



PRODUCT STANDARD

STEAM TURBINE ENGINEERING

ST 39012

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3.1 PUMP MOUNTING DETAILS

The pump shall be vertically mounted on the control fluid tank. The pump base plate shall match the counter flange provided on the tank as shown in annexure-I. OR AS PER THE SKETCH FURNISHED BY BHEL ALONG WITH ENQUIRY/ORDER CONFIRMATION FOR THE SAME IS TO BE GIVEN BY THE SUPPLIER.

3.2 FLUID SPECIFICATIONS


The fluid to be handled by the pump is a fire resistant fluid. The relevant properties of the fluid are as mentioned in Annexure-II.

4.0 PUMP TYPE & RATING :4.1 PUMP TYPE

The control fluid pump shall be of vertical, multistage, centrifugal type suitable for pumping control fluid. The control fluid pump shall combine a low pressure and a high pressure pump on a single shaft. Each pump shall have its own discharge flow/pressure characteristics. The total fluid flow needed for the low pressure and high pressure circuits flows through the low pressure pump and a pressure is built up according to the discharge flow/pressure curve of this part of the pump. After this stage, a part of the low pressure fluid is extracted and the remaining fluid flows through the high pressure pump where the pressure increases according to the discharge flow/pressure curve of the high pressure pump. The final discharge pressure from high pressure pump is addition of the pressures generated in the two pump sections.

4.2 PUMP RATING

The pump is required to operate normally at three duty points. The characteristics of both the pumps (low pressure and high pressure pumps) of Control fluid pump at

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the working fluid temperature of 55°C shall be as per the data sheet attached with the enquiry /order. The same are to be confirmed by the supplier at the time of submitting their offer.

Contd....

SUPERSEDES OLD TRACING BY NEW TRACING
 UNDER THE SAME NO.
 CHANGE ADVICE NO. STE-94-405.
 NAME R.C.A. SIGN *[Signature]* DATE 16-10-94

REVISION	WORKED BY	उमेश कुमार हल्द्वारा	<i>[Signature]</i>	21-10-94
	CHECKED BY	राजचंद अग्रवाल	राजचंद अग्रवाल	31.10.94



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5.0 MOTOR :

A suitable motor conforming to the pump requirement shall be supplied. The motor shall also meet other requirements as mentioned in Annexure-III.

6.0 DESIGN AND CONSTRUCTION OF PUMP :

6.1 All materials used in the construction of the pumps shall be selected from the range of materials most appropriately suitable for the purpose & service conditions. The bidder shall furnish along with 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. The size shall be standardised wherever possible so as to ensure interchangeability.

6.2 The materials of construction of the pumps shall be such as to resist corrosion and erosion and shall give a long trouble free service.

6.3 The lubrication of the pump bearing and gear coupling shall be arranged through a tapped connection on pump casing itself as shown in Annexure-I.

6.4 The design shall be such as to keep the friction loss and wear caused by end thrust, wear in mechanical seals and bearings and cavitation to the minimum. It should ensure long and trouble free service. All the rotating parts of the pump shall be balanced dynamically in assembled condition. The permissible level of vibration shall be according to VDI 2056 ^{or equivalent.} The noise level should not be more than 85 dba when measured at a distance of 1.5 m above floor and 1.0 m horizontally from equipment base plate.



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- 6.5 The pump bore and casing shall be capable of withstanding hydrostatic test pressure in line with para 9.2.1. 10.3.2 (e) ^⑥
- 6.6 Seals must comply with the following properties :
- Easy access and amenability for maintenance work.
 - No contamination of the medium from material abraded from the seals.
 - Minimum leakage losses with their controlled removal.
 - The material of seals should be resistant to fire resistant fluid (see Annexure-II - for properties of fire resistant fluid).
- 6.7 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 drawings.
- 6.8 Suitable thrust bearings shall be provided in the pumping set to take the thrust load of the pump & motor. The bearings shall be designed so as to assure 30,000 hours continuous service.
- 6.9 The mechanical design shall allow easy access to parts for maintenance work to be carried out.
- 6.10 Both the discharge branches of the pump shall be taken out above the base plate by the supplier.
- 6.11 The pumps shall be provided with drainage and venting devices.
- 6.12 All system parts conveying fluid shall be of fluid resistant construction.
- 6.13 Compression type fittings are not permissible.
- 6.14 For pump running at subcritical speeds, it shall be ensured, that the critical speed lies ^{minimum 15%} above the maximum speed attainable during operation. For pump running at



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supercritical 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.

6.15 NAME PLATE BILINGUAL [©]

Name plate identification marking shall be as follows in Hindi as well as in English languages.

- Type/Designation
- Manufacturer's name
- Manufacturer's works no.
- Year of manufacturing
- Purchase order no.
- High Pressure pump -
 - Volumetric flow(Litres/min.)
 - Discharge pressure(Bar/MWC)
- Low Pressure pump -
 - Volumetric flow (Litres/min.)
 - Discharge pressure(Bar/MWC).
- Operating Temp.(°C)
 - Max.
 - Min.
- Flow Medium
- Speed

7.0 COUPLING :

A suitable gear coupling shall be provided for coupling pump with motor and shall be designed to facilitate easy alignment and long trouble free service.

8.0 BASE PLATE, ANCHOR BOLTS, NUTS ETC. :

Necessary base plate, anchor bolts, nuts, sleeves and inserts shall be supplied by the supplier.



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9.0 CLEANING, PAINTING, CONSERVATION & PACKING

The surface shall be cleaned & prepared for the application of the coatings by blasting with non-silicatic abrasive agents. The protective coating shall be fluid resistant to prevent contamination of 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.

After testing the pump, its internals shall be thoroughly cleaned, dried and conserved before packing it. The pump shall be suitably packed for transportation. It should be packed such that it is safe at least for 2 years in a very damp and saline atmosphere.

Instructions should be issued regarding deconservation, reconservation and storage of package.

10.0 QUALITY ASSURANCE, INSPECTION & TESTING

- a) The manufacturer shall conduct all the tests required to ensure that all the component parts of the control Fluid Pump offered conform to the requirements of the specification and are in compliance with requirements of applicable codes and standards.
- b) The bidder shall submit along with his offer, quality plan in the enclosed format.



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- 10.1 The particulars of the proposed shop tests and procedures for the test shall be submitted to BHEL/its customer for approval along with quality plan.
- 10.2 The material shall be despatched only after inspection and clearance of material by BHEL/its customer and approval of test certificates by BHEL/its customer.
- 10.3 An indicative programme of minimum tests and checks to be carried out on the control fluid pump as envisaged by BHEL are given below. This is however not intended to form a comprehensive testing programme as it is supplier's responsibility to prepare detailed quality plan, which should also include tests, checks carried out by supplier as a part of their normal practice. The 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 finalisation. BHEL/its customer shall indicate customer hold points in approved Quality Plan beyond which work shall not proceed without the approval of BHEL. The supplier shall furnish his production plan and scheduled dates of testing atleast 3 months in advance to enable BHEL/its customer to plan for witnessing the tests, identified as customer hold points.



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- 10.3.1 Testing of materials -The material of each component shall be tested as per relevant specification for its chemical composition & mechanical properties viz, Y.S., UTS, Impact, % elongation, % R.A. etc. Suitable NDT to ensure freedom from surface and subsurface defects shall be carried out.
- 10.3.2 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 surface finish, axial & radial runout of shaft etc.
 - b) All the component parts of the pump shall be subjected to visual examination.
 - c) Impeller shaft and casing shall be subjected to MPE/DPT to ensure freedom from harmful surface defects. Shaft shall be subjected to UT examination to ensure freedom from harmful internal defects.
 - d) Complete rotor shall be subjected to dynamic balancing as per ISO - 1940 or equivalent.
 - e) Casing shall be subjected to hydraulic test at 1.5 times the design pressure.
 - f) All the welding shall be carried out as per qualified procedures and welders as per ASME section IX. All the welding in rotating and load carrying parts shall be subjected to



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to RT and DPT to ensure freedom from harmful internal and surface defects. Other weldments shall be subjected to DPT/MPI.

- g) Pump shall be subjected to performance test as per DIN 1944 or ^⑤equivalent. During performance test noise and vibration level shall be measured. Performance test shall be carried out with contract motor.
- h) Alignment checks for pump shaft and coupling to motor-shaft and coupling shall be carried out.
- i) Strip down examination after performance test shall be carried out and during strip down examination visual examination for wear ring clearance check, radial clearance and axial play of shaft, dimension/fitment of bearing housing, check for trueness of coupling and alignment shall be carried out.
- j) Type and routine test of motor as per IS: 325-1978. ^⑥
In addition to this degree of protection and noise level shall be carried out as type test and vibration measurement as routine test as per relevant IS.
- k) Check for completeness after reassembly shall be carried out.
- l) Check for painting and conservation shall be carried out.

11.0 SPECIAL TOOLS & TACKLES

One set of tools required for erection, operation and maintenance of the pumping sets shall be supplied together with each pump. List of these tools shall be



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submitted alongwith the offer.

12.0 SPARES :

The tenderer shall quote item wise price of the recommended spares for both pump & motor for three years and five years of operation respectively.

13.0 GUARANTEE :

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 is received by purchaser whichever occurs earlier.

13.2 The supplier shall guarantee the capacity, head and efficiency of the pump as per the tested characteristics with the control fluid.

13.3 If during erection and commissioning at site and operation during guarantee period, 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 findings of BHEL shall be final and binding on the supplier of pumping set.

13.4 The supplier shall repair/replace the defective parts at his own cost during the guarantee period.

14.0 DOCUMENTS REQUIRED WITH THE TENDER PROPOSAL :

Following documents shall be supplied by the tenderer with his tender proposal. In the absence of any of which, the offer may not



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be considered.

Examination of the pre-approval documents by BHEL shall not release the manufacturer and his sub-contractors, of their responsibilities. The approval documents shall form the basis for the order. No further changes shall be made without approval from BHEL.

- 14.1 Certified performance curves of both the pumps & control fluid pump (viz. Low pressure pump and high pressure pumps) at working fluid temperature of 20°C and 55°C.
- (a) Discharge vs head
 - (b) Discharge vs power input
 - (c) Discharge vs efficiency
 - (d) Speed vs torque
- 14.2 Cross sectional assembly drawing of the pump with the bill of material.
- 14.3 Pump, motor assembly drawing giving important dimensions, base plate details, suction & discharge nozzle details, details of lubrication arrangement, lifting lugs/ eye bolts locations, mounting arrangement showing static and dynamic loading.
- 14.4 Data required as per enclosed blank data sheet (Annexure-VI).
- 14.5 Quality plan in the enclosed format along with all the reference documents, inhouse ^{test} procedures etc. during the manufacture of the - pumping set.
- 14.6 Technical literature on the pumping set under offer. The technical literature shall particularly include detailed description, Assembly and dismantling instructions and instructions for erection, operation, cleaning and maintenance of the pumping set.
- 14.7 Technical details/data of motor offered in line with Annexure-III. Detailed filled



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up data sheets as per Annexure-IV shall be furnished after placement of the order.

15.0 DOCUMENTS TO BE SUPPLIED AFTER THE PLACEMENT OF ORDER :

Unless otherwise specified 15 copies and one reproducible each of the following documents duly approved by BHEL shall be furnished by the supplier within 12 weeks after the award of contract. BHEL's Customer name shall be indicated on the drawing/documents as per the instructions given in the Purchase Order.

- 15.1 General arrangement drawing, in line with para 15.3 above.
- 15.2 Cross sectional assembly drawing, with complete bill of materials.
- 15.3 Motor data as per enclosed format (Annexure IV).
- 15.4 Spare part list for both pump and motor.
- 15.5 Gear coupling details.
- 15.6 List of tools and tackles.
- 15.7 The static and dynamic loading details on support/foundation.
- 15.8 Operating instructions.
- 15.9 Cleaning and maintenance instructions
- 15.10 Assembly and dismantling instructions.
- 15.11 Instructions on deconservation and reconservations.
- 15.12 Model packing list.



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16.0 CERTIFICATES

Unless otherwise specified fifteen copies of following certificates in english language for each pumping set shall be supplied before the despatch of the equipment. The despatch clearance shall be given only after the approval of test certificates as is indicated 10.20 above.

16.1 Material test certificate for tests conducted as per clause 10.3.1 above ^{for} the main component parts such as impeller, casing, shaft, casing bolts, wear rings, pressure pipes, tooth type gear coupling, bearing supports, stuffing box, packing, mechanical seal etc.

16.2 Hydraulic test certificate.

16.3 Performance test reports and curves. Noise and vibration level report.

16.4 Type and routine reports of motor.

16.5 For all other tests/checks as is indicated in Quality Plan and is carried out by maker as his usual practice.

16.6 Shipping documents.

16.7 Guarantee certificates: Approval of test certificates by BHEL/its customer shall not relieve maker of his responsibility and guarantee of satisfactory performance for the stipulated period.

17.0 MISCELLANEOUS

The tenderer can make suitable offer even if there are minor deviations which do not affect the efficient functioning of the equipment. However, the deviations must be clearly spelled out in the offer, which can be incorporated in supply if duly approved by BHEL/Owner. Failure to do so shall render the supplier responsible for all consequences in the want of placement of an order.



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ANNEXURE I

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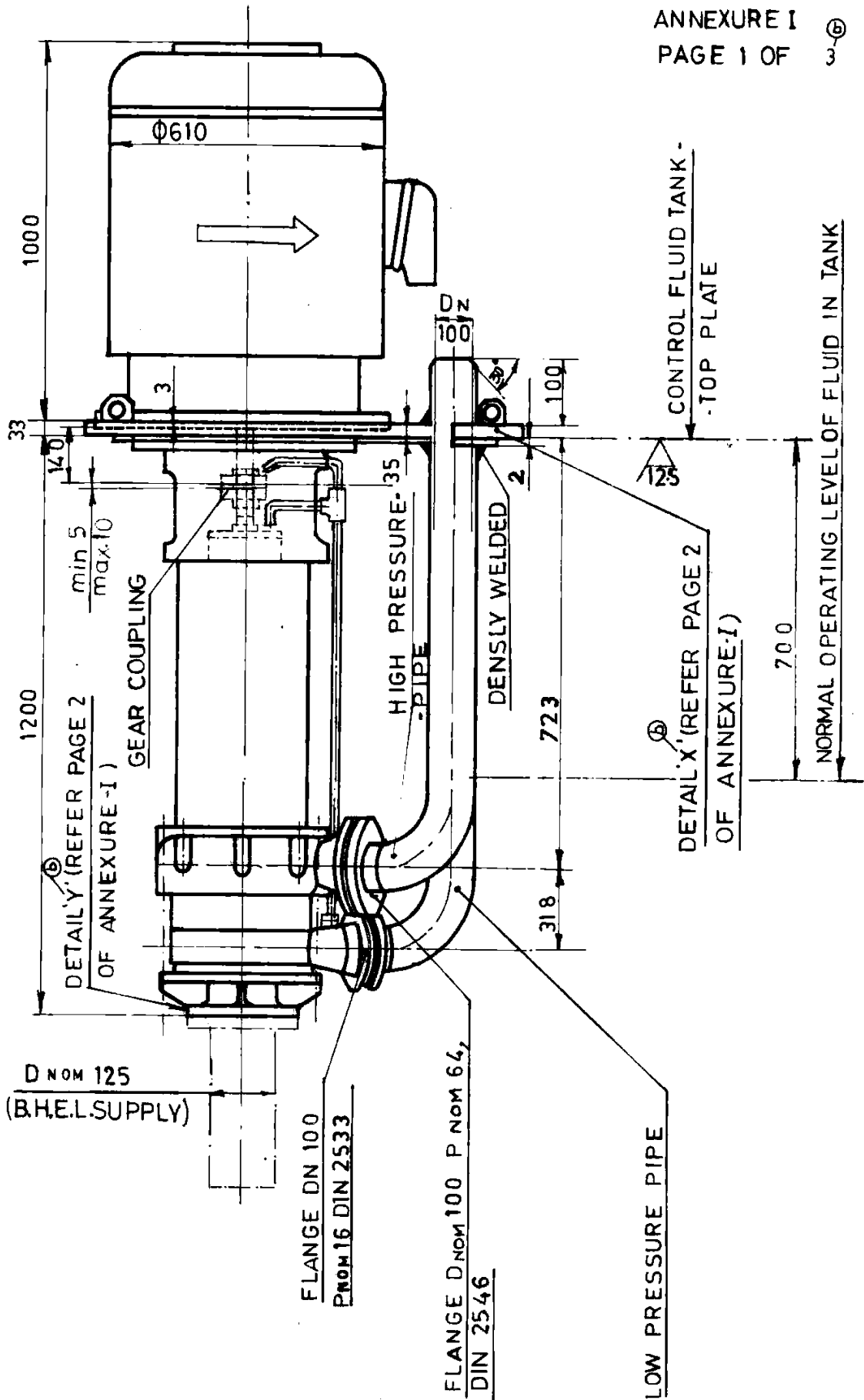
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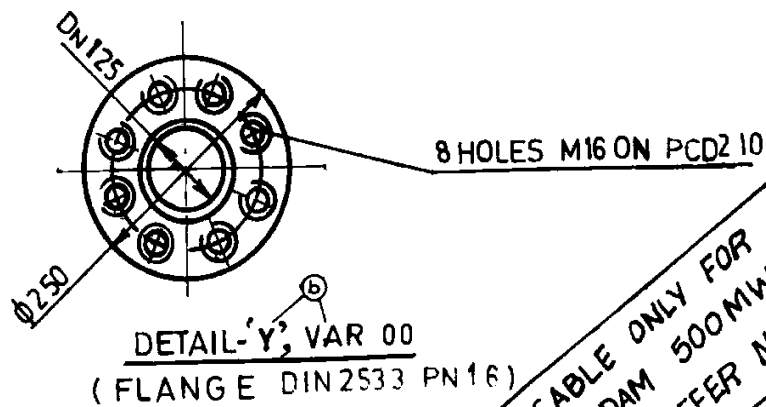
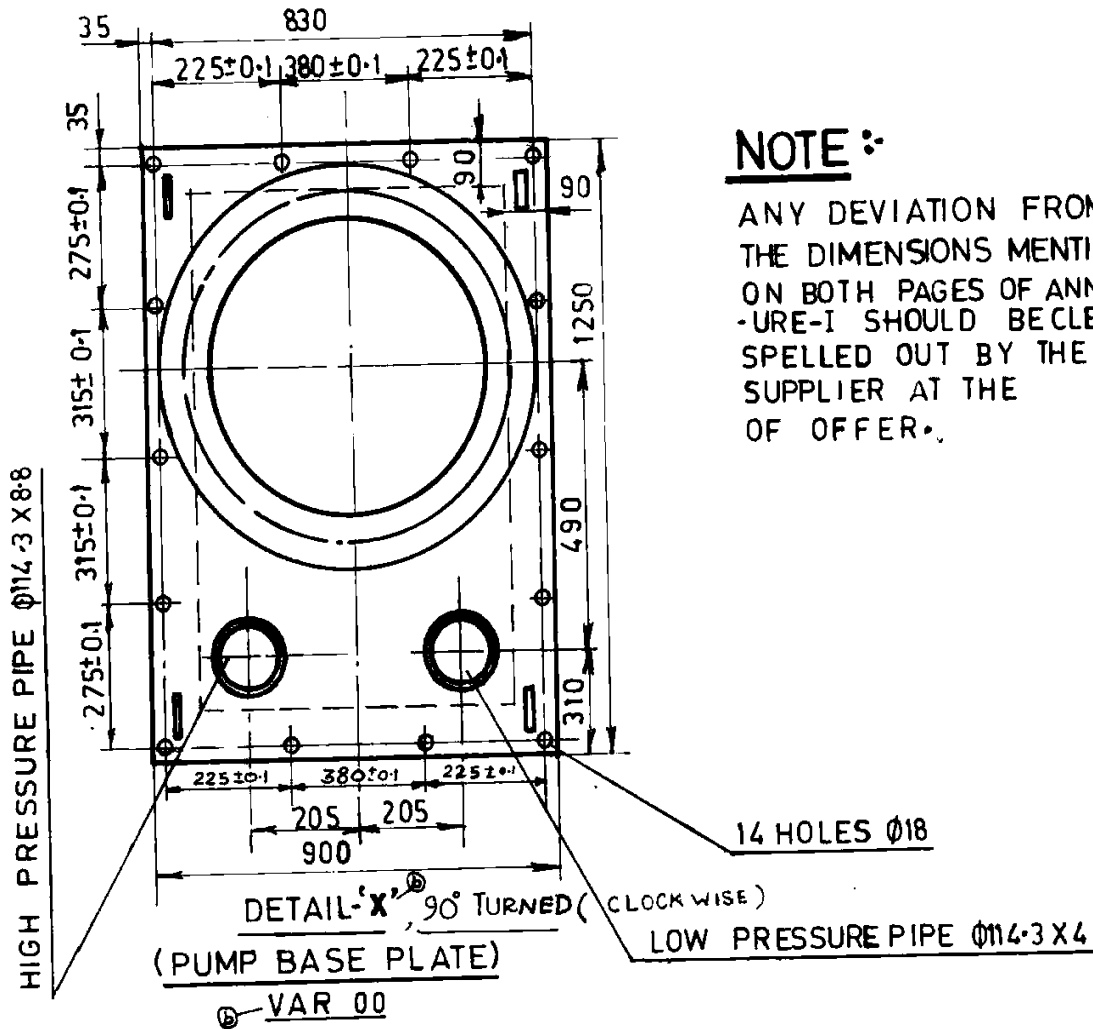
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REMARK:- APPLICABLE ONLY FOR SINGRAULI,
KORBA, & RAMAGUNDAM 500MW TG SETS.
FOR FUTURE SETS. REFER NEW SHEET 17



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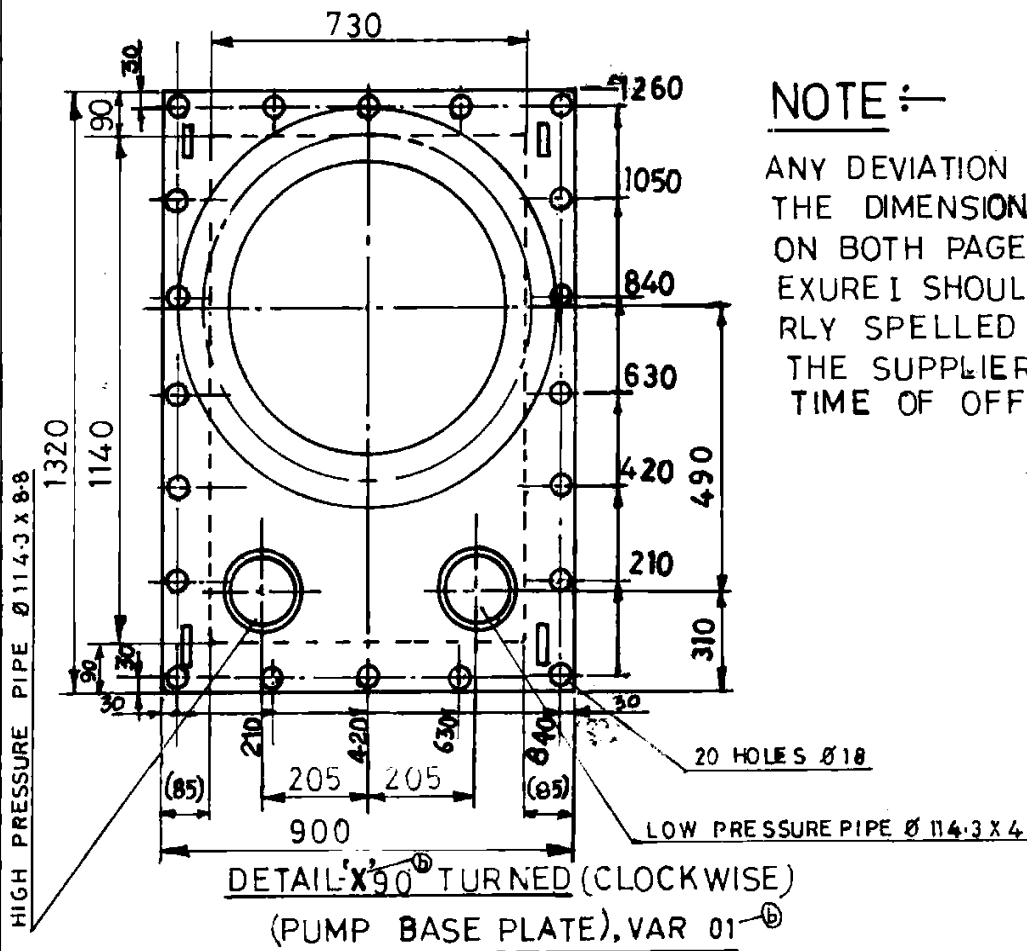
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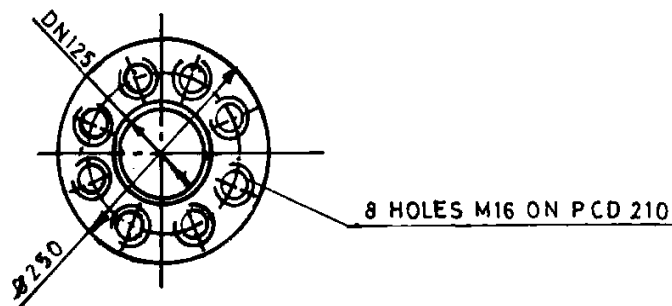
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**NOTE :-**

ANY DEVIATION FROM
THE DIMENSIONS MENTIONED
ON BOTH PAGES OF ANN-
EXURE I SHOULD BE CLEARLY
SPELLED OUT BY
THE SUPPLIER AT THE
TIME OF OFFER.



DETAIL 'Y', VAR 00

(FLANGE DIN 2533 PN16)



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ANNEXURE -II**WORKING FLUID SPECIFICATION**

Working fluid is a fire resistant fluid, consisting of phosphate esters of HS-D group, containing little water and Chlorine. Properties of the fire resistant fluid shall be as detailed below:

1. KINEMATIC VISCOSITY

at 55°C	21 mm ² /sec.
at 40°C) (Min) - 33 mm ² /sec.) (Max.) - 48 mm ² /sec.
at 20°C) (Min) - 115 mm ² /sec.) (Max.) - 210 mm ² /sec.

2. DENSITY

at 55°C	- 1.11 gm/cm ³
at 20°C	- 1.136 gm/cm ³

- | | |
|--------------------------------------|-----------------------|
| 3. Flash point | 235°C Min. |
| 4. Autoignition point | 500°C Min |
| 5. Pour Point | -18°C |
| 6. Water content | Max. 0.1% (By weight) |
| 7. Neutralisation No. | Max. 0.1 mg KOH/gm |
| 8. Chlorine content | 50 PPM (Max.) |
| 9. Air release property at 50°C | 5 minutes (Max.) |
| 10. Filtration class as per SAE A-6D | Class 6 |



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Annexure III

MOTOR - REQUIREMENTS

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- 1.0 A suitable motor conforming to the pump requirements shall be supplied. The motor shall also meet the following requirements broadly. The motor shall conform to IS: 4722, IS: 325, IS: 2253, IS: 2254, IS: 4029 and IS: 3202, or equivalent BS: specifications. The motor shall match the requirements of the driven equipment in all respects. The motor shall meet all Indian statutory requirements.

2.0 APPLICATION

To drive control fluid pump for supplying fluid to the governing elements.

3.0 TYPE OF MOTOR

Squirrel cage, induction motor.

- 3.1 KW rating of the motor should be the maximum of the following three conditions:

- 3.1.1 It shall have at least 15% reserve capacity than required to drive the pump when it is discharging maximum quantity at a viscosity corresponding to 50°C temperature.
- 3.1.2 It shall have at least 5% reserve capacity than required to drive the pump when it is discharging maximum quantity at a viscosity corresponding to 35°C temperature.
- 3.1.3 It shall have at least 5% reserve capacity than required to drive the pump when it is discharging 70% of maximum quantity at a viscosity corresponding to 20°C Temperature. Finally supplier shall furnish the KW rating at an ambient temperature of 50°C.

- 3.2 KW actually required : Pump capacity.
by driven equipment
under specified
operation/startup
conditions.

- 3.3 Rated Voltage : 415 V

Frequency : 50 Hz

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- 3.4 Permissible voltage and frequency variation under normal running condition. : $\pm 10\%$ Volt.
: $\pm 5\%$ frequency
- 3.5 Combined variation : 10 % (SUM OF ABSOLUTE VALUES)
- 3.6 Min. voltage required under starting conditions to bring driven equipment upto rated speed. : 80% rated
- 3.7 No. of phases : 3 ϕ
- 3.8 Type of duty : Continuous
- 3.9 Full load speed : It shall be commensurate with pump speed as per design.
- 3.10 Full load current : As per design
- 3.11 Starting current : Not to exceed 600% of I rated. (Subject to IS tolerance)
- 3.12 Starting torque : 1.3 (Min) of rated torque.
- 3.13 Break down torque : 2.05 times (min) of rated value.
- 3.14 Efficiency at full load : 90 % (Min)
- 3.15 Power factor at full load : 0.85 (Min)
- 3.16 Motor shall be designed to withstand the voltage and torque stresses developed due to the difference between the motor residual voltage and incoming supply voltage equal to 150% of the rated motor voltage during fast changeover of buses.
- 4.0 STARTING DATA
- 4.1 Starting : Suitable for DOL starting
- 4.2 Acceleration time with full load connected. : 3.5 \pm 0.5 Secs.
Min. locked rotor with-stand time under hot conditions at highest voltage: 2.5 sec. more than starting time.
- 4.3 Permissible starting duty cycle, No. of starts. : 3 Starts equally spread over an hour & 2 consecutive starts from hot condition without any injurious heating to the winding.



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- 4.4 Overload (% of full load): Motor shall be capable of that can be carried by running at full load at 80% of motor without impairing over-all performance and rated voltage for five minutes and period for which this and 70% of rated voltage for overload is applicable. 1 sec.
- 4.5 Location : Indoor
- 4.6 Class of Insulation : Class - F, Fungus resistant, Tropicalised as per IS: 3202, with temp. rise limited to 70°C over ambient of 50°C.
- 4.7 Shaft disposition mounting : Vertical / flange mounted
- 4.8 Method of connections driven equipment. : Flange flexible coupling
- 4.9 Direction of rotation and corresponding terminal designation. : To suit pump
- 4.10 Enclosure and ventilation: Totally enclosed, fan cooled, IP-55
- 4.11 Bearing : Thrust bearing, minimum standard life not less than 30000 working hrs
- 4.12 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.
- 4.13 Terminal connectors for stator leads type and No. : 6, Neutral shall be connected externally in the terminal box.
- 4.14 Terminal box : To be provided with double compression gland for aluminium cable.
- 4.15 Whether phases segregated : No
- 4.16 Space heater : To be provided
- 4.17 Rated voltage : 240 Volts
- 4.18 Motor shall be provided with paint suitable for the working conditions. (Material, thickness, colour as specified.)
- 4.19 Following tests shall be carried out:

Type and routine tests as per IS: 4722.

Following additional tests shall also be carried out:



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STEAM TURBINE ENGINEERING

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Annexure III
Page 4 OF 4

(1) TYPE TESTS

- (a) Measurement of Noise Level as per IS 12065. ^(c)
- (o) Degree of protection test to conform to the specified degree of protection.

(11) ROUTINE TESTS

- (a) 20% overspeed test for 2 minutes.
- (o) Measurement of vibrations. as per IS 12075. ^(c)

5.0 SPECIAL REQUIREMENTS

- 5.1 Separate terminal box and space heaters shall be provided. The motor shall be suitable to operate in an environment of oil fumes.
- 5.2 The motor shall be rewoundable.
- 5.3 The motor shall have on line greasing facility.
- 5.4 The motor construction shall be suitable for easy disassembly and reassembly.
- 5.5 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. It shall be capable of being rotated through 180° in steps of 90°. It shall be able to withstand a fault level of 45 KA for 0.12 sec, degree of protection IP-55. ^(f)
- 6.0 Documents :

^(f) Motor data sheets and documents as per Annexure - IV shall be furnished with the offer. Final data sheet & documents shall be subject to BHEL approval after placement of purchase order.

SIGN & DATE


SUPERSEDES
INVENTORY No.

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INVENTORY No.

SIGN & DATE	INVENTORY NO.		PRODUCT STANDARD		ST 39012
			STEAM TURBINE ENGINEERING		PAGE 23 OF 32
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.			ANNEXURE - IV DATA SHEET FOR AC-MOTOR SHEET 01 OF 04		
			1. GENERAL 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 : _____ 2. DESIGN AND PERFORMANCE DATA 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°C of ambient temp. : _____ x) Rated voltage (volts) : _____ xi) Rated frequency (Hz) : _____		
INVENTORY NO.	SIGN & DATE	SUPERSEDES OLD SHEET UNDER C/A NO. STE/01/183 <i>01-5-01</i>			
P-5510	<i>12/5/01</i>	WORKED BY	SCV <i>SCV</i>	1.5.01	
		CHECKED BY	V. KUMAR <i>V. KUMAR</i>	1.5.01	



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ANNEXURE - IV
SHEET 02 OF 04

xii) Permissible variation of:

a) Voltage (Volts)

b) Frequency (Hz)

c) Combine voltage and
frequency (absolute value)xiii) Minimum permissible starting
voltage (volts)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 voltagexx) Safe stall time with 110%
of rated voltage:

a. from hot condition

b. from cold condition

xxi) Torques:

a. starting (Kg-metre)
at 80% voltage

b. pull up (Kg-metre)

c. pull out (Kg-metre)

d. rated torque (Kg-metre)

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INVENTORY NO.

P-5510 12/5/01

SUPERSEDES OLD SHEET
UNDER C/A NO. STE/01/183

WORKED BY

SCV

1.5.01

CHECKED BY

V. KUMAR

1.5.01



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ANNEXURE - IV
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INVENTORY NO.

SIGN & DATE

P-5510 12/5/01

xxii) Stator winding resistance
per phase (ohms)

xxiii) Flywheel moment (GD^2) of
motor ($Kg-m^2$)

3. CONSTRUCTIONAL FEATURE :

i) STATOR WINDING INSULATION:

- Class
- Tropicalised (yes / no)
- Temperature rise over
specified ambient of $50^{\circ}C$, max $70^{\circ}C$ (yes / no)
- Method of temp. measurement
- Stator winding connection
- Number of terminals
brought out

ii) FOR SPACE HEATER:

- Type of terminal box and
degree of protection
- No. of space heaters
- Location
- Rated voltage & power
- Double compression cable glands
with lugs provided (yes / no)
- Suitable for cable size

iii) FOR MAIN TERMINAL BOX :

- Type of terminal box &
degree of protection
- Double compression cable glands
& lugs provided (yes / no)
- Suitable for cable size
- Terminal box capable of being rotated
through 180° in steps of 90° (yes / no)
- Fault level (KA , sec.)

^(f) SUPERSEDES OLD SHEET

UNDER C/A NO. STE/01/183

WORKED BY

SCV

1.5.01

CHECKED BY

V-KUMAR

1.5.01



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ANNEXURE - IV
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iv) BEARINGS :

- a. Type (at DE / NDE) _____
- b. Make _____
- c. Recommended lubricant _____
- d. Life _____

v) Starting suitable for :

- a. DOL only (yes / no) _____
- b. DOL as well as star-delta (yes / no) _____

vi) Total weight of motor (Kg) : _____

4. i) Noise level : _____

ii) Vibration level : _____

iii) Paint materials, thickness, colour : _____

Note : Supplier / vendor shall get the confirmation
about paint from BHEL before manufacturing of motor.

5. DOCUMENTS :

- i) Motor GA / dimensional
drawings including terminal boxes

drg.no. :- _____

ii) CURVES AT RATED VOLTAGE :

- a. Starting current -vs- time curve
- b. Speed -vs- starting time curve
- c. Torque -vs- speed curve
- d. Speed -vs- current curve
- e. Thermal withstand curve for
hot and cold conditions.

drg. no. :- _____

drg.no. :- _____

drg.no. :- _____

drg.no. :- _____

drg. no. :- _____

INVENTORY NO. SIGN & DATE

P-5510 12-15/01

(f) SUPERSEDES OLD SHEET
UNDER C/A NO. STE/01/183

WORKED BY

SCV QW

1.5.01

CHECKED BY

V.KUMAR

1.5.01

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STEAM TURBINE ENGINEERING




ANNEXURE-V
PAGE 1 OF 2

QUALITY CHECK PLAN


INVENTORY NO.	SIGN & DATE	COPYRIGHT AND CONFIDENTIAL		SUPERSEDES	SIGN & DATE
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Sl	Operation	Characteristics	Type of Check	Quantum of Check	Reference Document	Acceptance Norm	Format of Record	Agency
1	Material checking	Chemical composition and mechanical properties as per relevant standard.	Testing	100%				
2.	Dimensional checking	Visual and dimensional check including fits and tolerances, axial and radial runout of rotors.	Measurement	100%				
3.	N.D.T.	Check shaft and impeller for surface/subsurface defects.	N.D.T.	100%				
4.	Balancing	Dynamic balancing of all rotating parts in assembled condition.	Measurement	100%				
5.	Hyd. Test	Hydrostatic pressure test of casing.	Testing	100%				
6.	-	Direction of rotation of pump.	Visual					
7.	Performance Test	Performance test including noise and vibration level.	Testing	100%				
8.	Strip down Test	Open the end cover without dismantling the impeller. Check	Visual & measurement	100%				

QAX Deptt : S.S. Chauhan *S.S. Chauhan* 7/3/84

INVENTORY No. P. 5516	SIGN & DATE	COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.		SUPERSEDES INVENTORY No.	SIGN & DATE			
		PRODUCT STANDARD STEAM TURBINE ENGINEERING		ST 39012 PAGE 28 OF 32				
QUALITY CHECK PLAN ANNEXURE-V PAGE 2 OF 2								
Sl	Operation	Characteristics	Type of Check	Quantum of Check	Reference Document	Acceptance Norm	Format	Agency
9.	Conservation and packing	<p>the condition of the bearings. After reassembly, check the mechanical clearance and axial play of the shaft.</p> <p>After testing of pump, all internal/external surfaces shall be thoroughly cleaned, dried and conserved. All metallic surfaces except bright parts exposed to weather shall be given a suitable priming coat and then two coats of approved paints.</p>	Visual	100%				
10.	Motor	<p>Ensure packing of all items in water and dust proof packages. The packages shall be sufficiently strong to safe guard against any damage during transit.</p>	Type and routine tests as per relevant standards of Motor.	Testing	100%			
11.	Certificates	<p>Completeness & correctness of test certificates as per Purchase specification.</p>	Visual	100%				

QA Deptt: S.S. Chauhan
 By Chauhan
 7.5.84

SIGN & DATE	ST 39012	 PRODUCT STANDARD STEAM TURBINE ENGINEERING	PAGE 29 OF 32																															
			ANNEXURE-VI PAGE 1 OF 3																															
SUPERSEDES INVENTORY No.	DATA TO BE FURNISHED BY BIDDER ALONG WITH BID FOR CONTROL FLUID PUMP																																	
INVENTORY No. P-5570	SIGN & DATE	1.0 <u>Equipment and Service offered.</u> Please state whether the following equipment service as specified in the data sheets are offered or not.																																
		<table border="0"> <tr> <td>1.1 Pump as per specification</td> <td>Yes/No</td> <td></td> <td></td> </tr> <tr> <td>1.2 Motor</td> <td>Yes/No</td> <td></td> <td></td> </tr> <tr> <td>1.3 Necessary instruments, test connections</td> <td>Yes/No</td> <td></td> <td></td> </tr> <tr> <td>1.4 Base plate as per arg.</td> <td>Yes/No</td> <td></td> <td></td> </tr> <tr> <td>1.5 Companion flanges</td> <td>Yes/No</td> <td></td> <td></td> </tr> <tr> <td>1.6 Spare parts</td> <td>Yes/No</td> <td></td> <td></td> </tr> <tr> <td>1.7 Maintenance and special erection tools.</td> <td>Yes/No</td> <td></td> <td></td> </tr> <tr> <td>1.8 Commissioning of the set</td> <td>Yes/No</td> <td></td> <td></td> </tr> </table>			1.1 Pump as per specification	Yes/No			1.2 Motor	Yes/No			1.3 Necessary instruments, test connections	Yes/No			1.4 Base plate as per arg.	Yes/No			1.5 Companion flanges	Yes/No			1.6 Spare parts	Yes/No			1.7 Maintenance and special erection tools.	Yes/No			1.8 Commissioning of the set	Yes/No
1.1 Pump as per specification	Yes/No																																	
1.2 Motor	Yes/No																																	
1.3 Necessary instruments, test connections	Yes/No																																	
1.4 Base plate as per arg.	Yes/No																																	
1.5 Companion flanges	Yes/No																																	
1.6 Spare parts	Yes/No																																	
1.7 Maintenance and special erection tools.	Yes/No																																	
1.8 Commissioning of the set	Yes/No																																	
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.		2.0 <u>Design and Performance</u>																																
		2.1 Rated capacity of each pump $m^3/hr.$																																
		2.2 Discharge head at rated capacity.																																
		2.3 Maximum discharge																																
		2.4 Minimum discharge pressure corresponding to maximum flow.																																
		2.5 Shut off head																																
		2.6 Performance guaranteed when installed as per given arrangement. Yes/No																																
		2.7 Pump b.h.p./kw at rated capacity.																																
		2.8 Maxm. allowable suction lift (for minimum NPSH required).																																
		2.9 Efficiency.																																
		②-10 Rated speed (s^{-1})																																
		②-11 Rated power requirement (kw)																																
		②-12 Installed actual power (kw)																																

High Pr. Pump	Low Pr. Pump
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PRODUCT STANDARD
STEAM TURBINE ENGINEERING

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ANNEXURE-VI
PAGE 2 OF 3

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INVENTORY No.

P-5510

3.0 Material of construction

(TO BE CORRELATED WITH CROSS SECTIONAL DRAWING) ⑤

3.1 Casing**3.2 a) Impeller ⑤**

b) GUIDE WHEEL

3.3 Base plate**3.4 Wearing rings****3.5 Shaft****3.6 Stuffing box****3.7 Packing****3.8 Mechanical seal****4.0 Connection****4.1 Suction size****4.2 Discharge size****5.0 Drawings.**

5.1 General arrangement and sectional args. enclosed with offer.

Yes/No

6.0 Weight Schedule**6.1 Weight of pump****6.2 Weight of motor****6.3 Weight of pump with motor and base frame**⑤ **7.0 Characteristic curves**

7.1 CHARACTERISTIC OF TORQUE

7.2 7.1 Power consumption/
discharge pressure7.3 7.2 Discharge quantity/
pressure a) LOW PRESSURE PUMP
b) HIGH PRESSURE PUMP

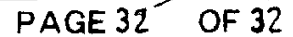
7.4 7.3 Discharge/efficiency

7.5 MOMENT OF INERTIA

**8.0 any deviation taken
against specification**

Yes/No

**9.0 Deviations taken as
mentioned here.**




INVENTORY NO.		SIGN & DATE		It m																	
P. 5570	REVISION			DEPTT.	TGE	STE	AME	DME	HGE	HTE	ACE	HXE	MTE	CFX	IN-SUL SYS.	HLE	TSX	THC	PPX	MCX	CSX
						✓											✓			X④	
				DEPTT.	AIX	MSX	CCX	FAX	TFX	TLX	TTX	TTX-ST	TTX-HT	TTX-EM	WT	QAX	QCX	PCM	WC 202	WC 205	WC 227
												✓				✓	✓				
P. 5570	REVISION			DEPTT.	FBM BL II	HTM	STM	W.C 632	ACM	CIM	FBM BLV	SUM	WWM	FBM BL VIII							
						✓															
														DRAWN		S.C.G.		7.3.84			
														WORKED		R.C.A.		7.3.84			
														CHECKED		G.K.D.		8.3.84			

NTPC QUALITY PLAN

	MANUFACTURERS NAME & ADDRESS:		MANUFACTURING QUALITY PLAN					PROJECT: _____ PACKAGE: _____ CONTRACT NO.: _____ CONTRACTOR: _____							
			ITEM: _____			QP NO. _____									
			SUB-SYSTEM: _____			REV. _____									
						DATE: _____									
					PAGE _____ OF _____										
SL NO.	COMPONENT OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS		
									D*	M	C	N			
1	2	3	4	5	6	7	8	9	10				11		
			LEGEND: * RECORDS IDENTIFIED WITH TICK SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER / SUB-CONTRACTOR C: CONTRACTOR NOMINATED INSPECTION AGENCY N: NTPC INDICATE “ P ” PERFORM “ W ” WITNESS AND “ V ” VERIFICATION AS APPROPRIATE “ CHP ” NTPC SHALL IDENTIFIED IN COLUM “ N ”					FOR NTPC USE:		DOC NO.					
MANUFACTURER / SUB- CONTRACTOR		CONTRACTOR													
SIGNATURE:								REVIEWED BY:		NAME & SIGN OF APPROVING AUTHORITY & SEAL					

QUALITY PLAN

 QC-178		Q.P. NO. _____ REV _____ SPEC. NO. _____ REV _____ DRG. NO. _____ REV _____						SHEET _____ OF _____ LEGENDS P-Performed by 1-BHEL REP W-Witnessed by 2-Vendor V-Verified by 3-Subvendor				
		SL NO 1	COMPONENT OPERATION 2	CHARACTERISTICS 3	CLASSIFICATION 4	TYPE OF CHECK 5	QUANTUM 6	REFERENCE DOCUMENT 7	ACCEPTANCE NORMS 8	FORMAT OF RECORDS 9	AGENCY <div> P W V </div>	
Empty row for data entry												