no. shall be attached upfront the inspection documents.

Note 4: For any spares item, apart from 'visual inspection' the 'interchangeability fitment certificate' or 'material TC' are to be submitted, with specific mentioning of the 'pert no/ item no of the approved GA/ x-sec drg.'.

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