TECHNICAL DELIVERY CONDITIONS AND GENERAL FEATURES FOR PUMP INCLUDING SPECIFIC REQUIREMENT OF QUALITY

1.0 DESIGN AND CONTRUCTION OF PUMP

1.1 All materials used in the construction of the pump shall be selected from the range of material 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 review and acceptance by BHEL / owner. BHEL / owner reserve the right to ask for change in material. The size shall be standardized so as to ensure interchangeability.

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

1.3 The supplier shall also furnish the method and frequency of lubrication of the bearings and quantity & type of lubricant required for normal operation but lubrication of bearings with the oil being handled is preferred.

1.4 The design shall be such as to keep the friction loss and wear caused by end thrust, wear in mechanical seals and bearings & cavitation to the minimum. It should ensure long and trouble free service. The rotor of the pump should be balanced dynamically so that the vibration is minimum. The sound pressure level of pump motor set should not be more than 85 dba when measured at a distance 1.5 m above floor and 1.0m horizontally from equipment base plate.

1.5 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) Minimum leakage losses with their positive removal.

1.6 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 drawings.

1.7 Pump bearings shall be designed so as to ensure 30,000 hrs. continuous service.

1.8 The mechanical design shall allow easy access to parts for maintenance work to be carried out. Screw and nuts must be locked to prevent loosening.

				नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
			अनुवादक TRANSLATED BY		
TSX	A.K.CHATURVEDI		निर्माणकर्ता WORKED BY	DHARAMPAL	16/06/06
QAX	S.S.Chauhan		जांचकर्ता CHECKED BY	ANUJ JAIN	16/6/06
सहमत विभाग AGREED DEPTT	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	S.C.AGRAWAL	
			स्वीकृति APPROVED :	(A.K.JAIN) AGM	21.08.06
REV.NO. 04			निर्माण PREPARED STE(TL/TA)	जारी ISSUED TSX	दिनांक DATE 31-08-1984
Dt. 21.08.06					

सामग्री सूची संख्या INVENTORY NO. P 55339

हस्ताक्षर एवं दिनांक SIGN & DATE 21/8/06

1.9 The discharge branch of the pump shall be taken out above the base plate by the supplier.

1.10 The pumps shall be provided with drainage and venting devices.

1.11 All pump parts conveying oil shall be of oil tight construction. Compression type fittings are not permissible.

1.12 Pump running at subscritical speeds, it shall be ensured that the critical speed lies above the maximum speed attainable during operation with a minimum margin of 15% of rated speed.

For pump running at supercritical speeds, it shall be ensured that there is a difference of sufficient magnitude. The margin between the bordering critical speeds and pump rated speed shall be at least 20% of the rated speed. The type of coupling between pump & drive unit is to be taken into account while calculating the critical speeds for bending forces.

1.13 Seals are to be designed such that they can be removed and reinstalled several times with out effecting the sealing quality.

1.20 **COUPLING**

Suitable coupling with guards shall be provided for coupling pump with motor and shall be designed to facilitate easy alignment. One set of coupling pins/ bolts shall be supplied in spare.

1.30 **FOUNDATION**

The pumps shall be mounted in the oil tank and hung from base plate at the tank top into the tank. For further details please refer the drawing No. attached herewith **(STE-TL-001).** All the seating machined surfaces of the base plate to be maintained for 0.5 mm flatness.

1.40 **SPECIAL TOOL & 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 submitted along with the offer.

2.0 **QUALITY ASSURANCE, INSPECTION AND TESTING**

2.1 The manufacturer shall conduct all tests required to ensure all the component parts of the pump offered conform to the requirements of the specification and is in compliance with the requirements of applicable codes and standards.

2.2 The bidder shall submit alongwith his offer quality plan in the enclosed format and in line with clause 2.0

2.3 The particulars of the proposed shop tests and proceudres for the tests shall be submitted to BHEL / its customer for approval along with quality plan.

2.4 The equipment shall be dispatched only after inspection and clearance of material by BHEL/ its customer and approval of test certificates by BHEL/ its customer.

2.5 The minimum tests/ checks to be carried out on the pump 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. BHEL/ its customer reserves the right to ask for any more checks at the time of quality plan finalisation.

2.5.1 **Testing of Materials**

The material of each component shall be tested as per relevant specification for its chemical composition and mechanical properties viz. **YS, Impact, %age elongation % RA** etc. Suitable NDT to ensure freedom from surface and subsurface defects shall be carried out.

2.5.2 Following tests shall be carried out during various stages of manufacturing at manufacturer's 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 on machined surfaces of casing and welds of discharge pipe, ultrasonic test on shaft (≥50mm) to be carried out.

(c) Dynamic balancing of the rotor as per ISO 1940 (Gr.6.3) or VDI 2060 or. equivalent.

(d) Pump casing and discharge pipe shall be subjected to hydraulic pressure test at 2 times the working pressure or 1.5 times the pump shut-off head whichever higher. Pump impeller shall be subjected to suitable NDT method like MPI/ DPT for surface defect examination.
The pressure test shall be carried out with original bolts. Duration of hydraulic test shall be 30 minutes. The testing should be carried out at manufacturer's works in the presence of BHEL's / customer representative.

(e) Performance test with one of the contract motor (A.C.) shall be carried out.However, in case of D.C. motor the performance test may be carried out with test bed motor. Performance test shall include verification of pump characteristics e.g. discharge Vs pressure, power consumption, efficiency, vibration and noise level etc.

These tests should be conducted as per DIN1944 class III or equivalent in the presence of BHEL/ customer. The characteristics have to be certified by BHEL/ customer representative.

(f) Strip down examination to check the condition of bearing, mechanical clearances, axial play of the shaft etc.

(g) Check the condition of the oil seals and any seepage of oil through the seals.

2.5.3 After testing the pump, all the surfaces and internals 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. Ensure assembly of all the components of pump as one unit and pack in water and dust proof package. The packages should be sufficiently strong to safeguard against any damage during transit and is safe for two years in a very damp atmosphere.

2.5.4 Test certificates indicating the test results of material testing NDT, dynamic balancing, hydraulic test, performance test, strip down examination etc. shall be furnished.

3.0 PREAPPROVAL DOCUMENTS AT THE TIME OF OFFER

3.1 Assembly drawing with parts lists. Nozzle sizes and their coordinates base plate details and cross sectional arrangement along with static and dynamical loading.

3.2 Calculation with necessary drawings (Torque / speed characteristics etc.) power requirement.

3.3 All welding shall be carried by qualified welder as per ASME sec.IX.

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

3.5 Quality plan, detailing out various stages of manufacturer along with relevant documents standards, acceptance levels, inspection document raised.

4.0 DOCUMENTS TO BE SUPPLIED AFTER THE PLACEMENT OF ORDER

These shall be supplied in 10 copies each or two copies and a set of reproducible.

4.1	Contractual drawings	: 8 weeks
4.2	Overhaul and spare parts lists	: 8 weeks
4.3	Equipment description	: 8 weeks
4.4	O & M manual (10 hard copy + 2CD)	:12 weeks
4.5	Record of test on noise levels before dispatch	
4.6	Record of test to DIN 1944-III or equivalent	: Before dispatch or equivalent.
4.7	List of tools and tackles	: 8 weeks
4.8	The static/ dynamic loading details on support/ foundation should be furnished	: 8 weeks

5.0 NAME PLATE IDENTIFICATION MARKING SHOULD BE AS FOLLOWS

The rating plate is to be made of **X12** or **Ni188** and plates should be provided in Hindi and English both.

5.1 Type/ Designation.

5.2 Manufacturer.

5.3 Manufacturer`s works No.

5.4 Year of manufacturing.

5.5 Purchaser`s order No.

5.6 Volumetric flow (l / m)

5.7 Discharge pressure (Bar/ MWC)

5.8 Operating temp. (In ^{0} C)

5.9 Flow medium.

5.10 Speed.

6.0 **CLEANING & PAINTING, CONSERVATION, PACKING**

The surface shall be thoroughly cleaned of all mill scales, oxide and other coatings. The protective coating should be oil resistant to prevent contamination of oil specified and to prevent the deterioration of the coating itself. The supplier shall give exact and precise details about the measures envisaged by him for internal and external surface protection, which shall be checked & approved by BHEL/ Owner. All surfaces, which will not be easily accessible after the shop assembly shall before hand be treated and protected for life of the equipment.

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

Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.

7.0 **GENERAL**

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 as per Annexure-I 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.

8.0 **GUARANTEE**

8.1 The supplier shall guarantee trouble free and satisfactory operation of the equipment for a period of 12 months after the installation and commissioning or for a period of 18 months from the day the equipment leaves the supplier's works.

8.2 The supplier shall guarantee the capacity, head and efficiency of the pump as per the tested characteristics with oil.

8.3 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 within a week time after receipt of assessment report. The supplier if he so desire, may depute his representatives to site at his own cost otherwise the findings of BHEL representative shall be final and binding on the supplier of pumping set.

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

9.0 **SPARES**

The supplier shall quote item wise price of recommended spares for 3 years and 5 years operation respectively.

ANNEXURE-I
DATA TO BE FURNISHED BY BIDDER ALONG WITH BID FOR OIL PUMP

1.0 EQUIPMENT AND SERVICE OFFERED

Please state whether the following equipment service as specified in the data sheet are offered or not.

1.1	Pump as per specification	Yes/ No
1.2	Motor / Make	Yes/ No
1.3	Necessary instruments, Test connections	Yes/ No
1.4	Base plate as per drg.	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

2.0 DESIGN AND PERFORMANCE

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 guarantee when installed as per given arrangement.	Yes/No
2.6	Pump B.H.P./KW at rated capacity.	
2.7	Maximum allowable suction lift (for minimum NPSH REQUIRED).	
2.9	Efficiency.	
3.0	**MATERIAL OF CONSTRUCTION**	
3.1	Casing.	
3.2	Impeller.	
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 drawings 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.

7.0 **CHARACTERISTIC CURVES**

7.1 Power consumption / discharge flow.

7.2 Discharge quantity / Pressure.

7.3 Discharge / efficiency.

8.0 **Any deviation taken against specifications.** Yes/No

9.0 **Deviation taken as mentioned here.**

10.0 **CONSTRUCTION FEATURES**

10.1 Type of pumps.

10.2 No. of stages.

10.3 Type of impeller.

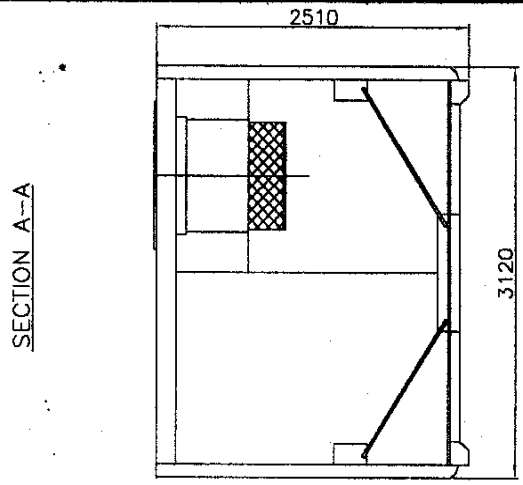
10.4 Type of stuffing box sealing offerred.

10.5 Type of coupling offered.

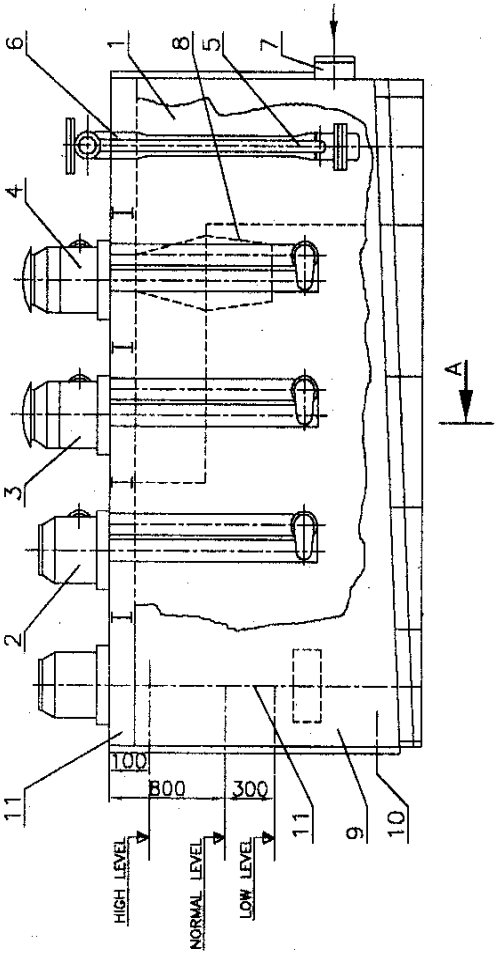
10.6 Type of bearing and lubriction.

10.7 Impeller diameter.

11.0 Cross referred Standards: Nil

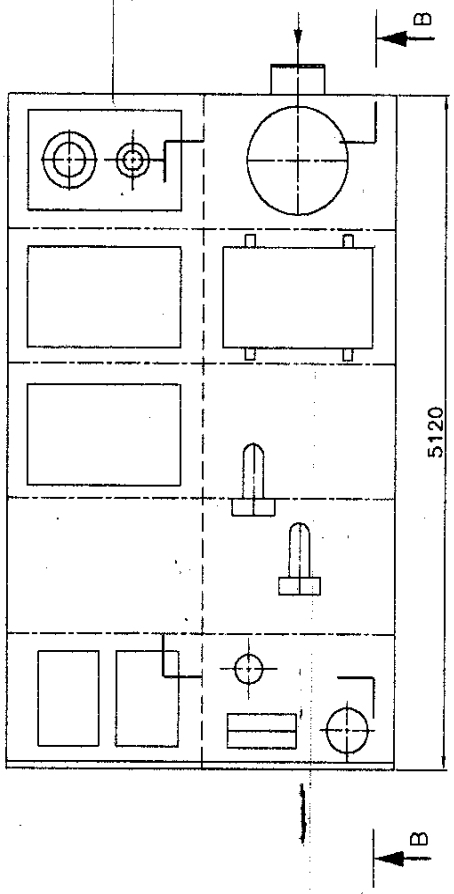


SECTION A–A



SECTION B–B

1. TANK.
2. D.C. BEARING OIL PUMP.
3. A.C. AUXILIARY OIL PUMP.
4. A.C. AUXILIARY STAND BY OIL PUMP.
5. INJECTION PIPE.
6. SUCTION PIPE (INJECTOR).
7. INLET.
8. STRAINER.
9. PARTITION.
10. DRAIN.
12. JACKING OIL PUMP.



OIL TANK ARRANGEMENT
DRG. NO. STE–TL–001

निर्माणकर्ता WORKED BY	DHARAMPAL		16/06/06
जाँचकर्ता CHECKED BY	ANUJ JAIN		16/6/06

REV. NO. 04

INVENTORY NO. P_5539

SIGN & DATE 21/9/06

TECHNICAL SPECIFICATION FOR AUXILIARY OIL PUMP SET (CENTRIFUGAL PUMP)

1.0 INTENT OF SPECIFICATION:-

THIS SPECIFICATION IS INTENDED TO COVER DESIGN, MANUFACTURE, ASSEMBLY, TESTING AND DELIVERY OF PUMP SET COMPLETE WITH BASE PLATE, LIFTING LUGS, COUPLING, MOTOR AND OTHER ACCESSORIES IF FELT NECESSARY BY SUPPLIER.

THE PUMPING SETS ARE INTENDED FOR OPERATION IN CONJUCTION WITH STEAM TURBINES AND SHOULD BE SUITABLE FOR CONTINUOUS OPERATION AT AN AMBIENT TEMPERATURE OF 50°c + AVERAGE HUMIDITY 90% AND MAXIMUM HUMIDITY 100%.

2.0 FUNCTION:-

A.O.P. COMES IN OPERATION WHEN THE TURBINE IS INITIALLY STARTED AND WHENEVER PRESSURE IN THE LINE IS BELOW SET POINT, GOVERNING SYSTEM IS TO BE CHARGED AND LUBE OIL SUPPLY IS NEEDED FOR THE BEARING. THESE ARE TWO IN QUANTITY / SET. ONE PUMP IS KEPT AS STANDBY PUMP.

3.0 APPLICABLE CODE/STANDARD:- IS:4722, IS:325, IS:2253, IS:2254, IS:3202, IS:4029.

4.0 OIL SPECIFICATION:-

THE OIL TO BE HANDLED BY THE PUMP IS SERVOPRIME-46 OR IOC 46 OF IOC BRAND AND TURBINOL-47 OF M/S HINDUSTAN PETROLEUM CORPORATION LTD. (ISO VG 46).

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.)

				NAME	SIGNATURE & DATE
			अनुवादक TRANSLATED BY	-	
TSX	AK CHATURVEDI		निर्माणकर्ता WORKED BY	DHARAMPAL	27/03/06
QAX	S S Chauhan		जांचकर्ता CHECKED BY	ANUJ JAIN	27/3/06
सहमत विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	S.C.AGRAWAL	27/3/06
			स्वीकृति APPROVED : (A.K.JAIN) AGM		
REV.NO. 06	(SUPERSEDES)		निर्माण PREPARED : STE	जारी ISSUED : TSX	दिनांक DATE : 03-08-84
Dt. 07-04-06					

हस्ताक्षर एवं दिनांक SIGN & DATE
सामग्री सूची संख्या INVENTORY NO. P-5541
सामग्री सूची संख्या को अधिक्रमित करता है SUPERSEDES INVENTORY NO.
हस्ताक्षर एवं दिनांक SIGN & DATE

5.0 PUMP SPECIFICATION:–

5.1 IDENTIFICATION NO. TO BE MENTIONED ON NAME PLATE MAV22AP001 AND MAV23AP001.

5.2 DESIGN TEMPERATURE = 100°C
OPERATING TEMPERATURE = 65°C
NORMAL SUCTION PRESSURE = 0.05 Bar
MINIMUM SUCTION PRESSURE = 0.025 Bar

VARIANT NUMBER	NORMAL DISCHARGE CAPACITY (Liter/Min)	NORMAL DISCHARGE PRESSURE (Bar)	MAXIMUM DISCHARGE CAPACITY (Liter/Min)	MAXIMUM DISCHARGE PRESSURE (Bar)
VAR. 1	2544	7.0	4700	6.6
VAR. 2	3248	6.1	4560	5.8
VAR. 3	2820	6.6	5355	6.2
VAR. 4	3240	7.4	5460	6.6
VAR. 5	3060	7.3	6600	7.1
VAR. 6	2544	8.0	4700	6.6
VAR. 7	2356	7.4	3204	6.9
VAR. 8	2905	8.2	5177	6.6
VAR. 9	1930	7.5	–	–
VAR. 10	2880	6.7	6016	6.3
VAR. 11	3060	7.3	6600	7.1
VAR. 12	3180	8.2	5400	6.6
VAR. 13	1852	8.0	4649	7.0
VAR. 14	2767	8.0	2392	8.3
VAR. 15	2774	8.4	5144	8.0
VAR. 16				
VAR. 17				

5.3 DURING INITIAL STARTUP IN WINTER OIL TEMPERATURE MAY GO AS BELOW AS 20°C. THE CAPACITY OF MOTOR SHALL BE AS INDICATED IN CLAUSE NO. 7.3 OF THIS SPECIFICATION.

5.4 PUMP WITH DROOPING CHARACTERSTIC SHALL NOT BE ACCEPTABLE.

5.5 PUMP SHALL BE SUITABLE FOR MOUNTING VERTICALLY ON THE OIL TANK & PUMP BED PLATE SHALL MATCH THE COUNTER FLANGE PROVIDED ON THE TANK AS PER SKETCH ON SHEET NO. 6.

5.6 PUMP SUPPLIER SHALL FURNISH THE PERMISSIBLE TIME FOR THE OPERATION OF PUMP AT SHUT OFF LOAD.

6.0 MOTOR:–

A SUITABLE MOTOR CONFORMING TO THE PUMP REQUIREMENT SHALL BE SUPPLIED. THE MOTOR SHALL ALSO MEET THE FOLLOWING REQUIREMENTS BROADLY. THE MOTOR SHALL CONFIRM TO IS:4722, IS:325, IS:2253, IS:2254, IS:4029 & IS:3202 OR EQUIVALENT BS: SPECIFICATIONS. THE MOTOR SHALL MEET ALL INDIAN STATUTORY REQUIREMENTS.

6.1 APPLICATION:–

TO DRIVE OIL PUMP FOR SUPPLYING OIL TO BEARING & GOVERNING ELEMENTS.

6.2 TYPE OF MOTOR:–

SQUIRREL CAGE, INDUCTION MOTOR.

6.3 KW RATING OF THE MOTOR SHOULD BE THE MAXIMUM OF THE FOLLOWING THREE CONDITIONS:

6.3.1 IT SHALL HAVE ATLEAST 15% RESERVE CAPACITY THAN REQUIRED TO DRIVE THE PUMP WHEN IT IS DISCHARGING MAXIMUM QUANTITY AT A VISCOSITY CORRESPONDING TO 50°C TEMPERATURE.

6.3.2 IT SHALL HAVE ATLEAST 5% RESERVE CAPACITY THAN REQUIRED TO DRIVE THE PUMP WHEN IT IS DISCHARGING MAXIMUM QUANTITY AT A VISCOSITY CORRESPONDING TO 35°C TEMPERATURE.

6.3.3 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° TEMPERATURE. FINALLY SUPPLIER SHALL FURNISH THE KW RATING AT AN AMBIENT TEMPERATURE OF 50°C.

6.4	KW ACTUALLY REQUIRED BY DRIVEN EQUIPMENT UNDER SPECIFIED OPRATION/ STARTUP CONDITIONS.	: PUMP CAPACITY
6.5	RATED VOTAGE	: 415V
	FREQUENCY	: 50 Hz
6.6	PERMISSIBLE VOLTAGE AND FREQUENCY VARIATION UNDER NORMAL RUNNING CONDITIONS.	: ±10% VOLT. ± 5% FREQUENCY
6.7	COMBINED VARIATION	: 10% (SUM OF ABSOLUTE VALUES)
6.8	MINIMUM VOLTAGE REQUIRED UNDER STARTING CONDITION TO BRING DRIVEN EQUIPEMENT UPTO RATED SPEED.	: 80% RATED
6.9	NO. OF PHASES	: 3 ø
6.10	TYPE OF DUTY	: CONTINUOUS
6.11	FULL LOAD SPEED	: IT SHALL BE COMMENSURATE WITH PUMP SPEED AS PER DESIGN.
6.12	FULL LOAD CURRENT	: AS PER DESIGN.
6.13	STARTING CURRENT	: NOT TO EXCEED 600% OF RATED CURRENT (EXCLUSIVE OF IS TOLERANCES)
6.14	STARTING TORQUE	: 1.3 (MIN.) OF RATED TORQUE.
6.15	BREAK DOWN TORQUE	: 2.05 TIMES (MIN.) OF RATED VALUE.
6.16	EFFICIENCY AT FULL LOAD	: 90% (MIN.)
6.17	POWER FACTOR AT FULL LOAD	: 0.85% MINIMUM

6.18 MOTOR SHALL BE DESIGNED TO WITH STAND 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.

7.0 STARTING DATA:

7.1	STARTING	: SUITABLE FOR DOL STARTING.
7.2	ACCELERATION TIME WITH FULL LOAD CONNECTED.	: 3.5 ± 0.5 SECS.

7.3 LOCKED ROTOR WITHSTAND TIME UNDER HOT CONDITION AT RATED VOLTAGE SHALL BE AT LEAST 2.5 SEC. MORE THAN STARTING TIME.

7.4	PERMISSIBLE STARTING DUTY CYCLE NO. OF STARTS.	: 3 STARTS EQUALLY SPREAD OVER HOUR AND 2 CONSECUTIVE STARTS FROM HOT CONDITION WITHOUT ANY INJURIOUS HEATING TO THE WINDING.
7.5	OVER LOAD (% OF FULL LOAD) THAT CAN BE CARRIED BY THE MOTOR WITHOUT IMPAIRING, OVERALL PERFORMANCE AND PERIOD FOR WHICH THIS OVERLOAD IS APPLICABLE.	: MOTOR SHALL BE CAPABLE OF RUNNING AT FULL LOAD AT 80% OF RATED VOLTAGE FOR FIVE MINUTES AND 70% OF RATED VOLTAGE FOR 1 SEC.
7.6	LOCATION	: INDOOR
7.7	CLASS OF INSULATION	: CLASS–F, FUNGUS RESISTANT, TROPICALISED AS PER IS:3202 WITH TEMP. RISE LIMITED TO THAT OF CLASS B.

7.8	SHAFT DISPOSITION MOUNTING	: VERTICAL / FLANGE MOUNTED
7.9	METHOD OF CONNECTION DRIVEN EQUIPEMENT.	: FLANGE FLEXIBLE COUPLING.
7.10	DIRECTION OF ROTATION AND CORRESPONDING TERMINAL DESIGNATION.	: TO SUIT PUMP
7.11	ENCLOSURE AND VENTILATION	: TOTALLY ENCLOSED FAN COOLED IP-55
7.12	BEARING	: THRUST BEARING MIN. STANDARD LIFE OF NOT LESS THAN 30,000 WORKING HOURS.
7.13	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.
7.14	TERMINAL CONNECTORS FOR STATOR HEADS TYPE AND NUMBER.	: 6 NEUTRAL SHALL BE CONNECTED EXTERNALLY IN THE TERMINAL BOX.
7.15	TERMINAL BOX	: TERMINAL BOX SHALL BE PROVIDED WITH DOUBLE COMPRESSION TYPE BRASS CABLE GLANDS AND COPPER CABLE LUGS TO MATCH OWNER'S ALUMINIUM CABLES, THE SIZE OF WHICH WILL BE INTIMATED AT THE TIME OF ORDERING. TERMINAL BOX SHALL BE CAPABLE OF BEING ROTATED THROUGH 180° IN STEPS OF 90° AND IT SHALL HAVE A DEGREE OF PROTECTION OF IP:55. IT SHALL ALSO BE SUITABLE TO WITHSTAND THE FAULT LEVEL OF 50 KA FOR 0.25 SEC.
7.16	WHETHER PHASES SEGREGATED	: NO
7.17	SPACE HEATER	: TO BE PROVIDED
7.18	RATED VOLTAGE FOR SPACE HEATERS	: 240 VOLTS

8.0 SPECIAL REQUIREMENTS

8.01 THE MOTOR SHALL BE RE-WOUNDABLE.

8.02 THE MOTOR SHALL HAVE ON LINE GREASING FACILITY.

8.03 THE MOTOR CONSTRUCTION SHALL BE SUITABLE FOR EASY DIASSEMBLY AND REASSEMBLY.

8.04 THE MOTOR SHALL BE SUITABLE FOR WORKING IN AN ENVIRONMENT OF OIL FUMES WITHOUT ANY HAZARD.

8.05 SEPARATE TERMINAL BOX FOR SPACE HEATERS SHALL BE PROVIDED.

8.06 MOTOR SHALL BE PAINTED WITH PAINT SUITABLE FOR WORKING CONDITION AND ITS COLOUR SHALL BE INTIMATED AT THE TIME OF ORDERING.

9.0 TESTS AT MANUFACTURE'S WORKS:

(i) MOTOR AFTER COMPLETE ASSEMBLY SHALL BE SUBJECTED TO BOTH TYPE AND ROUTINE TESTS AS PER IS: 4722.

(ii) IN ADDITION THE FOLLOWING TESTS SHALL ALSO BE CARRIED OUT:

REV. NO. 06		निर्माणकर्ता WORKED BY	DHARAMPAL	Dhal	27/03/06
		जांचकर्ता CHECKED BY	ANUJ JAIN	Jain	27/3/06

हस्ताक्षर एवं दिनांक SIGN & DATE 20/4/06
सामग्री सूची संख्या INVENTORY NO. P-5541

ADDITIONAL TYPE TEST:

(a) DEGREE OF PROTECTION TEST TO CONFORM TO THE SPECIFIED DEGREE OF PROTECTION.

(b) MEASUREMENT OF NOISE LEVEL AS PER IS: 12065. MOTOR NOISE LEVEL SHALL BE LIMITED SO AS TO ACHIEVE COMBINED PUMP MOTOR NOISE LEVEL AS PER CLAUSE 1.4 OF ST38013.

ADDITIONAL ROUTINE TESTS:

(a) 20% OVERSPEED TEST FOR 2 MINUTES.

(b) MEASUREMENT OF VIBRATION AS PER IS: 12075.

10.0 DOCUMENTS TO BE SUPPLIED WITH OFFER:–

THE OFFER SHOULD BE ACCOMPANIED WITH FOLLOWING DOCUMENTS IN TWO COPIES. THE OFFER WILL NOT BE CONSIDERED IF ALL THESE DOCUMENTS ARE NOT SUPPLIED.

10.1 CHARACTERISTICS AT 80%, 100% AND 110% VOLTAGES.

10.1.1 STARTING CURRENT V/S TIME.

10.1.2 TORQUE V/S SLIP.

10.1.3 THERMAL WITHSTAND CHARATERISTIC FOR HOT AND COLD CONDITION.

10.2 TYPE AND FRAME SIZE.

10.3 STARTING TIME

10.3.1 WITH 100% VOLTAGE AT TERMINAL.

10.3.2 WITH 80 % VOLTAGE AT TERMINAL.

10.4 SAFE STALL TIME AT 110% VOLTAGE UNDER HOT CONDITION.

10.5 POWER (Kw) RATING CALCULATION W.R.T. PUMP REQUIREMENT.

10.6 EXPECTED LIFE OF BEARING.

11.0 DOCUMENTS TO BE FURNISHED WITHIN FOUR WEEKS OF PLACEMENT OF ORDER (FOR BHEL OR THEIR CUSTOMER'S APPROVAL):–

11.1 SIX HARD COPIES AND ONE SOFT COPY (IN PDF FORMAT) OF MOTOR DATA SHEET AND G.A. DRAWING.

11.2 DRAWING SHOWING TERMINAL DETAIL OF ALL TERMINALS AND LOCATION AND DIMENSION OF TERMINAL BOXES.

11.3 ROTOR WEIGHT AND TOTAL MOTOR WEIGHT.

11.4 CHARACTERISTIC CURVES OF THE MOTOR.

12.0 SIX COPIES OF TESTS CARRIED OUT AS PER CLAUSE NO. 9.0 ON EACH MOTOR SHALL BE FURNISHED TO BHEL FOR SCRUTINY AND APPROVAL. ONLY ON ACCEPTANCE FROM BHEL SIDE, MOTOR CAN BE CONSIDERED SUITABLE FOR DISPATCH.

13.0 FOR TECHNICAL DELIVERY CONDITON AND GENERAL FEATURES OF PUMP, PLEASE REFER ST38013.

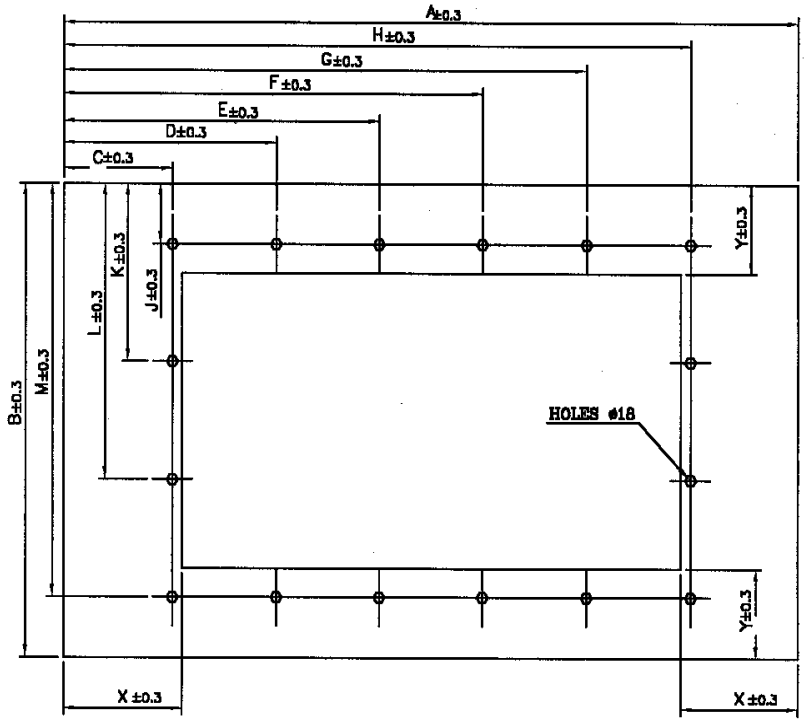
14.0 CROSS REFERRED STANDARDS:

IS:325, IS:4722, IS:2253, IS:2254, IS:3202, IS:4029, IS:12065, IS;12075, ST38013.

REV. NO.		निर्माणकर्ता WORKED BY	DHARAMPAL		
06		जांचकर्ता CHECKED BY	ANUJ JAIN		

P-5541

BED PLATE EXISTING ON OIL TANK



BED PLATE TYPE	A±0.3	B±0.3	C ±0.3	D ±0.3	E±0.3	F ±0.3	G±0.3	H ±0.3	J ±0.3	K±0.3	L ±0.3	M±0.3	X ±0.3	Y ±0.3	NO. OFF HOLES
AA	1500	900	50	330	610	890	1170	1450	72.75	324.25	575.75	827.25	100	100	16

TECHNICAL SPECIFICATION FOR EMERGENCY OIL PUMP SET (CENTRIFUGAL PUMP)

1.0 INTENT OF SPECIFICATION:–

THIS SPECIFICATION IS INTENDED TO COVER DESIGN, MANUFACTURE, ASSEMBLY, TESTING AND SUPPLY OF PUMP SETS COMPLETE WITH BASE PLATE, LIFTING LUGS, COUPLING, MOTOR WITH STARTING RESISTANCE AND OTHER ACCESSORIES IF FELT NECESSARY BY THE SUPPLIER.

THE PUMPING SETS ARE INTENDED FOR OPERATION IN CONJUCTION WITH STEAM TURBINES AND SHOULD BE SUITABLE FOR CONTINUOUS OPERATION AT AN AMBIENT TEMPERATURE 50°c & AVERAGE HUMIDITY 90% AND MAXIMUM HUMIDITY 100%.

2.0 FUNCTION:–

WHEN THERE IS AC POWER FAILURE, THIS PUMP COMES IN OPERATION WITH DC POWER SUPPLY. MAINLY THE FUNCTION OF THIS PUMP IS TO SUPPLY OIL TO BEARINGS SO AS TO SAVE THESE FROM STARVATION DURING EMERGENCY. THIS IS ONE IN QUANTITY/SET.

3.0 APPLICABLE CODE/STANDARD:–

IS:2253, IS:2254, IS:3202, IS:4691, IS:4722 AND IS:4729.

4.0 OIL SPECIFICATION:–

THE OIL TO BE HANDELED BY THE PUMP IS SERVOPRIME–46 OR IOC–46 OF IOC BRAND AND TURBINOL–47 OF M/S HINDUSTAN PETROLEUM CORPORATION LTD. (ISO VG–46).

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.)

				NAME	SIGNATURE & DATE
CIE	VINOD KUMAR		अनुवादक TRANSLATED BY	-	
TSX	AKCHATURVEDI		निर्माणकर्ता WORKED BY	DHARAMPAL	14/8/06
QAX	S S Chauhan		जांचकर्ता CHECKED BY	ANUJ JAIN	14/8/06
सहमत विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	S.C.AGRAWAL	28/6/06
			स्वीकृति APPROVED :	(A.K.JAIN) AGM	21.08.06
REV.NO. 04 (SUPERSEDES)			निर्माण PREPARED :	STE (TL/TM)	जारी ISSUED : TSX
Dt. 31.08.06					दिनांक DATE : 03-08-84

हस्ताक्षर एवं दिनांक SIGN & DATE 21/9/06
सामग्री सूची संख्या INVENTORY NO. P-5540

5.0 PUMP SPECIFICATION:-

5.1 IDENTIFICATION NO. TO BE MENTIONED ON NAME PLATE MAV24AP001

5.2 TYPE CENTRIFUGAL TYPE

DESIGN TEMPERATURE = 100°C

OPERATING TEMPERATURE = 65°C

NORMAL SUCTION PRESSURE = 0.05 Bar

MINIMUM SUCTION PRESSURE = 0.025 Bar

VARIANT NUMBER	NORMAL DISCHARGE CAPACITY (Litre/Min.)	NORMAL DISCHARGE PRESSURE (Bar)
VAR. 1	1800.00	2.3
VAR. 2	1920.00	1.7
VAR. 3	1200.00	2.0
VAR. 4		
VAR. 5		

5.3 DURING INITIAL STARTUP IN WINTER OIL TEMPERATURE MAY GO AS BELOW AS 20°C. MOTOR SHALL BE CAPABLE OF STARTING AND CONTINUOUS RUNNING OF THE PUMPING SET AT THIS SPECIFIED VALUE OF TEMPERATURE .

5.4 PUMP WITH DROOPING CHARACTERSTIC SHALL NOT BE ACCEPTABLE.

5.5 PUMP SHALL BE SUITABLE FOR MOUNTING VERTICALLY ON THE OIL TANK AND PUMP BED PLATE SHALL MATCH THE COUNTER FLANGE PROVIDED ON THE TANK AS PER SKETCH ON SHEET NO. 6.

5.6 PUMP SUPPLIER SHALL FURNISH THE PERMISSIBLE TIME FOR THE OPERATION OF PUMP AT SHUT OFF LOAD.

6.0 MOTOR:-

A SUITABLE MOTOR CONFORMING TO THE PUMP REQUIREMENT SHALL BE SUPPLIED. THE MOTOR SHALL ALSO MEET THE FOLLOWING SPECIFICATIONS BROADLY. THE MOTOR SHALL CONFIRM TO IS:2253, IS:2254, IS:3202 AND IS:4722 OR EQUIVALENT BS: SPECIFICATIONS. THE MOTOR SHALL MEET ALL INDIAN STATUTORY REQUIREMENTS.

6.1 APPLICATION:-

TO DRIVE OIL PUMP FOR SUPPLYING OIL TO BEARINGS IN THE EVENT OF A.C.

6.2 TYPE OF MOTOR:-

SEPARATELY EXCITED OR COMPOUND MOTOR WITH 10% COMPOUNDING .

6.3 KW RATING:-

IT SHALL HAVE AT LEAST 25% RESERVE CAPACITY THAN REQUIRED TO DRIVE THE PUMP WHEN IT IS DISCHARGING MAX. QUANTITY, AT VISCOSITY CORRESPONDING TO 65°C. FINALLY SUPPLIER SHALL MENTION KW RATING AT AN AMBIENT TEMP. OF 50°C.

6.4 KW ACTUALLY REQUIRED BY DRIVE EQUIPMENT UNDER SPECIFIED OPERATING AND START UP CONDITION. : PUMP CAPACITY

6.5 RATED VOLTAGE : 220 V D.C.
220 V D.C.FIELD.

6.6	PERMISSIBLE VOLTAGE VARIATIONS UNDER NORMAL RUNING CONDITIONS.	: −15% +10%
6.7	MINIMUM VOLTAGE REQUIRED UNDER STARTING CONDITION TO BRING DRIVEN EQUIPEMENT UPTO RATED SPEED.	: 80% RATED CURRENT
6.8	TYPE OF DUTY	: CONTINUOUS
6.9	FULL LOAD SPEED	: IT SHALL BE COMENSURATE WITH PUMP SPEED AS PER DESIGN.
6.10	FULL LOAD CURRENT	: AS PER DESIGN.
6.11	STARTING CURRENT	: 3 TO 3.5 TIMES. I RATED
6.12	STARTING TORQUE	: 3 TO 3.5 TIMES. TORQUE
6.13	EFFICIENCY AT FULL LOAD	: 85% MINIMUM

7.0 STARTING DATA

7.1 STARTING

SUITABLE FOR DIRECT ON LINE STARTING WITH A PERMANENT RESISTANCE CONNECTED IN THE ARMATURE CIRCUIT. UNDER THIS CONDITION MOTOR SHALL BE CAPABLE OF DRIVING THE PUMP AT 100% LOAD. THE MOTOR SHALL ACCELARATE TO FULL SPEED WITH FULL LOAD CONNECTED WITHIN 3±0.5 SECONDS. SUCH RESISTANCE SHALL ALSO BE INCLUDED IN THE OFFER. THE RESISTANCE SHALL BE FOR CONTINUOUS DUTY. THE RESISTANCE BOX ENCLOSURE TEMP. RISE OVER AMBIENT SHOULD NOT EXCEED 70°C AND IT IS OF FeCr−Al OR CUPRO−NICKLE TYPE SHOULD HAVE IP21 (MIN.) DEGREE OF PROTECTION.

7.2 STARTING RESISTANCE BOX/PANEL SHALL BE IN VENDOR SCOPE OF SUPPLY.

7.3 PERMISSIBLE STARTING DUTY CYCLE/NO. OF STARTS:−

THREE STARTS SPREAD OVER AN HOUR AND TWO CONSECUTIVE STARTS FROM HOT CONDITION WITHOUT ANY INJURIOUS HEATING TO THE WINDING.

7.4	OVER LOAD (% OF FULL LOAD) THAT CAN BE CARRIED BY THE MOTOR WITHOUT IMPAIRING, OVERALL PERFORMANCE AND PERIOD FOR WHICH THIS OVERLOAD IS APPLICABLE.	: 25% FOR 5 MINUTES.
7.5	LOCATION	: INDOOR
7.6	CLASS OF INSULATION	: CLASS−F, FUNGUS RESISITANT, TROPICALISED AS PER IS:3202 WITH TEMP. RISE LIMITED TO THAT OF CLASS B.
7.7	SHAFT DISPOSITION/MOUNTING	: VERTICAL / FLANGE MOUNTED
7.8	METHOD OF CONNECTION TO DRIVEN EQUIPEMENT.	: FLANGE FLEXIBLE COUPLING.
7.9	DIRECTION OF ROTATION AND CORRESPONDING TERMINAL DESIGNATION.	: TO SUIT PUMP
7.10	ENCLOSURE AND VENTILATION	: TOTALLY ENCLOSED FAN COOLED IP−55

7.11	BEARING	: THRUST BEARING WITH A MINIMUM STANDARD LIFE OF NOT LESS THAN 30,000 WORKING HOURS.
7.12	GROUNDING DEVICE	: SUITABLE ARRANGEMENT SHALL BE PROVIDED FOR EARTHING THE MOTOR AT TWO SEPARATE & DISTINCT CONNECTION POINTS. DESIGNATION OF EARTHING CONDUCTOR SHALL BE AS PER IS:4722–1992.
7.13	TERMINAL CONNECTORS	: 2 FOR ARMATURE SUITABLE FOR ALUMINIUM CABLE. 2 FOR FIELD. SUITABLE FOR 2C–10 mm ALUMINIUM CABLE.
7.14	CABLE FOR GROUNDING POINTS	: TO BE PROVIDED
7.15	TERMINAL BOX	: TERMINAL BOX SHALL BE PROVIDED WITH DOUBLE COMPRESSION TYPE BRASS CABLE GLANDS (Nickel Chromium PLAED HEAVY DUTY, CONFIRMING TO BS:6121) AND COPPER CABLE LUGS TO MATCH OWNER'S ALUMINIUM CABLES, THE SIZE OF WHICH SHALL BE INTIMATED LATER. TERMINAL BOX SHALL BE CAPABLE OF BEING ROTATED THROUGH 180° IN STEPS OF 90°. IT SHALL HAVE A DEGREE OF PROTECTION OF IP–55.

8.0 SPECIAL REQUIREMENTS

8.1 THE MOTOR SHALL BE RE–WOUNDABLE.

8.2 THE MOTOR SHALL HAVE ON LINE GREASING FACILITY.

8.3 THE MOTOR CONSTRUCTION SHALL BE SUITABLE FOR EASY DIASSEMBLY AND REASSEMBLY.

8.4 THE MOTOR SHALL BE SUITABLE FOR WORKING IN AN ENVIRONMENT OF OIL FUMES WITHOUT ANY HAZARD.

8.5 THE MOTOR SHALL BE PAINTED WITH PAINT SUITABLE FOR WORKING CONDITION AND ITS COLOUR SHALL BE INTIMATED LATER ON.

9.0 TESTS AT MANUFACTURER'S WORKS:

(i) MOTOR AFTER COMPLETE ASSEMBLY SHALL BE SUBJECTED TO BOTH TYPE AND ROUTINE TESTS AS PER IS:4722. TYPE TEST SHOULD NOT BE MORE THAN 5 YEARS OLD w.r.t. DATE OF ORDERING.

(ii) IN ADDITION THE FOLLOWING TESTS SHALL ALSO BE CARRIED OUT.

ADDITIONAL TYPE TESTS:

(a) DEGREE OF PROTECTION TEST TO CONFORM TO THE SPECIFIED DEGREE OF PROTECTION.

(b) MEASUREMENT OF NOISE LEVEL AS PER IS: 12065. MOTOR NOISE LEVEL SHALL BE LIMITED SO AS TO ACHIEVE COMBINED PUMP MOTOR NOISE LEVEL AS PER CLAUSE 1.4 OF ST38013.

REV. NO. 04		निर्माणकर्ता WORKED BY	DHARAMPAL		14/06/06
P-5540		जांचकर्ता CHECKED BY	ANUJ JAIN		14/6/06

ADDITIONAL ROUTINE TESTS:

(a) 20% OVERSPEED TEST FOR 2 MINUTES.
(b) MEASUREMENT OF VIBRATION AS PER IS: 12075.

10.0 DOCUMENTS TO BE SUPPLIED WITH OFFER:–

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10.1 CHARACTERISTICS
10.1.1 STARTING CURRENT V/S TIME.
10.2 TYPE AND FRAME SIZE.
10.3 STARTING TIME IN SECOND.
10.3.1 WITH 100% VOLTAGE AT TERMINALS.
10.3.1 WITH 85 % VOLTAGE AT TERMINALS.
10.3.2 WITH 80 % VOLTAGE AT TERMINALS.
10.4 SAFE STALL TIME AT 100% VOLTAGE UNDER HOT CONDITIONS.
10.5 POWER (Kw) RATING CALCULATIONS W.R.T. PUMP REQUIREMENT.
10.6 EXPECTED LIFE OF BEARING.

11.0 DOCUMENTS TO BE FURNISHED WITHIN FOUR WEEKS OF PLACEMENT OF ORDER:–

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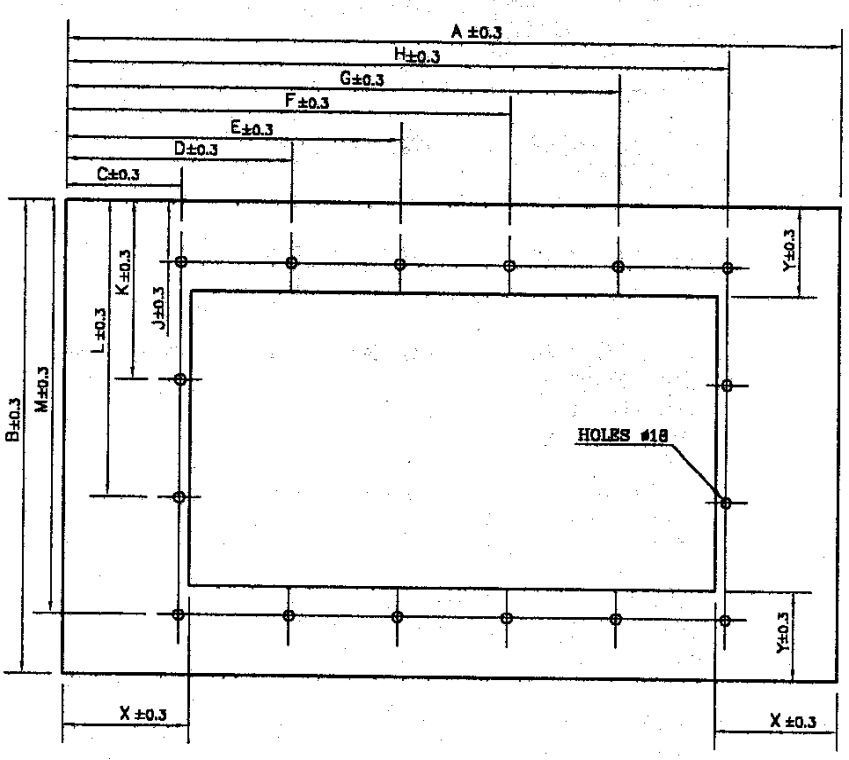
13.0 FOR TECHNICAL DELIVERY CONDITION AND GENERAL FEATURES OF PUMP. LPEASE REFER ST38013.
14.0 CROSS REFERRED STANDARDS: IS:2253, IS:2254, IS:3202, IS:4691 IS:4722 AND IS:4729.

BED PLATE EXISTING ON OIL TANK



BED PLATE TYPE	A±0.3	B±0.3	C ±0.3	D ±0.3	E±0.3	F ±0.3	G±0.3	H ±0.3	J ±0.3	K±0.3	L ±0.3	M±0.3	X ±0.3	Y ±0.3	NO. OFF HOLES
AA	1500	900	220	432	644	856	1068	1280	115	338.3	561.6	784.9	240	170	16

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.	COMPONENT OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10	11	12	13

NTPC QUALITY PLAN

	MANUFACTURERS NAME & ADDRESS:		MANUFACTURING QUALITY PLAN					PROJECT:_____ PACKAGE:_____ CONTRACT NO.:_____ CONTRACTOR:_____					
			ITEM:_____ SUB-SYSTEM:_____				QP NO._____ REV._____ DATE:_____ PAGE _____OF.____					
SL NO.	COMPONTENT 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 INDENTIFIED 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 " VERIFACTION 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				